Conference Report

Abstracts of the 44th Annual Scientific Meeting of the Nutrition Society of Australia

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Abstract: The 44th Annual Scientific Meeting of the Nutrition Society of Australia was held virtually from 3 to 4 December 2020. The theme of the meeting was Nutrition: Adapting to a New World. Abstracts were submitted from 27 countries. In total, 305 registrants attended the conference and 128 papers were presented consisting of 6 plenary, 54 oral and 68 poster presentations. This issue presents the proceedings of this meeting in the form of abstracts for papers presented at the conference.

Keywords: ageing; agriculture and farming; chronic diseases; communication and education; food security; genomics; gut microbiota; micronutrients; nutrition; public health

1. Plenary Presentations

1.1. Nutrition and Food Security during COVID-19—Turning Lessons Learned into Action and Preparedness

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In Australia and around the world, the COVID-19 pandemic has caused unprecedented social and economic change. The onset of the pandemic disrupted the food supply changed the way people shopped for food and heightened the economic vulnerability of households and businesses. The culmination of these circumstances has negatively influenced food availability and access, and exacerbated food insecurity. In this talk, I will present the findings from The Tasmania Project's Food Survey conducted in May 2020, and follow up survey in September 2020. I will highlight changes in the prevalence and sociodemographic predictors of food insecurity throughout the pandemic, and discuss the impact of the pandemic on food access and supply. Our results demonstrate the prevalence of food insecurity is substantially higher than before the pandemic and is largely related to a sudden loss of income. Despite the easing of social distancing restrictions, the prevalence of food insecurity was double pre-pandemic levels in September 2020. Is this the new normal or is this just normal? This talk will explore the consumer led-strategies identified in our study for disaster preparedness in the future, which include shortening food supply chains and establishing food-related disaster plans to ensure equitable access to affordable healthy food for all.

1.2. Optimal Nutrition to Maximize Immune Function: Relevance to COVID-19

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Our innate and adaptive immune systems are our primary defence against invading pathogens. Optimal immune function is absolutely dependent on adequate levels of specific micronutrients—vitamins and trace minerals. These include the lipid soluble vitamins A, D, and E; the water soluble vitamins C and B6, B12 and folate; and the minerals zinc, iron, copper, selenium and magnesium. These micronutrients are required for physical and biochemical barriers and various immune cell functions. Deficiencies of these micronutrients result in decreased resistance to infection and increased morbidity and mortality. Many regions of the world have deficiencies in these micronutrients, particularly low-middle income countries (LMICs). This has implications for the global coronavirus (SARS-CoV-2) pandemic, which is severely affecting LMICs, with 8 of the top 10 worst hit countries being LMICs. Many of the risk factors for COVID-19 also overlap with risk factors for nutrient deficiencies. Recent research is indicating associations between lower vitamin D status and higher country COVID-19 cases and mortality. The World Health Organization has recently prioritised vitamin C for further research as an adjunctive intervention with biologic plausibility for COVID-19. There are currently dozens of trials underway globally to assess the efficacy of various micronutrients for COVID-19 prevention and treatment.

2. Oral Presentations

2.1. The Effect Intermittent Energy Restriction on Weight Loss and Diabetes Risk Markers in Women Who Have Had Gestational Diabetes: A 12-Month Randomised Control Trial

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Weight loss after gestational diabetes (GDM) can prevent or delay type 2 diabetes. Intermittent energy restriction (IER) may be an achievable alternative to continuous energy restriction (CER). Overweight females aged ≥18 years with previous GDM were invited to participate in this 12-month non-inferiority trial. Participants were randomised 1:1 to either an intermittent 2-day 2100 kJ ($n = 61$) or a daily 6000 kJ ($n = 60$) diet. Data are median and IQR unless otherwise stated. Sixty-two participants completed the trial to 12 months (49% attrition). Withdrawal was similar between both diet groups (IER 48% ($n = 29$), CER 50% ($n = 30$), $p = 0.8$). Weight loss was significant by time ($p < 0.001$) but not time by diet group (IER-4.2, 7.4 kg, CER-2.9, 7.6 kg, $p = 0.2$). The mean between group difference for weight loss for IER compared to CER was −1.6 kg (95%CI-4.2, 1.0 kg, $p = 0.2$), confirming non-inferiority of IER for weight loss. HbA1c, fasting plasma glucose, fasting serum insulin and HOMA-IR changed over time ($p < 0.001$) with no between group differences ($p > 0.05$). There were no changes in 2-h glucose tolerance by time or time by diet at 12 months. Weight loss was similar in both groups suggesting that IER is as effective as CER in this population.

2.2. Short Chain Fatty Acid Treatment Alters Extra-Oral mt2r108 Expression In Vitro

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The family of receptors that detect bitter compounds (T2R) are expressed throughout the gastrointestinal tract. There is evidence that extra-oral taste receptors alter the risk for obesity via the modulation of metabolic hormones and/or interactions with the intestinal microbiome. Short chain fatty acids (SCFA) are microbial metabolites produced in the colon that are linked to obesity risk. Importantly, SCFA may modulate risk for obesity via intestinal T2Rs activation. Therefore, we aimed to determine whether SCFA treatment altered T2R expression in intestinal cells (STC cell line). STC-1 cells were treated with acetate (1, 5 and 10 mM) for 48 h. RNA was extracted using phenol-chloroform extraction and was reverse transcribed (Invitrogen m-mlv reverse transcription kit). Gene expression was analysed for *mt2r108* and *mt2r138* (orthologous to human *TAS2R8* and *TAS2R38*) by qPCR (QuantStudio 7, SYBR green and custom primers). Relative expression was calculated using the delta-CT method with reference gene (GAPDH). Treatment with 10 mM acetate for 48 h significantly increased the expression of *mt2r108,* and a similar trend was observed for *mt2r138*. Lower levels had no impact on expression. These data suggest an interaction between bacterial metabolites and intestinal taste receptors. The potential consequences for obesity risk require further investigation.

2.3. High-Saturated or Polyunsaturated-Fat Dietary Patterns and Risk of Obesity and Type 2 Diabetes: A Longitudinal Analysis of the UK Biobank

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Evidence suggests that the type of fat consumed is a risk factor for developing obesity and type-2 diabetes. Few studies have explored these associations using a reduced rank regression dietary patterns (DPs) approach. This study used adults from the UK Biobank ($n = 13{,}454$; mean age 54.9 years) to investigate associations between DPs high in saturated fatty acid (SFA) or polyunsaturated fatty acid (PUFA) and obesity and self-reported type-2 diabetes incidence after a 5-year mean follow-up. Reduced rank regression was used to derive DPs from 24-h dietary assessments, with SFA, PUFA, total fat and fibre density as response variables. Logistic regression, adjusted for socio-demographics and health behaviours, was used to investigate the associations between DPs and obesity and type-2 diabetes incidence. Two DPs were identified: DP1—high-SFA foods (e.g., butter and bacon) and low in high-fibre foods (e.g., vegetables); DP2—high-PUFA, high-fibre foods (e.g., nuts and vegetables) and low in high-SFA foods (e.g., beef). DP1 was associated with higher obesity incidence (OR 1.15, 95%CI 1.09, 1.21), while DP2 was associated with lower obesity incidence (OR 0.88, 95%CI 0.83, 0.92). DPs were not significantly associated with type-2 diabetes incidence. These findings provide evidence that DPs based on SFA and PUFA intake influence the incidence of obesity, but not type-2 diabetes.

2.4. Energy-Dense Dietary Patterns High in Free Sugars and Saturated Fat and Risk of Obesity in Young Adults: A Cross-Sectional Application of Reduced Rank Regression

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Energy-dense diets high in free sugars and saturated fat (SFA) are risk factors for obesity. However, few studies have derived dietary patterns (DPs) based on intakes of these nutrients in young adults (18–30 years). This study aimed to examine associations between reduced rank regression-derived DPs and obesity risk. Data from young adults ($n = 675$, mean age 24.3 years) who completed three or four days of a food diary smartphone application were used. DPs were derived using reduced rank regression (response variables: energy density, fibre density, free sugars intake and SFA intake). Logistic regression, adjusted for age, sex, country of birth, education, SEIFA, physical activity and smoking, was used to investigate the associations between DPs and obesity risk. Two DPs explained the majority of dietary intake: DP1 characterised by energy-dense foods high in free sugars and SFA (e.g., sugar-sweetened beverages and pizza) and low in high-fibre foods (e.g., vegetables) was associated with higher obesity risk (OR 1.18, 95%CI 1.02, 1.36). DP2 characterised by high-free sugars foods (e.g., sugar-sweetened beverages) and low in high-SFA foods (e.g., butter) was not significantly associated with obesity risk. These findings support evidence that discouraging energy-dense DPs high in free sugars and SFA may help lower obesity prevalence in young adults.

2.5. Diet Quality of Young Adult Discretionary Beverage Consumers in New South Wales

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The consumption of discretionary beverages among young adults is known to be high. This study examined differences in energy and nutrient intakes (as proxy for diet quality) between consumers and non-consumers of discretionary beverages. Three-day dietary records were collected using a purpose-designed and validated app by 1001 18–30 year-olds across New South Wales. The sample included rural and metropolitan areas, and low and high socioeconomic areas. Mean energy and nutrient intakes and differences between consumers and non-consumers were calculated using descriptive statistics and ANCOVA tests, adjusted for age, gender and interaction terms. Over the three days, 61.0% consumed a discretionary beverage with soft drinks (51.2%) and flavoured tea/coffee (24.8%) being the most popular. Discretionary beverages contributed 3.8% of total energy and 16.6% of total sugars in this sample. Compared to non-consumers, consumers had significantly higher intakes of energy (8736 kJ vs. 7294 kJ), total sugars (16.5% vs. 13.3% energy), and saturated fat (12.5% vs. 12.0% energy), and lower intakes of protein (18.5% vs. 20.5% energy), all $p < 0.05$. This study adds to evidence that young adult consumers of discretionary beverages have higher energy intakes but lower diet quality than non-consumers.

2.6. Supporting Lifestyle Change in Adults Newly Diagnosed with Moderate-Severe Obstructive Sleep Apnoea: A Question of Timing?

Helen Truby [1], Kaitlin Day [2], Bradley Edwards [3], Denise O'Driscoll [4,5], Alan Young [4,5], Kerryn Roem [2], Ladan Ghazi [2], Claire Bristow [2], Maxine Bonham [2], Chiara Murgia [6], Terry Haines [7] and Garun Hamilton [2,8]

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Obesity and sleep apnoea are inter-related conditions, current treatment is self-administered respiratory support via continuous positive airway pressure (CPAP) and weight loss. This study was designed to examine whether the timing of starting a weight loss attempt affects weight change over 12 months. In a stepped wedge design each participant was randomised to undertake a 6-month dietitian supervised lifestyle intervention, commencing between 1 and 6 months after starting CPAP. Sixty adults (75% males, mean age 49.4 SD 10.74 years; mean BMI 34.1 SD 4.8) were recruited. After 12 months, exposure to the intervention (CPAP and lifestyle) resulted in a 2.18 kg difference in weight change compared to control (CPAP alone) (Coef [95%CI] 2.18 [1.48 to 2.87], $p < 0.001$. During the control period (CPAP only) there was no change in body weight (Coef, [95%CI] 0.03, [−0.3 to 0.36], $p = 0.86$). Timing of the weight loss attempt made no difference to outcomes at 12 months. Adults can simultaneously adopt many new behaviours when supported by health professionals. Enabling a period of establishing CPAP before commencing a weight loss appears not to be of benefit, supporting the recommendation of adjunctive weight-loss interventions upon diagnosis of obesity and sleep apnoea.

2.7. Cereal Polyphenol Intakes and Colorectal Cancer Risk in the Melbourne Collaborative Cohort Study

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Polyphenols in cereal foods may contribute to reducing colorectal cancer (CRC) risk, yet little is known about intakes of cereal-derived polyphenols (total polyphenols, alkylresorcinols, lignans, phenolic acids) and their association with CRC risk in Australia. These associations were evaluated in the Melbourne Collaborative Cohort Study (MCCS). Dietary data were collected (1990–1994) using a 121-item food frequency questionnaire, comprising 17 cereal items, and matched to polyphenol data.

In 35,245 MCCS participants, there were 1394 incident CRC cases. Cox proportional hazards models with age as the time scale were adjusted for sex, SES, ethnicity, physical activity, smoking, and dietary intakes of energy, alcohol and fibre. Hazard ratios (HRs) for quintile 2 (Q2) (HR 0.80, 95%CI 0.68, 0.95) and Q4 (HR 0.75, 95%CI 0.62, 0.90) of total cereal polyphenol intake, and in Q3 (HR 0.80, 95%CI 0.67, 0.95) and Q4 (HR 0.79, 95%CI 0.66, 0.95) of alkylresorcinol intake, were reduced relative to Q1. Adding body mass index to the model did not markedly alter the results. Overall, little evidence was found of a linear association between cereal polyphenol intake and CRC risk. Expanding the analysis to other food groups and cancers may provide further insights into the role of polyphenols in cancer aetiology.

2.8. Ex Vivo Short Chain Fatty Acid Treatment of PBMCs from Subjects with Asthma Reduces LPS-Induced Inflammatory Cytokine Production

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Short chain fatty acids (SCFA) are the bacterial metabolites of soluble fibre fermentation. SCFA have anti-inflammatory properties exerted via free fatty acid receptor (FFAR) activation and histone deacetylase (HDAC) inhibition, identifying a therapeutic benefit in asthma. This study aimed to determine if SCFA treatment of PBMCs from subjects ($n = 12$) with asthma reduced LPS-induced inflammatory cytokine production. PBMCs were isolated via density centrifugation and cultured simultaneously with 5 ng/mL LPS and 2 or 20 mM acetate, propionate or butyrate for 48-h at 35 °C 5%CO_2. Interleukin-1β (IL-1β), tumour necrosis factor-α (TNF-α), IL-10 and interferon-γ (IFN-γ) were measured in cell culture supernatants via LEGENDplex^{TM}. FFAR and HDAC mRNA expression were measured via RT-qPCR with fold-change ($2^{-\Delta\Delta Ct}$) calculated. LPS-induced IL-1β decreased following 20 mM acetate ($p = 0.009$), propionate ($p = 0.043$), and butyrate ($p = 0.003$) treatments. However, LPS-induced TNF-α decreased only with 20 mM butyrate treatment ($p = 0.016$). Butyrate treatment increased *HDAC1* (1.98 (1.72, 2.38) (med (IQR), $p < 0.001$) and *HDAC3* (4.53 (3.97, 5.0), $p < 0.001$) mRNA expression, however reduced *HDAC7* (0.08 (0.05, 0.11), $p = 0.003$) and *HDAC9* (0.24 (0.09, 0.44), $p = 0.002$). Propionate treatment up-regulated *HDAC1* (1.9 (1.54, 1.94), $p < 0.001$) and *HDAC2* (1.34 (1.16, 1.55), $p = 0.011$) and decreased *HDAC4* (0.64 (0.51, 0.91), $p = 0.049$) mRNA expression. These observations suggest short chain fatty acids differentially affect HDAC expression and may have therapeutic potential in asthma.

2.9. Transcriptomic Analysis of Selenium-Related Pathways and Their Association with Non-Alcoholic Fatty Liver Disease

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Currently available literature provides conflicting information with regards to the association between selenium and non-alcoholic fatty liver disease (NAFLD). Transcriptomic exploration of the aetiology and progression of NAFLD may offer insight into this potential association. In this study, gene expression databases were searched for studies that measured global liver gene expression in patients with NAFLD and healthy controls. Four datasets met the criteria and were included in the analysis. A subset of five pathways containing 167 genes that had selenium or selenoproteins as key elements were analysed. There was a lack of consistency in gene expression differences between NAFLD and controls across studies in selenoprotein expression. However, SCLY, a key enzyme in the metabolism of dietary selenium, was consistently down-regulated in NAFLD compared to controls. Twelve genes were up-regulated (ALOX5AP, HBA1, HBB, SERPINE1, CCL1, TXN, MTR,

JUN, FTH1, ATG7, MAP1LC3A, ACSL4) and nine genes were down-regulated (PLG, PNPO, ABCA1, CBS, SCLY, SLC11A2, OLPAH, ANPEP, CYP1A1) in at least three datasets (adj. $p < 0.05$ in at least 2 of these datasets). Although no consistent differences in selenoprotein genes was observed in NAFLD, the decreased expression of SCLY sheds light on a potential relationship between the metabolism of selenium and NAFLD.

2.10. *Navigating Dietary Advice for Multiple Sclerosis*

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Multiple sclerosis (MS) is an inflammatory demyelinating disease with no known cure. Despite insufficient evidence, numerous diets are promoted to reduce symptoms or even cure MS. We aimed to explore the challenges faced by adults with MS when making dietary decisions, and their perceived dietary education needs. We conducted six focus groups with people with MS ($n = 33$ plus one spouse without MS). Groups were audio-recorded, transcribed verbatim, and thematically analysed using a general inductive approach. Six themes emerged: (1) confused about where to seek dietary advice and what to eat; (2) skeptical about national dietary guidelines; (3) motivated to prioritise and personalise certain foods or diet plans; (4) recognising barriers to making dietary changes; (5) judging if the dietary changes are working; and (6) wanting dietary guidelines for MS. The self-determination theory explained why people with MS make dietary modifications, and the varying levels of motivation. People with MS are highly motivated to make dietary changes and improve their health. MS-specific dietary resources and nutrition education need to incorporate ways to increase autonomous forms of motivation. Future dietary intervention studies could use the self-determination theory as a framework to improve long-term adherence to healthier diets.

2.11. *Patterns of Change in Lifestyle Behaviours Following Childbirth*

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Lifestyle behaviours may worsen following childbirth due to a range of factors including reduced prioritisation of health and time availability. Longitudinal data from surveys 3 and 5 (ages 25–30 and 31–36 years) from the 1973–1978 birth cohort of the Australian Longitudinal Study on Women's Health were used. We assessed changes in weight, energy intake, diet quality (measured using the Dietary Guidelines Index), physical activity and sitting time in women who were nulliparous at survey 3 using multivariable linear regression models. Of 4927 nulliparous women at survey 3, 2503 were parous by survey 5. Mean weight change between surveys 3 and 5 was not statistically different between nulliparous (3.6 ± 8.4 kg) and parous (3.9 ± 7.5 kg) women ($p = 0.19$). With each additional child, women had increased energy intake (381.34 kJ, 95%CI 313.95, 448.74), decreased diet quality (-0.45 unit, 95%CI-0.78, -0.12), lower physical activity (-122.45 METmin/day, 95%CI-157.16, -87.73) and less sitting time (-1.03 hrs/day, 95%CI-1.11, -0.94) after adjusting for the endpoints at baseline, age, BMI, education, marital status, socioeconomic status, smoking, alcohol frequency and stress. With each additional child, Australian women have higher energy intake, poorer diet quality, lower physical activity and less sitting time, which does not translate to a difference in weight compared to nulliparous women.

2.12. Relationships between Use of Meal/Recipe Bases and Concentrates, Cooking Skills Confidence, and Adequate Vegetable Intake

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Most Australians do not meet vegetable intake recommendations. Vegetables often require preparation, and therefore cooking skills, and are most commonly consumed in evening meals. Products such as meal/recipe bases and concentrates are increasingly common and typically provide recipes. However, the relationships between use of these products, cooking confidence and vegetable intake remain unknown. Therefore, we surveyed Australian adults (via social media snowball recruitment) on their use of meal/recipe bases or concentrates, their cooking skills confidence (35-point index), and vegetable intakes (adequate ≥ 5 servings/day vs. inadequate). Analyses were adjusted for age, sex, income and education level. Eight hundred and forty-two participants provided complete and valid surveys. In total, 36.7% of participants reported using meal/recipe bases or concentrates. Use of these products was associated with lower cooking skills confidence score (25.9 vs. 28.9, $p < 0.0001$), and lower likelihood of adequate vegetable intake (OR 0.6, 95%CI 0.4–0.9, $p = 0.02$). Cooking skills confidence was also positively correlated with likelihood of adequate vegetable intake (Unit odds ratio = 1.06). Therefore, improving the vegetable content of recipes provided with meal/recipe bases or concentrates may be a tool to increase vegetable intakes in users with lower cooking skills confidence, along with traditional approaches directed at increasing cooking skills and awareness of the importance of vegetables.

2.13. Relationships between Health Perception of Fresh and Frozen Vegetables, Habits of Purchasing and Consumption

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Most Australians do not meet vegetable intake recommendations. Frozen vegetables are a lower cost long shelf-life alternative to fresh, however they may be incorrectly perceived as less healthy by consumers. We surveyed Australian adults (via social media snowball recruitment, $n = 372$) on their usual purchasing and intake habits regarding fresh and frozen vegetables. Perceived healthiness was rated (0–100) for fresh and frozen broccoli, cauliflower, corn and beans and an average score calculated. Analyses were adjusted for age, sex, income and education. In total, 41.7% of participants reported purchasing only fresh vegetables and 58.3% reported purchasing a combination of fresh and frozen, or frozen only. In total, 82% of participants reported normally eating vegetables with their evening meals ≥ 5 times/week. Those who purchased only fresh vegetables had a lower health perception of frozen (74.4 (95%CI 71.1–77.7) vs. 84.9 (82.0–87.7); $p < 0.001$) and fresh vegetables (87.1 (95%CI 85.1–89.2.0) vs. 90.1 (88.3–91.8); $p = 0.008$). Those who usually ate vegetables with their evening meal ≥5 times/week had higher health perception of frozen (82.0 (95%CI 79.2–84.9) vs. 76.7 (72.2–81.3); $p = 0.003$) and fresh vegetables (90.4 (95%CI 88.7–92.9) vs. 84.0 (81.4–86.7); $p < 0.001$). Therefore, improving awareness of the healthiness of both fresh and frozen vegetables may help improve vegetable consumption.

2.14. Food Technology Neophobia and Consumer Acceptance of Waxed Apples

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Wax coatings increase the shelf-life and sustainability of apples. As consumer interest in 'natural' products grows, it is important to study the relationship between food technology neophobia (FTN)

and acceptance of wax coatings. In an online experiment (*n* = 466), participants were randomised into one of three conditions, each viewing a different advertisement. The control group were informed that apples are waxed, the second group were informed that wax increases shelf-life and the third group were informed that wax contributes to sustainability. Participants food technology neophobia level and acceptance of waxed apples before and after viewing the advertisement was assessed. Analysis of covariance was undertaken to determine if the advertisement influenced acceptance when controlling for FTN. A negative correlation between FTN and acceptance was found at baseline ($p < 0.001$, R = −0.51) and after advertisement viewing ($p < 0.001$, R = −60). The analysis revealed a significant effect of the advertisement on acceptance ($F_{(2460)}$ = 20.964, $p < 0.001$, η2 = 0.084) with information on the purpose of apple coating increasing acceptance. As edible coating technologies increase in number and application, this knowledge will help to design effective education/marketing campaigns that inform consumers on how coatings increase shelf-life and reduce food waste, whilst at the same time meeting consumers' desire for 'naturalness'.

2.15. Sensory Evaluation of Commercial Dairy Yogurts Compared to Plant-Based Alternatives Using Facial Expression Recognition Technique

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Facial expression recognition (biometrics) technology, an advanced sensory method, intrinsically measures participants' facial expressions for evaluation of the tasted food products. The objective of the study was to evaluate biometrics approach (unconscious method) for tasting of dairy yogurts and their plant-based substitutes and compare it with other conscious approaches. Six yogurt products differing in consistency and consumer experiences were evaluated by 62 consumers (53% Asians, 47% Westerns) for overall liking on 9-point hedonic scale and selected emotions for each of the products tasted, which formed the part of conscious sensory method. Furthermore, consumers were video recorded while tasting the products for biometrics approach which was further analyzed using FaceReaderTM software. The results from hedonic scales showed a difference in the overall liking towards the six yogurt products and were explained by the cheak all that apply (CATA) and biometrics methods. A linear model developed using overall liking scores as response variable, explained 65.1% and 8.8% variability in data by CATA method of emotions and biometrics method, respectively. It was concluded that biometrics approach of facial recognition can be used to distinguish acceptability of really different yogurt samples and can be used in combination with other approaches for better understanding of consumer behaviour.

2.16. Knowledge, Attitudes, and Behaviours Related to Salt and Culinary Herb and Spice Use in Evening Meals by Australian Adults

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Using culinary herbs and spices during home cooking is recommended to reduce the use of salt, with the intention to lower sodium intakes and minimise risk of cardiovascular disease. This study aims to explore adults' knowledge, attitudes and behaviours (KAB) related to culinary herbs and spices,

and salt use in home cooking. Participants (≥17 years) living in Australia were recruited via convenience sampling to complete an online survey comprising questions about KAB of herbs and spices, and salt in home cooking at evening meals. There were 270 participant responses (Median 32.5 years, 83% female). Participants (45–98%) reported liking 33 listed culinary herbs and spices, which were used weekly and monthly. Most (71%) did not know the sodium Suggested Dietary Target but knew processed foods are the main source of sodium in the Australian diet (80%). Almost half (48%) agreed using herbs and spices resulted in adding less salt during cooking. However, there was no difference in the number of herbs and spices used in cooking evening meals between high and low sodium consumers ($p > 0.05$). Study findings inform future salt reduction campaigns and serve as a baseline to monitor changes in KAB of Australians' use of herbs, spices and added salt.

2.17. Evaluation of a Control Nutrition Education Program for an Online Dietary Intervention in Individuals with Depression

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The quality of a control condition is vital for rigour in dietary research. We aimed to evaluate acceptability and engagement with an online nutrition education program, designed for use as a control arm for a randomised controlled trial of Mediterranean diet for depressive symptoms. Sixty participants with at least mild depressive symptoms were recruited to view the online program (15 video modules) within a 2-week period. The modules provided education on specific nutrients, their role in mental health, and safety considerations. Dietary sources were not mentioned. Participants completed an acceptability questionnaire and a diet questionnaire measuring diet quality and supplement use at baseline and 2 weeks, and system analytic data captured engagement. Twenty-seven (45%) of the sixty participants were active users. Most participants agreed the amount of content (16/20, 80%) and program length (18/20, 90%) was acceptable and the content was useful (17/20, 85%). Diet quality did not change (6.5 ± 2.1 vs. 6.0 ± 2.7, $p = 0.14$) nor did supplement use (69% vs. 69%, $p = 1.00$). Our findings of acceptability and of no change in diet/supplement use demonstrates the suitability of this program as a control condition for an intervention evaluating the effect of a web-based dietary program on depressive symptoms.

2.18. The Effect of Dietary Supplementation on Aggressive Behaviour in Australian Adult Male Prisoners: Feasibility and Pilot Study for a Randomised, Double Blind Placebo Controlled Trial

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This study assessed the feasibility of conducting a nutrition trial with omega-3 fatty acids in adult male prisoners with the aim of decreasing aggressive behaviour. Adult male inmates were recruited from South Coast Correctional Centre, NSW for a 16-week randomised control trial comparing the effect of omega-3 long-chain polyunsaturated fatty acids (n-3 LCPUFA) and multivitamin supplements versus placebo on aggressive behaviour. The baseline and post-intervention assessments were participant

erythrocyte n-3 LCPUFA levels and measures of aggressive behaviour. One hundred and thirty-six adult male inmates consented to the study with a retention rate of 60%, and 93% of blood samples were successfully collected. From the baseline data, the odds ratio shows that inmates are 4.3 times more likely to be aggressive if they are below the 6% cut off on the omega-3 index. Both groups improved across all outcome measures and, at the current sample size, no significant differences were seen between them. A power calculation suggests a total sample size of 600 participants is required to detect the effects of this dietary supplementation, and that this supplementation study is feasible in a Correctional Centre. Important criteria for the exclusion and consideration of logistics and compliance are presented.

2.19. Fruit and Vegetable Intake Is Inversely Associated with Perceived Stress Across the Adult Lifespan

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Long-term exposure to stress can impact mental health. Poor diet quality and low fruit and vegetable (FV) intake have been associated with worse mental health, but the relationship between FV intake and perceived stress (PS) is unclear. This cross-sectional study aimed to explore the association of FV intake and PS in men and women aged ≥25 years from the Australian Diabetes, Obesity and Lifestyle (AusDiab) Study. At baseline (1999–2000) dietary intake was assessed using a Food Frequency Questionnaire (n = 8689) and PS was assessed using a validated Perceived Stress Questionnaire [PSQ index ranging from (0–1; higher index reflecting greater PS)]. Mean age of participants was 47.4 (SD 14.1) years (49.8% females). Participants with the highest intakes of FV had a 10% lower PSQ index compared to those with the lowest intake [Quartile 4: 0.27 ± 0.004 vs. Quartile 1: 0.30 ± 0.004 (mean ± SE), p = 0.004]. Similar associations were found when fruits and vegetables were assessed individually. Subgroup analyses suggest these findings were not different in men and women. The findings of this study suggest that current daily recommendations for FV intake may also be beneficial for reducing perceived stress.

2.20. *The Contribution of Major Food Categories and Companies to Household Purchases of Added Sugar in Australia*

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The Australian government will release sugar reformulation targets for packaged foods. The aim of this study was to estimate the amount of added sugars purchased from packaged food products, and the relative contribution that food categories and food companies make to Australian household added sugar purchases. We used one year of grocery purchase data from a nationally representative consumer panel of Australian households (Nielsen Homescan), combined with a database which contains product-specific sugar information (FoodSwitch). Added sugar purchases (g/day per capita) were examined overall and across household income strata. Added sugar information was available from 7371 households who purchased 26,312 unique food and beverage products. The amount of added sugar acquired from packaged foods and beverages was (mean ± SE) 37.0 ± 0.01 g/day per capita. Low-income households purchased 11 g/d (95%CI 9–13 g/day, $p < 0.001$) more added sugar from packaged products than high-income households per capita. Ten food categories accounted for 81.5% of added sugar purchased and the top 10 contributed 67.1% of added sugar purchases. Australian households purchase a considerable amount of added sugar from packaged foods. There is substantial opportunity for the government to strengthen the proposed sugar reformulation targets within the context of a multi-component package of policies.

2.21. *COVID-19 and Food-Related Behaviours of Australian Household Food Gatekeepers*

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The increased restrictions, safety concerns, financial hardships, and supply chain havoc related to COVID-19 pandemic and lockdowns influenced people's food-related behaviours. The exploration of these behaviours helps to identify coping strategies. This will shed insights on their long-term influence on people's health and wellbeing. This study aimed to explore Australian food gatekeepers' perceptions and responses towards their food-related behaviours during the COVID-19 pandemic and lockdown. We conducted online semi-structured interviews with 21 household food gatekeepers from June to September 2020. The interview transcripts were analysed using the template analysis technique. Preliminary data analysis revealed that in the majority of households, home cooking has increased. Many participants reported using food delivery services either for ingredients or cooked food. Moreover, participants reported increased experimentation in the kitchen. In some households, junk and takeaway food consumption and alcohol intake have increased. Many participants indicated the difficulties they faced in obtaining some food items. In most households, family mealtimes have increased. In conclusion, households have developed both healthy and less healthy food-related behaviours during this period. Nutrition promotion efforts during and beyond the pandemic should consider these findings, to empower people and develop effective strategies in helping people to make healthy food decisions.

2.22. *Diet Quality and a Traditional Dietary Pattern Predict Lean Mass in Women: Longitudinal Data from the Geelong Osteoporosis Study*

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Low muscle mass is associated with reduced independence and increased risk for falls and fractures. Identification of modifiable risk factors for low muscle mass is thus imperative. This study aimed to examine the longitudinal relationship between both diet quality and patterns and lean mass in women. The Geelong Osteoporosis Study's 10- and 15-year women's follow-up data were used, with participants aged 21–89 years. Self-reported lifestyle and demographics were collected, and food frequency questionnaire data informed the dietary exposure variables: the Australian Recommended Food Score (ARFS); the Dietary Inflammatory Index (DII); and posteriori dietary patterns. The outcome, Skeletal Muscle Index (SMI), was calculated from DXA-derived appendicular lean mass (ALM) relative to height (ALM kg/m^2). Analyses employed Generalised Estimating Equations. The ARFS positively predicted SMI over 5-years; adjustments for age and physical activity did not attenuate significance (B: 0.044, (95%CI 0.004, 0.084) kg/m^2). Following adjustments for age, physical activity, and hormone therapy the DII and 'traditional' dietary pattern were associated with SMI. A less inflammatory diet was associated with SMI (B: -0.040, (95%CI-0.075, -0.005) kg/m^2) and a 'traditional' dietary pattern with higher SMI (B: 0.080, (95%CI 0.020, 0.140) kg/m^2). No other associations were observed. Our study reinforces the importance of diet quality for healthy, aging muscle mass.

2.23. *Dietary Patterns Were Not Associated with Cognitive Function in Older New Zealand Adults: The Reach Study*

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Preserving cognitive function maintains independence. Dietary pattern analysis considers the total diet. This cross-sectional study explores associations between a posteriori dietary patterns and cognition in older adults. The Researching Eating, Activity and Cognitive Health (REACH) study

included men and women (*n* = 367) aged 65–74 years, living independently in Auckland, New Zealand. A 109-item validated food frequency questionnaire captured dietary data. Global cognitive domain and its components: attention, executive function, episodic memory, working memory and location learning were assessed using the Computerised Mental Performance Assessment System (COMPASS). Dietary patterns were derived using principal component analysis with varimax rotation. Multiple regression explored associations between dietary patterns and cognitive function. Age, sex, apolipoprotein E ε4 (*APOE-ε4*) genotype, physical activity levels and education were included in statistical models. Three dietary patterns: 'Mediterranean style', 'Western' and 'prudent' explained 18% of variation in dietary intake. Higher cognitive scores were seen in females ($p < 0.001$), non-*APOE-ε4* allele carriers ($p = 0.02$) and participants with lower energy intake ($p < 0.004$), higher education ($p < 0.004$) and of younger age ($p < 0.03$). No associations were seen between cognitive domains and dietary patterns or physical activity. In conclusion, dietary patterns were not associated with cognitive function, although sex, energy intake, education, *APOE-ε4* and age predicted cognitive scores.

2.24. Inflammation Marker Profiling of Dietary Patterns and Association with All-Cause Mortality

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Mechanisms by which healthy diets protect against disease and premature mortality are not fully understood. We investigated associations between three dietary scores (Mediterranean dietary score (MDS), Alternative Healthy Eating Index 2010 (AHEI), energy adjusted Dietary Inflammatory Index (E-DII®)) and plasma B-vitamins, markers of inflammation and kynurenines to derive dietary pattern-based marker scores and assessed their associations with mortality. To derive weighted marker scores, we examined the association between 30 plasma markers and each dietary score for 770 participants in the Melbourne Collaborative Cohort Study. Associations between marker scores and mortality (*n* = 249 deaths) were estimated using Cox regression (median follow-up: 14.5-years). The MDS, E-DII® and AHEI were associated ($p < 0.05$) with nine, 14 and 11 plasma markers, respectively. Healthier diets (higher MDS, AHEI and anti-inflammatory E-DII®) were associated with lower concentrations of kynurenines, neopterin, INF-γ, cytokines and CRP. Five of the six markers common to the three dietary scores were kynurenine pathway constituents. Marker scores showed stronger inverse associations with mortality than their respective dietary scores. MDS, AHEI and E-DII are associated with immune-related plasma markers. The substantial overlap between diet scores, especially for kynurenine pathway constituents, suggests shared mechanisms by which they confer mortality benefits.

2.25. Environmental UVR Levels and Vitamin D and Folate-Related Genetic Variants Are Associated with Blood Pressure in a Large Elderly Australian Cohort

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Chronic increases in blood pressure (BP), the leading risk factor for cardiovascular diseases (CVD), have been shown to be inversely associated with increases in environmental ultraviolet radiation (UVR). UVR-sensitive vitamins related to homocysteine levels and other CVD risk factors, vitamin D and folate, and related genetic variants, may modulate this association; however, this has yet to be examined. Therefore, we assessed the independent and interactive associations of environmental UVR, nutrients levels, and related genetic variants on BP in an elderly Australian cohort ($n = 647$). Systolic and diastolic BP (SBP/DBP), and levels of red blood cell (RBC) folate, 25-hydroxyvitamin D (25(OH)D), and homocysteine were measured. Subjects were genotyped for 21 folate/vitamin D variants. Environmental UVR levels were assessed as the erythemal dose rate accumulated over the two-days (2D-EDR), six-weeks (6W-EDR) and four-months (4M-EDR) prior to clinics. Multivariate analyses found negative associations between SBP and 2D-EDR ($\beta = -0.10$, $p = 0.02$), and 6W-EDR ($\beta = -0.09$, $p = 0.03$). *MTHFR*-rs1801133 and *VDR*-rs2228570 were related to increased and decreased DBP, respectively ($p = 0.03$, $p = 0.04$). Associations remained following adjustments for 25(OH)D and RBC-folate, however only the association between 2D-EDR and SBP remained following adjustment for homocysteine levels. These findings indicate environmental UVR, and *MTHFR*-rs1801133 and *VDR*-rs2228570 variants are potential predictors of BP.

2.26. The Relationship between Omega-3 Index and Measures of Sarcopenia in Older Australians

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Advancing age is associated with a gradual decline in muscle strength, mass and function, especially in participants over 50 years of age. This can progress to sarcopenia, a debilitating geriatric disease with significant impacts on individuals and public health. Omega-3 fatty acids may lessen decline in muscle mass by countering inflammaging and preventing mTOR pathway dysregulation, thus maintaining muscle protein synthesis. This study aimed to determine relationships between omega-3 index (O3I) status and clinical measures of sarcopenia in at-risk participants who completed a combined nutrition and exercise intervention. Body composition was measured by dual energy X-ray absorptiometry (DEXA), and erythrocyte fatty acids were measured by gas chromatography. Participants were divided by O3I status; O3I >6 was classified as high O3I ($n = 15$) and O3I ≤6 was classified as low O3I ($n = 9$). At baseline, higher O3I was correlated with higher gait speed ($p = 0.03$), however increasing O3I was correlated with lower shoulder adduction strength ($p = 0.04$). Upon trial completion, ASMM increased by 0.40 kg in the high O3I group, while the low O3I group saw a decrease of -0.19 kg ($p = 0.09$). Additionally, O3I was positively correlated with change in grip strength ($p = 0.03$). Further research is necessary to investigate links between omega-3 fatty acids and sarcopenia.

2.27. An Audit of the Australian Retail Toddler Food Environment

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The range of foods marketed as suitable for toddlers is increasing, and many do not align with feeding or dietary recommendations. Evidence describing the availability and characteristics of toddler foods in Australia is lacking. We aimed to describe the current retail toddler food environment in Australia. A cross-sectional audit of the current Australian toddler (i.e., 1–3 years) food environment was undertaken by visiting major supermarket and pharmacy chains, and online searching. All toddler foods within the store were included. Details on product label attributes were collected via photographs using a smartphone for data entry and analysis. One hundred and fifty-four unique products were identified. In total, 81% were snack foods, 40% of all foods were discretionary and 85% were

ultra-processed. In total, 47% of all products were both core and ultra-processed. Discretionary foods had higher ($p < 0.001$) values for energy, fat, saturated fat, carbohydrate, sugar and sodium than core foods. Sugar content was higher in ultra-processed foods compared with processed ($p < 0.001$) and minimally-processed ($p < 0.001$) foods. Sodium levels were also higher in ultra-processed compared with minimally processed ($p < 0.001$) foods. The retail food environment for toddlers in Australia consists of many food products which do not align with best practise feeding guidelines or dietary recommendations.

2.28. Differences in Fatty Acid Profiles of Beef Carcases from Commercial Australian Production Systems

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Differences in fatty acid composition of grass and grain-fed beef is well understood, yet there is little understanding of the impact of grass supplemented and short-term grain feeding, which is required to verify labelling claims regarding production system of origin. This research aims to examine differences between the fatty acid composition of beef carcases from a variety of beef production systems. Fat was collected from beef carcases representing grass-fed, supplemented grass-fed, short term (70 days) and long term (100 day) grain-fed ($n = 505$) systems, and analysed using a modified one-step extraction. Long term grain-fed cattle had higher saturated fatty acids (SFA) (27.8 g/100 g) compared to grass-fed cattle (25.0 g/100 g), although was not different to short grain-fed (28.3 g/100 g) or grass supplemented (26.1 g/100 g). The MUFA concentration was not different between short term grain (32.8 g/100 g), grass and grass supplemented cattle, yet long term grain-fed cattle were lower (29.2 g/100 g). Furthermore, grass-fed cattle were higher in concentration of omega-3 fatty acids (0.4 mg/100 g) compared to long grain-fed (0.1 mg/100 g), short grain-fed (0.2 mg/100 g) and grass supplemented (0.2 mg/100 g) cattle.

2.29. Supplementing Sheep Feed with a Micro-Encapsulated Blend of Essential Oils (MBEO) Can Be an Alternative, Sustainable Feeding Strategy for Australian Livestock Enterprises

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There is a growing trend in livestock nutrition for the utilisation of natural, phytogenic plant compounds, such as essential oils to beneficially sustain animal growth performance as to what had been previously achieved through ionophore or antibiotic feeding strategies. Lambs ($n = 190$) were fed for 48 days on pelleted feed A or B, which were supplemented with either a MBEO or a sodium lasalocid ionophore (LASA). Metabolizable energy (ME) and crude protein (CP) on a 100% DM basis for diets A and B were 11 MJ/kg of ME and 14.5% CP, and 12 MJ/kg of ME and 16.5% CP, respectively. On day 0, lambs were allocated to one of the four dietary treatments by their bodyweight (BW); (1) A+MBEO, (2) B+MBEO, (3) A+LASA and (4) B+LASA and had ad libitum access to feed. All lambs were weighed and pen feed disappearance recorded weekly. Carcase parameters were recorded at the end of the feeding period. No significant differences were observed for growth or carcase measurements of lambs that consumed a diet with either MBEO or LASA supplementation. This study highlighted equivalent growth rates and carcase yields were achievable between lambs fed a pelleted diet with either an ionophore or MBEO.

2.30. Packaged Food Supply in Fiji: Nutrient Levels, Compliance with Salt Targets and Adherence to Labelling Regulations

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The Fijian Government has regulated nutrient labelling and set voluntary sodium reformulation targets in efforts to curb rising diet related non-communicable diseases. Our aim was to establish a national database of packaged foods and assess compliance to labelling regulations and reformulation targets. Data were collected from the labels of all packaged food products sold at five major supermarkets in Fiji in 2018. Proportions of products compliant with labelling regulations and with sodium reformulation targets, and mean sodium and sugar content were calculated in each food category. In total, 5946 packaged food products were surveyed, of which 4278 were included for analysis. Overall compliance with labelling of all required nutrients was low, 14% of packaged foods in 14 major categories met national regulations. The food group with the highest mean sodium content was convenience foods (1699 mg/100 g), and confectionary (52.6 g/100 g) had the highest free sugar content. Sixty percent of products met the voluntary Fiji sodium reformulation targets. Improving the nutritional composition of foods and improving labelling has the potential to curb the escalating burden of diet related non-communicable diseases. Our findings indicate ample opportunity for improvements in labelling and nutritional composition of the Fijian packaged food supply.

2.31. Diets within Planetary Boundaries: Study of Water Use and Australian Dietary Choices

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There is widespread interest in sustainable diets and water use is one important aspect as agriculture accounts for around 70% of freshwater use. While some dietary habits are known to have lower water scarcity footprints, an outstanding question is what level of reduction is necessary to be considered sustainable. The pursuit of unnecessarily aggressive reductions in dietary water footprints could limit healthy food choices (especially fruits and nuts) and have adverse effects on public health nutrition. In this study, water scarcity footprint results for 9341 self-selected Australian adult diets, quantified using life cycle assessment, were compared to the planetary boundary for freshwater use down-scaled to the level of an individual diet. It is estimated that there is 695 L/person/day available for food production for a current global population of 7.8 billion, or 603 L/person/day for a future population of 9 billion. In contrast, the average Australian adult diet required 433 L/day. Diets based on the Australian Dietary Guidelines required 521 L/day, or 379 L/day with lower water scarcity footprint-intensity food choices. In conclusion, current Australian diets do not appear to be too water demanding. Local action to improve water management is needed in areas where water scarcity is a problem.

2.32. Barriers and Enablers of Harnessing Food Waste to Address Food Insecurity in Australia: A Scoping Review

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Australia has one of the highest rates of food insecurity in all developed countries with numbers growing annually. Despite this, millions of tonnes of food are wasted each year, which if appropriately rescued and redirected, could drastically lower rates of food insecurity. This scoping review aimed to identify barriers and enablers of harnessing food waste across food sectors to address food insecurity. A systematic search was conducted. Enablers ($n = 126$) and barriers ($n = 106$) were collected from 39 articles and were categorised by food sector (retail, household, food rescue organisations (FROs) and food system as a whole) and theme. Most enablers (e) and barriers (b) focused on FROs (e = 92/126, b = 71/106), followed by households (e = 12/126, b = 17/106), retail (e = 12/126, b = 10/106) then food systems (e = 10/126, b = 8/106). Eight themes for enablers and seven for barriers were established. Three novel advancements, paramount across all studied sectors were proposed: (1) partnerships and subsidies to minimise transportation costs for redistributing imperfect/surplus food; (2) partnerships and subsidies to stably involve nutrition experts in FROs and; (3) food rescue programs and campaigns which combine five characteristics: free for participants, addressing food literacy; utilising multiple mass media tools; age-tailoring; and framing messages with additional personal values.

2.33. Using Wearable Cameras to Assess Foods and Beverages Omitted in 24 h Dietary Recalls by Young Adults

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Misreporting in self-reported measures of dietary intake are well documented with an increase in the prevalence of low energy reporting between the two most recent national dietary surveys using 24 h recall method. The aim of this study was to assess food and beverages omitted by young adults during a 24 h dietary recall using wearable cameras that continuously captured images of participant's activities from a first person perspective in free living conditions. Three consecutive 24 h recalls were administered by a dietitian using the ASA-24 Australia program. Fifty-seven participants aged between 18 and 30 years were included. Eating occasions identified in images were assigned to breakfast, lunch, dinner or snacks. Foods omitted from the corresponding 24 h recalls were determined. Binary logistic regression assessed differences in omitted items and eating occasions. Participants omitted a mean of 16% of beverages and 14% of eating occasions over three days, mostly snacks 90%. Snacks were 7.3 times more likely to be omitted than breakfast (odds ratio [OR] 7.31, 95%CI 3.11–17.16, $p < 0.001$). Wearable cameras provide a passive and objective method of capturing omitted foods and beverages. Future studies using the 24 h dietary recall method should consider targeting snacks to reduce omissions.

2.34. Biomarkers of Dietary Patterns: A Systematic Review of Randomised Controlled Trials

Shuang Liang [1,2,3,4], Reeja Nasir [1,3,4], Fiona O'Leary [3,4,5], Clemence Toniutti [1,4], Kim Bell-Anderson [3,4,5] and Michael Skilton [1,2,3,4]

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Most current dietary assessment tools are prone to measurement errors. Dietary biomarkers are a promising alternative for objective measurement of dietary intake. The development of dietary

biomarkers has predominantly focused on individual nutrients or foods, yet dietary guidelines focus increasingly on dietary patterns. This systematic review aims to identify dietary biomarkers being used as indicators of dietary patterns and novel biomarkers identified in exploratory studies. Five electronic databases were searched. Sixteen publications reporting randomised trials met the inclusion criteria. The most studied dietary patterns were Mediterranean diet, Dietary Approaches to Stop Hypertension diet, and New Nordic diet, followed by diets based on national/international dietary guidelines, low glycaemic load diet, and vegetarian diet. Eight publications incorporated pre-existing dietary biomarkers, the most common being erythrocyte omega-3 index, 24-h urinary electrolytes, and serum/plasma carotenoids. Eight studies identified novel metabolomic biomarkers associated with dietary patterns, the most frequently identified being those associated with protein, lipid, and fish intakes. Assessing biomarkers that are relevant to a specific aspect of a dietary pattern may be useful for assessing adherence to dietary pattern interventions. The identification of people who consume a specific dietary pattern, on the basis of their biomarker profile, remains an area for future research.

2.35. Distribution and Frequency of Dietary Intakes in 18-Month-Old Children across a Day

Jie Min Chui, Alison Spence, Kathleen Lacy, Miaobing Zheng, Rebecca Leech, Sarah McNaughton and Karen Campbell

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Dietary behaviours in early childhood are understudied despite links with later health. This study aimed to describe 24-hourly distribution of dietary intakes and frequency of eating occasions among 428 children aged 18 months to identify opportunities within a day for improvements in diet. Dietary intake was assessed using two 24-h parent-reported recalls of child intakes in the Melbourne InFANT program. Daily eating occasions were calculated based on 15-min intervals and energy values excluding 0 kJ. Intake distributions were calculated examining intakes of fruits, vegetables, discretionary foods, and total energy-containing foods and beverages hourly on weekdays ($n = 418$) and weekends ($n = 376$). Few differences in patterns between weekdays and weekend days were observed. Overall, children ate 7.6 ± 1.7 occasions/day on average, where 2.2 ± 1.1, 1.5 ± 0.8 and 2.6 ± 1.5 contained fruit, vegetables and discretionary foods, respectively. Analysis of distribution of intake showed consumption throughout the day (6 a.m.–10 p.m.) for total foods, fruits and discretionary foods. Vegetable consumption showed a distinct peak at 6 p.m., a small peak at 11 a.m., and minimal intake at other times. The 18-month-olds had high eating frequency with little distinction between weekdays and weekend days. Most eating occasions lacked vegetables, hence promoting vegetable consumption at occasions other than dinner will provide opportunities to improve vegetable intake.

2.36. Estimating Energy Intake and Misreporting from a Qualitative Food Frequency Questionnaire: An Instructive Example Using an Australian Cohort and Survey Data

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Qualitative food frequency questionnaires (Q-FFQ) omit portion size information from dietary assessment. This restricts researchers to using consumption frequency data, limiting investigations of dietary composition (i.e., energy-adjusted intakes) and energy misreporting. To support such

researchers, we provide an instructive example of Q-FFQ energy intake estimation that derives portion size information from a reference survey population and evaluates energy misreporting. A sample of 1919 Childhood Determinants of Adult Health Study (CDAH) participants aged 26–36 years completed a 127-item Q-FFQ. We assumed sex-specific portion sizes for FFQ items using 24-h dietary recall data from the 2011–2012 Australian National Nutrition and Physical Activity Survey (NNPAS) and compiled energy density values primarily using the Australian Food Composition Database. Median (interquartile range) energy intake was 9010 (7218–11,601) kJ/d in CDAH and 9055 (6916–11,825) kJ/d in weighted, age-matched NNPAS respondents (n = 1383). Median energy intake to basal metabolic rate ratios were 1.37 (1.10–1.70) in CDAH and 1.35 (1.03–1.74) in weighted NNPAS, indicating notable under-reporting in both samples, with increased under-reporting severity among the overweight/obese. This process can assist researchers wanting an estimate of Q-FFQ derived energy intake and to evaluate energy misreporting, broadening the scope of diet-disease investigations that depend on consumption frequency data.

2.37. *Development of an Australia-Specific Vitamin K Food Composition Database*

Claire Palmer [1], Henrietta Koch [2], Kevin Croft [2], Sujata Shinde [2], Joshua Lewis [1,3,4], Jonathan Hodgson [1,4], Lauren Blekkenhorst [1,4] and Marc Sim [1,4]

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There is no database of the vitamin K content in Australian foods. This limits the epidemiological research exploring potential health benefits of vitamin K1 (Phylloquinone; PK) and K2 (Menaquinone; MK). We have developed a database by measuring vitamin K content of food items commonly assessed in Australian food frequency questionnaires. We also compared the PK and MK content of foods from Australia with other international databases. Vegetables, fruits, oils, meat, and animal products (n = 60 food items) were obtained from three major Australian retailers and were assessed for PK and MK content using Liquid Chromatography Tandem-Mass Spectrometry. Vitamin K content in food varied considerably compared to Dutch and American (USA) databases. In foods known to be rich in PK, contents differed substantially between databases (e.g., Australia vs. USA, spinach 263 vs. 483 µg/100 g; broccoli 68 vs. 102 µg/100 g, respectively). MK-4 content in dairy products also differed by ~300% (e.g., Australia vs. USA, cottage cheese 1.0 vs. 0.3 µg/100 g, Australia vs. Dutch, whole yoghurt 1.8 vs. 0.6 µg/100 g). This database, for the first time, provides researchers with better estimates of vitamin K content in Australian foods, thus enabling future work exploring potential health benefits of dietary PK and MK on health outcomes.

2.38. *Eating Occasions and Ultra-Processed Food Consumption among Age Groups in Australia*

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Ultra-processed foods (UPFs) account for nearly half of Australians' total energy intake. However, little is known about UPF consumption at eating occasions across the day. This study aimed to describe the consumption of UPFs at eating occasions among Australian participants from the National Nutrition and Physical Activity Survey 2011–2012 (n = 12,153; aged 2–85 y). Food items reported at each eating occasion during a 24 h recall were classified using the NOVA system. The contribution of NOVA groups (including UPFs) to total energy intake by time-of-day and according to eating occasion (meal/snack) was determined by age group. Higher intakes of UPFs occurred later in the

day (between 6 p.m. and 9 p.m.) among all age groups. The proportion of UPFs consumed at snacks was 35% higher than at meals for all age groups, with adolescents and young adults presenting the highest ratios. Children and adolescents consumed more UPFs than other NOVA groups at meals (45% of energy intake vs. <35% from other NOVA groups), while older adults and elderly had higher intakes of unprocessed and minimally processed foods. The consumption of UPFs by children and adolescents displaces other foods at meals and is related to late eating and snacking among all age groups in Australia.

2.39. Extra Virgin Olive Oil High in Polyphenols Improves Antioxidant Status in Healthy Adults. The OLIVAUS Study

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Olive oil polyphenols have been associated with several cardiovascular health benefits. This study examined the antioxidant and anti-inflammatory effect of extra-virgin high polyphenol olive oil (HPOO) vs. low polyphenol olive oil (LPOO) in healthy adults. In a double-blind cross-over trial, 50 participants (aged 38.5 ± 13.9 years, 66% females) were randomized to consume 60 mL/day of HPOO (360 mg/kg polyphenols) or LPOO (86 mg/kg polyphenols) for 3 weeks. Following a 2-week wash-out, participants crossed-over to the alternate treatment. Plasma oxidized low-density lipoprotein (ox-LDL), total antioxidant capacity (TAC), high-sensitivity C-reactive protein (hs-CRP) and anthropometrics were measured at baseline and follow-up. There were no significant differences between treatments. However, plasma ox-LDL decreased by 6.5 mU/mL (95%CI −12.4 to −0.5), while TAC increased by 0.03 mM (95%CI 0.006 to 0.05) following HPOO consumption. Stratified analyses on HPOO participants with higher waist circumference measures (>94 cm in males, >80 cm in females), indicating high cardiovascular risk, showed a further decrease in ox-LDL by 13.5 mU/mL (95%CI −23.5 to −3.6) and an increase in TAC by 0.04 mM (95%CI 0.006 to 0.07). No significant results were observed for hs-CRP. Our findings demonstrate the antioxidant effect of HPOO, which is more pronounced in high cardiometabolic risk adults.

2.40. Increased Nitrate Intake from Beetroot Juice Does Not Alter Soluble Cellular Adhesion Molecules and Circulating Inflammatory Cytokines in Treated Hypertensive Individuals: A Randomised, Controlled Trial

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Evidence of the role of dietary nitrate as an immunomodulator in healthy individuals is emerging. Whether dietary nitrate reduces inflammatory cytokines or soluble adhesion molecules in hypertension is unclear. Beetroot and green leafy vegetables are rich sources of dietary nitrate. In a randomised, placebo-controlled, double-blind crossover trial with 27 treated hypertensive participants, we investigated the effect of 1-week intake of nitrate-rich beetroot juice versus 1-week intake of nitrate-depleted beetroot juice (placebo) on inflammatory cytokines and soluble adhesion molecules. Primary outcomes, namely circulating inflammatory cytokines (IL-1β, IL-6, IL-8, IL-10, TNF-α) and soluble adhesion markers (ICAM-1, VCAM-1, CD62E, CD62P), were assessed by flow cytometry. Nitrate metabolism was assessed by measuring nitrate and nitrite levels in saliva, plasma, and urine. Seven days of nitrate-rich beetroot juice resulted in a 7-fold increase in salivary nitrite, an 8-fold increase in salivary nitrate, a 3-fold increase in plasma nitrate and nitrite, and a 4-fold increase in urinary nitrate and nitrite compared to placebo ($p = 0.001$). No differences were observed in inflammatory cytokine or soluble adhesion molecules with increased nitrate intake. This study does not provide evidence that a 1-week increase in ingestion of dietary nitrate is effective in reducing low-grade inflammation in treated hypertensive individuals.

2.41. Dietary Supplementation with Curcumin Reduces Pro-Inflammatory Mediators: A Systematic Review and Meta-Analysis of Randomized Controlled Trials

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Chronic inflammation is a major contributor to the development of non-communicable diseases. Clinical evidence regarding the anti-inflammatory effects of curcumin, a polyphenol from turmeric; remains inconclusive due to discrepancies regarding optimal dosage, duration and formulation. The aim of this review was to evaluate the efficacy of curcumin supplementation on systemic inflammatory mediators, comparing dose, duration and bioavailability status of interventions. RCTs investigating effects of dietary curcumin on inflammatory mediators in humans not receiving anti-inflammatory treatment were eligible. Evidence quality was appraised using Quality Criteria Checklist for Primary Research. Thirty-two trials (2038 participants) were included and 28 meta-analyzed using random-effects model and effect sizes expressed as Hedges g (95%CI). Pooled data showed a reduction in C-reactive protein [weighted mean difference (WMD) −1.55 mg/dL, 95%CI −1.81, −1.30], interleukin (IL)-6 (WMD −1.69 pg/mL, 95%CI −2.56, −0.82), tumour necrosis factor-alpha (WMD −3.13 pg/dL, 95%CI −4.62, −1.64), IL-8 (WMD −0.54 pg/mL, 95%CI −0.82, −0.28), monocyte chemoattractant protein-1 (WMD −2.48 pg/mL, 95%CI −3.96, −1.00), increased IL-10 (WMD 0.49 pg/mL, 95%CI 0.10, 0.88) and no effect on intracellular adhesion molecule-1. This provides evidence for the anti-inflammatory effects of curcumin and supports further investigation confirming dose, duration and formulation to optimise anti-inflammatory effects in humans with chronic inflammation.

2.42. The Role of Illness Perceptions in Treatment Response of Adults with IBS Undergoing Low FODMAP Diet Intervention: A Prospective Study

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The low fermentable oligosaccharide, disaccharide, monosaccharide and polyol (FODMAP) diet is efficacious in irritable bowel syndrome (IBS) at the group level, but not all patients respond to the treatment. We aimed to investigate baseline illness perceptions as predictors of treatment response and their cross-sectional associations with baseline IBS symptom levels. Adults aged >18 yo were recruited from dietetic practice clinics and via social media. Participants completed the Illness Perception Questionnaire and IBS Symptom Severity Score (IBS-SSS) at three timepoints; pre-, post- and 4-weeks after the initial consult. Linear mixed model analysis determined the effect of illness perception on symptoms. Fifty-six participants (86%F) showed the low FODMAP diet was effective ($\beta = -10.00 \pm 1.74$, $p < 0.0001$) indicating an average decrease of 10.0 points on the IBS-SSS per week of treatment. The identity ($\beta = 29.0 \pm 6.8$, $p < 0.0001$), time ($\beta = 32.8 \pm 6.7$, $p < 0.0001$), consequences ($\beta = 34.8 \pm 964$, $p < 0.001$), and emotional representations ($\beta = 31.3 \pm 6.7$, $p < 0.001$) subscales at baseline were significantly associated with higher baseline levels of IBS symptoms. Treatment control and personal control subscales predicted symptom response over time ($\beta = -4.8 \pm 1.7$, $p = 0.007$; $\beta = -6.2 \pm 1.7$, $p = 0.006$, respectively). Cognitions associated with negative consequences of the illness were associated with IBS symptom severity. Understanding of treatment and personal control of symptoms before treatment may improve efficacy of the low FODMAP diet.

2.43. Tolerability of Resistant Starch and Non-Fermentable Fibre, Alone or in Combination, in Patients with Irritable Bowel Syndrome: A Pilot Investigation

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The fermentative activities of resistant starch 2 (RS2) may offer therapeutic value to patients with irritable bowel syndrome (IBS). Its benefits may be more evenly distributed around the bowels when combined with a non-fermentable fibre. This pilot investigation evaluated the tolerability of RS2 and non-fermentable sugarcane bagasse, alone and in combination, in patients and healthy controls. Patients with IBS ($n = 6$) and healthy controls ($n = 5$) underwent a blinded, randomised cross-over trial. Following a 3-day baseline, subjects received interventions containing the fibres in escalating doses lasting 3 days each: RS2 (10, 15, 20 g/d); sugarcane bagasse (5, 10, 15 g/d); and their combination (20, 25, 30 g/d). Overall and specific gastrointestinal symptoms were assessed via 100-mm visual analogue scale. Mean change in overall symptoms of ≤20 mm from baseline was defined as tolerable. During baseline, mean overall symptoms were greater in patients compared with those in healthy controls (27.8 vs. 8.1 mm, $p = 0.01$). Mean change in overall symptoms throughout each intervention were ≤20 mm from baseline for either cohort. No significant differences were found for abdominal pain, bloating, wind or dissatisfaction with stool consistency in either cohort. RS2 and sugarcane bagasse, alone and in combination, were well tolerated at the dosages evaluated.

2.44. A Randomized Cross-Over Study of FODMAP Intake on Pain Signalling in Irritable Bowel Syndrome

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The low FODMAP (fermentable oligo-, di-, mono-saccharides and polyols) diet reduces symptoms of irritable bowel syndrome (IBS). Microbiota-FODMAP interactions may modulate gastrointestinal pain signalling. This study aimed to characterize the effect of FODMAPs on symptoms and pain signalling. Patients with IBS underwent four assessments: two non-intervention periods, followed by a low- and high-FODMAP diet given in random order for 3-weeks each. Patients were advised that either diet may have therapeutic potential. At the end of each period, patients completed a 7-day food diary, the IBS Severity-Scoring-System, and provided stool. The effects of faecal supernatants from five patients were assessed during in vitro extracellular recordings of the lumbar-splanchnic nerves of murine distal colon. Analysis was conducted by two-way ANOVA. Symptoms reduced with the low FODMAP diet (mean ± SD, 266 ± 70 vs. 171 ± 80, $p < 0.01$, $n = 25$). Faecal supernatants at baseline increased the basal firing frequency of afferent nerves ($p < 0.05$), an effect which was lost when supernatants from the low FODMAP diet were applied (NS). These results show that lowering FODMAP intake improves symptoms which correlates with reduced pain signalling induced by faecal supernatants. This suggests that mediators secreted by the microbiome may underlie the reduction in pain induced by the low FODMAP diet.

2.45. Digestive Health Effects of High Amylose Wheat: A Randomised Controlled Trial in Healthy Adults

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Replacing conventional wheat with high amylose wheat (HAW) containing high levels of resistant starch, lowers the glycaemic response to bread, but its effect on the gut health of healthy adults is unknown. This study aimed to investigate whether HAW food consumption improved measures of gut health, bowel habit and perceived gut comfort. Eighty healthy adults were enrolled in a 4-arm parallel, randomised, controlled, double-blind trial. They consumed diets containing bread and biscuits made from low amylose wheat (refined, LAW-R or wholemeal, LAW-W) or HAW (refined, HAW-R or wholemeal, HAW-W) flour for 4 wk. At baseline and after 4 wk, faecal markers of health, including short chain fatty acids such as butyrate were measured. A gut comfort questionnaire was also completed at baseline, 2 and 4 wk. Participants consuming HAW-R products excreted 38% more faecal butyrate than those consuming LAW-R ($p < 0.05$), but faecal butyrate excretion was similar for HAW-W and LAW-W. Wheat amylose content did not affect measures of faecal consistency, including faecal output, faecal moisture, defecation frequency and stool consistency. The HAW diets were also well tolerated with no adverse effects on digestive comfort. Foods made with refined HAW flour rather than conventional wheat was effective in improving some measures of gut health.

2.46. *Effects of High Amylose Wheat on the Gut Microbiome and Fermentation Metabolites: A Randomised Controlled Trial in Healthy Adults*

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Resistant starch (RS) has been shown to have favourable effects on gut health but whether a wheat containing high levels of RS affects the gut microbiome and fermentation metabolites in humans is unknown. This study determined whether consumption of high RS wheat-based foods modulate the abundance of specific bacteria involved in carbohydrate and protein fermentation as well as specific metabolites associated with gut health. Eighty healthy adults were enrolled in a 4-arm parallel, randomised-controlled, double-blind trial. They consumed a diet containing bread and biscuits made from low amylose wheat (refined, LAW-R or wholemeal, LAW-W) or high amylose wheat (refined, HAW-R or wholemeal, HAW-W) flour for 4 wks. At baseline and 4 wk, faecal samples were collected for microbiome, SCFA and p-cresol analysis. The HAW-R group had higher levels of SCFA producing microbes, *Faecalibacterium* ($p < 0.001$) and *Roseburia_inulinivorans* ($p < 0.001$) and excreted 38% more butyrate ($p < 0.005$) in their faeces. Furthermore, HAW-R group had lower abundance of *p*-cresol producing bacteria such as *Peptostreptococcaceae_Clostridium* (0.8-fold) and 24% lower faecal concentrations of *p*-cresol ($p < 0.05$) in the faeces. Increased RS intake through foods containing refined HAW flour improved measures of gut health related to carbohydrate and protein fermentation.

2.47. *Mice Fed a High Protein Diet for 24 Weeks Had an Altered Microbiome, Increased Plasma Endotoxin, Systemic Inflammation and Kidney Injury*

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The popularity of high protein diets has increased substantially in recent years driven by the promotion of weight loss diets such as Paleo, Atkins and ketogenic diet. However, concern remains about the potential negative effects that excessive protein intake has on the kidneys. It is increasingly recognised that changes in the gut microbiota and disruption of the gastrointestinal barrier may play a role in diets' effects on the kidneys, termed the gut-kidney axis. C57bl/6 mice were fed a diet containing either 7% (control) or 52% (HPD) energy from protein for 24 weeks. Albumin, kidney injury molecule 1 (KIM-1) and monocyte chemoattractant protein 1 (MCP-1) were measured by ELISA. Endotoxin was measured using a limulus amoebocyte lysate kit. Gut microbiota and predicted bacterial metagenome pathways were assessed using 16S rRNA gene analysis with QIIME2 and PICRUSt2, respectively. HPD increased albuminuria, urinary KIM-1, plasma endotoxin and MCP-1. HPD altered microbial β-diversity with a concomitant decrease in branched-chain amino acid synthesis and increase in microbial urea cycle pathways. These results demonstrate that chronic HPD consumption causes albuminuria, systemic inflammation, increased gastrointestinal permeability and is associated with gut microbiota remodelling with an increase in the urea cycle pathway, which may contribute to renal injury.

3. Poster Presentations

3.1. Longitudinal Weight Gain and Lifestyle Factors in Women With and Without Polycystic Ovary Syndrome

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While women with polycystic ovary syndrome (PCOS) have a higher risk of weight gain than women without PCOS, the independent association of lifestyle factors with weight change is not known. We used data from the 1973–1978 cohort of the Australian Longitudinal Study on Women's Health for longitudinal analysis of data collected over 19 years. Linear mixed-effects models were used to examine weight change and its association with lifestyle factors, adjusted for socio-demographic, psychological factors and health care utilisation. Women with PCOS gained more weight annually (0.27 kg/year, 95%CI 0.14, 0.40) than women without PCOS. While women with PCOS had higher weight gain than those without PCOS both for the groups with better and worse lifestyles, the magnitude of this difference was greater for women with PCOS who had higher energy intake, glycaemic index and longer sitting time and those not meeting physical activity (PA) guidelines. Women with PCOS and with higher energy intake, increased glycaemic index, longer sitting time and insufficient PA had the greatest weight gain. This indicates lifestyle factors have a more profound impact on weight gain in women with PCOS than without PCOS.

3.2. Transcriptomic Responses to Weight Loss: Findings from The Sleeping Well Trial

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Transcriptomics enables the capture of a global picture of the individual level molecular adaptations occurring during weight loss and could help tailor personalised nutrition interventions. This study explored the transcriptomic response to a six-month lifestyle intervention in participants with obstructive sleep apnoea (OSA) from The Sleeping Well trial and the extent this differed between high (HR) and low responders (LR). A subset of participants ($n = 18$) had RNA from immune cells sequenced pre- and post-intervention. Based on changes in waist circumference, weight and OSA severity, participants were grouped into always HR, always LR or mixed. HR had the largest response to the intervention with three genes and 17 pathways significantly altered (adj. p-value < 0.05 and z-score > 1.96), followed by the mixed group with one gene and 12 pathways significantly altered and LRs with six pathways only significantly altered. Differences were greater between groups at baseline than the within groups response to the intervention. The largest difference was between HR and mixed with 39 genes and 22 pathways significantly altered. This suggests that differences between HR, LR and mixed, in immune cell transcription, at baseline existed, which is not mediated by weight loss.

3.3. Associations between Two Diet Quality Scores and Obesity in a Nationally Representative Sample of Iranian Households: A Cross-Sectional Study

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Research examining associations between diet quality and obesity in Iranian adults is limited by small and non-representative samples. This study investigated the cross-sectional associations between two diet quality indices and obesity in a nationally representative sample of Iranian adults and whether these associations were modified by sex or area of residence. Data on 18,307 adults (mean age 37.0 (SD 15.2) years) were used from the Iranian National Survey 2001–2003. Two diet quality indices (Healthy Eating Index, HEI, and Diet Quality Index International, DQI-I) were calculated from three household 24-h dietary recalls. Multi-level regression analyses were used to evaluate associations between household HEI and DQI-I and individual Body Mass Index (BMI). Effect modification by sex and area of residence (urban vs. rural) were examined. Higher HEI and DQI-I were associated with higher BMI (β HEI: 0.07, 95%CI 0.06, 0.09; β DQI-I: 0.03, 95%CI 0.02, 0.04). The positive associations between HEI and DQI-I and BMI were stronger in females and in rural areas. While these findings suggest that higher diet quality is associated with higher BMI in Iranian adults, longitudinal health and individual dietary intake data are needed to determine whether these unexpected associations persist over time.

3.4. What Adolescents See on Instagram: Content Analysis of #Intermittentfasting, #Keto, #Lowcarb

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Adolescents report engaging in dieting attempts to manage weight. Diet-related information may be sourced from social media, given its frequent use. This study aimed to describe popular diet content visible on adolescent social media accounts. An adolescent Instagram profile captured 250 'top' images from three popular diet hashtags (#intermittentfasting #keto #lowcarb). Images were coded using a pre-determined ontology as food (core or discretionary; common foods/food groups), people (group, individual, before/after), or informative. At the time of data collection, there were 3.8 M #intermittentfasting, 19 M #keto and 22 M #lowcarb posts on Instagram. Images tagged #intermittentfasting were categorised as 44% food, 40% people, 14% information; #keto were 55.6% food, 33.6% people, 9.2% information; and #lowcarb were 64.8% food, 16.4% people, 18.4% information. Of the 750 images, 79.3% of food images were core foods, depicting animal protein ($n = 219$), vegetables ($n = 195$) and dairy ($n = 111$). Desserts represented almost one in five #lowcarb images ($n = 47$). Images of people were individual (51.1%) or before/after (41.3%); mostly female (77.4%), of white (55.3%) ethnicity. Across all posts, 12.5% were linked to a commercial product/programme and 2.3% provided nutrition information. This study found diet-related images visible to adolescents on Instagram promote animal-based foods with/without vegetables. Few provide useful nutrition information.

3.5. Significant and Rapid Weight Gain after Heart Transplantation

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Heart transplant recipients are known to suffer considerable weight gain after transplantation, increasing their risks of cardiovascular events and graft rejection, but Australian evidence is scarce. This study aimed to assess weight changes in heart transplant recipients in the two years post-transplantation. Heart transplant recipients at Queensland's cardiothoracic transplant hospital were eligible if aged ≥18 years, were transplanted in the period 1990–2017 and were alive ≥2 years post-transplantation. We extracted measured weights at time of transplant (baseline), at routine follow-up at one year and two years post-transplantation; measured height; and demographic information from hospital records. We assessed changes in body mass index (BMI) from baseline to 2 years post-transplantation using repeated ANOVA and McNemar test. Of 316 heart transplant recipients, 127 (40%) (median age 52 years; male 81%) had all weight measurements available. At baseline, mean BMI was 26.3 kg/m^2 ± standard error 1.02; 79 (62%) were overweight/obese. At one year, mean BMI increased to 27.7 kg/m^2 ± 1.02 ($p < 0.001$) and 91 (72%) were overweight/obese ($p = 0.019$). At two years, mean BMI further increased to 28.2 kg/m^2 ± 1.02 (from baseline $p < 0.001$) and 98 (77%) were overweight/obese ($p < 0.001$). Our findings show significant weight increases occur in the two years post-heart transplant, especially during the first one year.

3.6. The Impact of Delaying Departure on Ad Libitum Consumption of a Laboratory Breakfast Meal

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Laboratory studies assessing dietary behaviour often employ different defined post-prandial delay (DPD) periods before participants are permitted to leave. The aim of this study was to examine the impact of varying DPD periods on dietary intake and subjective appetite responses at an ad libitum buffet breakfast. Twenty-four participants (age: 23.4 ± 6.3 y; BMI: 23.9 ± 3.9 kg·m^2) completed three laboratory trials following a quasi-randomised, crossover design. Each trial incorporated a DPD period of either 0 hr, 1 hr or 3 hrs following breakfast. On completion of the DPD period, subjective ratings of appetite were recorded, before participants departed the laboratory. One-way repeated measures ANOVA were used to analyse results, with post hoc paired-sample t tests conducted on significant main effects. Breakfast energy and carbohydrate intakes were significantly lower on the 0-h compared to 1-h ($p = 0.014$) and 3-h trials. Ratings of hunger were significantly higher ($p < 0.01$) on the 3-h compared to both 0-h and 1-h DPD trials. Delaying participants from leaving a laboratory alters dietary intake of an ad libitum test meal and subsequent subjective responses. The post-meal delay period appears to be an important methodological characteristic capable of altering the results of laboratory feeding studies.

3.7. Lower Glycaemic Index Foods and Beverages and the Drive to Eat: A Systematic Review and Meta-Analysis of Randomised Controlled Trials

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The drive to eat includes subjective perceptions of hunger, fullness, appetite and satiety, or more objective ad libitum intake of foods, or circulating levels of appetite-regulating hormones. We conducted a systematic review and meta-analysis of randomised controlled trials of the effect of glycaemic index (GI) foods/meals/diets in humans of all ages on the drive to eat. Thirty-five studies (28 publications, $n = 609$ participants) met our inclusion criteria and were eligible for meta-analysis. Average GI in the lower versus higher group were 44.5 and 78.6, respectively. Lower GI foods/meals/diets compared to higher GI comparators, significantly improved measures of the drive to eat, overall (Standardised Mean Difference (SMD) −0.17, 95%CI −0.30, −0.05, $p = 0.008$). Similarly, lower GI foods/meals/diets compared to higher GI comparators significantly improved subjective measures of the drive to eat (satiety, appetite, fullness and hunger) overall (−0.10, 95%CI −0.19, −0.02, $p = 0.020$). For satiety, there was a statistically significant improvement (−0.22, 95%CI −0.37, −0.08, $p = 0.002$). Finally, there was a lower food intake in the hours after consumption of a single lower GI food or single meal compared to higher GI comparators (−0.22, 95%CI −0.32, −0.12, $p < 0.001$). Overall, the evidence suggests that there is a causal relationship between the consumption of lower GI foods and increased satiety.

3.8. Self-Management Strategies, Physical Activity and Dietary Intake in Women with Polycystic Ovary Syndrome: A Cross-Sectional Study

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The 2018 Polycystic Ovary Syndrome (PCOS) Evidence-Based Clinical Guidelines recommend lifestyle intervention (physical activity [PA], nutrition and behavioural interventions) as first-line treatment for PCOS management. Use of self-management strategies helps women better implement these recommendations and reduce the risk of PCOS-associated disease. This paper describes the association between PA and nutrition-related self-management strategies and body weight, body mass index (BMI), PA and dietary intake in women with PCOS. Women ($n = 501$) in Australian aged 18–45 years with self-reported PCOS completed a 24-h dietary recall and the International Physical Activity Questionnaire (IPAQ) online. Nutrition self-management strategies had no association with diet quality [OR: −0.02 (95%CI −3.21, 2.63), $p = 0.843$], energy intake [OR: −0.05 (95%CI −842.91, 546.08) $p = 0.671$], BMI [OR: −0.13 (95%CI −3.76, 0.95), $p = 0.236$] nor weight [OR: 0.04 (95%CI −7.11, 4.66), $p = 0.679$]. PA self-management strategies increased the odds of meeting PA recommendations [Odds ratio (OR): 3.88 (95%CI 2.87, 5.25), $p < 0.001$] but had no association with BMI [OR: 0.14 (95%CI −0.72, 3.19), $p = 0.211$] nor weight [OR: 0.06 (95%CI −3.49, 6.28), $p = 0.571$]. Use of PA, but not nutrition self-management strategies, was associated with implementing PCOS lifestyle recommendations. Other behaviour determinants (e.g., self-efficacy) should also be considered when wanting to implement PCOS lifestyle recommendations in the long-term.

3.9. Perceptions of Children and Parents on the Use of Video Games for Nutrition Education—A Focus Group Study

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With nearly one-third of New Zealand children being overweight and obese, and the majority deemed not to be meeting national physical activity guidelines, it is with urgency that we address childhood obesity in New Zealand. Changing dietary behaviours has proven difficult. Serious games are increasingly being used in behaviour interventions due to the rapid growth and accessibility of digital technology. Hence, we aim to explore the perceptions of New Zealand parents and children on video games for nutrition education. A qualitative research design using focus group interviews was used to gather the perceptions of parents and children on video games for nutrition. Ten adults and 62 children from three primary schools in Dunedin took part in the study. A total of ten focus groups for children and one for adults were carried out over one school-term. Preliminary analysis was undertaken following the completion of each focus group, and the 10th focus group was determined to be the point of saturation. NVivo software will be used for data analysis. Content analysis will be carried out, and meaningful sections of text will be systematically and sequentially coded and categorised following a general inductive approach, allowing key 'themes' to emerge from the data.

3.10. Indonesian Women's Experiences Obtaining Antenatal Nutrition Information

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Understanding the information-seeking behaviours of women in pregnancy is critical for developing effective antenatal nutrition education. This study aimed to investigate Indonesian women's antenatal nutrition information-seeking behaviour and its relationship to socio-demographic characteristics. Women in Indonesia, who had given birth in the previous two years ($n = 335$, 30 ± 4.8 years), completed an online survey. Information-seeking and characteristics data were analysed using chi-square, factor analysis and multiple regression. Women searched for or obtained nutrition information from multiple sources, including their husband (98.2%), digital media (96.4%), mothers (in-law) (91.6%), friends (93.4%) and preference to health practitioners, including doctors (89.3%), midwives (81.2%) and nutritionists (52.2%). Factor analysis identified four categories of information sources: (1) family, online and obstetrics sources, (2) friends and relatives, (3) mass media and nutritionists, (4) maternal health resources (midwives, maternal health book, health volunteers). Highly educated and income women were more likely to seek nutrition information from 'family, online and obstetrics sources' (Factor 1; $p < 0.001$). Low educated and non-working women were more likely to seek nutrition information from 'maternal health resources' (Factor 4; $p < 0.001$). To appropriately target a wide range of women, antenatal nutrition interventions need to consider the different information sources that women across the socio-economic spectrum access.

3.11. Exploring Issues to Be Addressed in a Food Literacy Programme for Parents of Young Children from Disadvantaged Areas

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Childhood provides an optimal opportunity for growth and development and parents play a fundamental role in forming good eating habits in their children. A healthy diet improves quality of life and well-being and reduces the risk of chronic disease. The aim of this research was to explore the challenges of providing healthy diets for 0–5-year-old children. This research formed part of the formative research to develop a food literacy programme for parents with young children from disadvantaged areas of Western Australia. This qualitative study employed a general inductive inquiry approach. Eight focus groups were conducted with 67 parents living in low socio-economic areas within the Perth metropolitan region. Participants were recruited through community-based parenting organisations. Themes identified from the focus group data were aligned with relatedness, autonomy and competence within the Self Determination Theory. Implications for the programme identified from the themes include importance to build trust and rapport with parents attending the programme. A food literacy programme needs to place emphasis on the importance of parents creating environments that support responsive parenting practices and create opportunities for parents during the programme to practice behaviours that build their child's autonomy and competence around eating healthy food.

3.12. Fruit and Vegetable Knowledge and Intake within an Australian Population: The AusDiab Study

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Understanding the relationship between fruit and vegetable knowledge (FVK) and fruit and vegetable intake (FVI) is important for optimal health promotion. Using data from the Australian Diabetes, Obesity and Lifestyle Study (AusDiab), we investigated associations between FVK and FVI, and demographic and lifestyle factors. Baseline FVK was measured using two self-reported questions. FVI was measured using a validated, self-reported, food frequency questionnaire in 1999/00 (baseline), 2004/05 and 2011/12. Amongst the 8966 participants assessed at baseline, 24.1% had optimal, 73.0% had insufficient and 2.9% had poor FVK. Using linear regression, those with insufficient or poor FVK reported lower FVI (grams/day) compared to those with optimal FVK; at baseline [coefficient (95%CI)]: −67.1 (−80.0, −54.3) and −124.0 (−142.9, −105.1); 5 years: −50.4 (−61.4, −39.4) and −122.2 (−152.7, −91.6); and 12 years: −42.5 (−54.6, −30.5) and −94.6 (−133.8, −55.5), of follow-up (all $p < 0.001$). Poor FVK was more likely to be reported in males, older aged (>65 years), socio-economically disadvantaged, smokers and those with insufficient physical activity/sedentary behaviour. Our study demonstrates that knowledge of fruit and vegetable recommendations is strongly associated with FVI, with several demographic and lifestyle factors predicting FVK. Health promotion messages aimed at increasing FVK should target these subgroups for maximal effect.

3.13. Defining Wholegrain Foods—Do Estimations of Intake Affect Associations between Whole Grains and Anthropometric Measures: An Australian and Swedish Perspective

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Historically, there are inconsistencies in the calculation of wholegrain intake, particularly through use of varied wholegrain food definitions. The current study aimed to investigate impacts of using a whole grain food definition on identifiable associations with anthropometric measures in Australian and Swedish cohorts. Data from the Australian National Nutrition and Physical Activity Survey 2011–2012, the Swedish Riksmaten adults 2010–2011 and relevant food composition databases were utilised. Whole grain intakes were calculated as grams of whole grain from any food (absolute intake) or based on foods complying with the Healthgrain definition (≥30% whole grain (dry weight), more whole than refined grain and meeting accepted standards for 'healthy foods'). In Australian adults, whole grain intake was associated with all anthropometric measures when applying a definition, but not with body weight when including grams of absolute intake. No associations with quartiles of wholegrain intake were found for Swedish adults. BMI, waist circumference and waist-to-height ratio were associated with absolute grams of wholegrain intake, but not when applying a definition. Use of wholegrain food definitions impact our findings on wholegrain benefits. Consistency, currently absent from global research, is critical to establish clear evidence of wholegrain benefits.

3.14. Understanding Young Australian Adults' Views on Energy Dense and Nutrient Poor Foods (EDNP) Using Qualitative Research

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Excessive consumption of EDNP foods is known to be detrimental to human health. However, few studies have examined the influence of demographic and socio-psychological variables on EDNP food behaviours among young Australian adults. This study explores young Australian adults' views and experiences of EDNP foods, focusing on the transition between dependant and independent living. In this phenomenological study, data were gathered from participants through semi-structured interviews. Participants included young Australian adults aged between 18 and 30 years. Data were collected Australia-wide through online/telephonic interviews. Data were qualitatively analysed. Thirty interviews have been conducted so far. Preliminary analyses reveal that EDNP foods were viewed as 'treat' foods. EDNP foods were often consumed during leisure times and during the latter part of the day. Weekends, celebrations, social and familial gatherings were the most common occasions for consumption. Making healthy food choices not only required exercising conscious effort but warranted a need to practise a habit of avoiding unhealthy foods and self-awareness. It is hoped that the findings from this study will provide ways of understanding poor food choices made by this cohort. This research necessitates the need to focus on demographic and socio-psychological variables to reduce the high EDNP food behaviour.

3.15. Are Socio-Demographic Characteristics Associated with Ultra-Processed Food Consumption in Australian Adults? Findings from a Nationally Representative Cross-Sectional Study

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Ultra-processed food (UPF) consumption amounts to roughly half of dietary energy consumed by Australians. However, little is known about how UPF consumption is distributed among socio-demographic groups. This study examined whether socio-demographic characteristics vary by consumption of UPFs in a cross-sectional nationally representative survey of Australian adults. Dietary and socio-demographic data collected from the Australian Health Survey 2011–2013 (n = 8209 aged ≥19 years; mean age 49.5 years (SD 17.1)) were analysed. UPFs were identified using the NOVA classification system. Adjusted linear regression analyses were used to examine associations between dietary share of UPF (% of total energy intake, continuous) and socio-demographics (sex, age, country of birth, area-level disadvantage, education, household income and rurality). UPF consumption was higher among the youngest adults (aged 19–30 years), adults born in Australia, those experiencing greatest area-level disadvantage, lower educated adults and the second-lowest household income quintile. There was no evidence of an association with sex and rurality. This research adds to the body of evidence on dietary inequalities across Australia and can be used to inform the development of policies and guidelines to promote healthy diets in Australia.

3.16. Differences and Determinants of Vitamin D Deficiency among UK Biobank Participants: A Cross-Ethnic and Socio-Economic Study

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Few contemporary cross-ethnic studies have investigated the prevalence and determinants of very low 25-hydroxyvitamin D [25(OH)D] concentrations. We conducted cross-ethnic analyses on the prevalence and determinants of vitamin D deficiency (25(OH)D ≤ 25 nmol/L) using data from 440,581 UK Biobank participants, of which 415,903 identified as White European, 7880 Asian, 7602 Black African, 1383 Chinese and 6473 of mixed ancestry. Determinants of deficiency were examined by logistic regression. The prevalence of 25(OH)D deficiency was highest among participants of Asian ancestry (57.2% in winter/spring and 50.8% in summer/autumn) followed by those of Black African ancestry, mixed, Chinese and White European ancestry. Participants with higher socio-economic deprivation were more likely to have deficiency compared to less deprived ($p \leq 1 \times 10^{-300}$). In fully-adjusted analyses, regular consumption of oily fish was associated with reduced odds of vitamin D deficiency across all ethnicities, while outdoor-time in summer was less effective for Black Africans (OR 0.89, 95%CI 0.70, 1.12) than White Europeans (OR 0.40, 95%CI 0.38, 0.42). Severe vitamin D deficiency remains an issue throughout the UK, particularly in lower socio-economic areas. In some groups, deficiency is alarmingly high with one-half of Asian and one-third of Black African ancestry populations affected across seasons.

3.17. Prevalence and Amount of Alcohol Consumption in 18 to 30 Year Olds in New South Wales

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The National Health and Medical Research Council advises youngest adults, those aged ≤25 years, are most likely to experience harm after excessive alcohol consumption. This study determined alcohol intake among 18 to 30-year-olds across New South Wales. Dietary data for 1001 young adults were collected by a three-day prospective record using a purpose-designed and validated app. Median alcohol intakes (g) per consumer were calculated and comparisons made by age group and gender using a Mann Whitney U test. Mean difference in energy intake was investigated using a General Linear Model, adjusted for age, gender, consumer status and effect modification. The proportion of youngest adults (<25 years old) consuming alcohol was less than among 25 to 30 year-olds (23.5% vs. 38.5%, $p < 0.001$). For consumers, the median daily intake was 11.2 g (IQR 5.3–18.5) for 18 to 24 year-olds, and 14.1 g for 25 to 30-year-olds (IQR 7.3–25.5) $p = 0.041$. Males consumed more alcohol than females, 14.7 g (IQR 7.3–26.2) and 12.3 g (IQR 5.5–20.2), respectively, $p = 0.017$. Mean (adjusted) energy intake of consumers was 9163 kJ compared to 7698 kJ for non-consumers ($p < 0.001$). Contrary to public opinion, drinking was less prevalent among youngest adults with median intake equivalent to approximately one standard drink only.

3.18. Demographic Correlates of Plant-Based Diet Quality among Australian Adults: Findings from a Nationally Representative Cross-Sectional Study

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There is increasing interest in adopting plant-based diets for health and sustainability reasons, however little is known about the consumers of plant-based diets. This study aimed to explore the demographic correlates of plant-based diet quality among Australian adults. Using data from the Australian Health Survey (2011–2013), dietary intakes from two 24 h recalls were used to calculate three plant-based diet quality indices: an overall plant-based diet index (PDI); a healthful plant-based diet index (hPDI); and an unhealthful plant-based diet index (uPDI). Linear regression analyses were used to evaluate the association between each PDI and age, sex, education (non-school qualification, diploma/certificate, tertiary), physical activity (meeting physical activity guidelines) and smoking status (current smoker, ex-smoker or never smoked). Males and females ($n = 5105$) aged 18–84 years were included. Higher hPDI was associated with being older. PDI and hPDI were associated with being female, a higher education level, meeting physical activity guidelines and having never smoked/ex-smoking. uPDI was associated with being younger, male, lower education, not meeting physical activity guidelines and currently smoking. These findings add to the emerging literature on consumers of plant-based diets and can inform dietary advice and policies that aim to increase intake of healthy plant-based foods among Australian adults.

3.19. Do the Dietary Guidelines Evidence Reviews Answer the Right Questions?

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The development of dietary guidelines usually begins with a review of the available evidence to answer specific questions designed to summarise the evidence underlying food, diet and health relationships. These evidence reviews have come under scrutiny in the past for a limited nutrient focus

and lack of rigour, but recent guideline processes have attempted to deliver more rigorous but also more broadly applicable guidelines. However, dietary guidelines still have limited resonance with the public. To understand the focus of dietary guidelines evidence reviews, we analysed and compared the research questions addressed by the most recent dietary guidelines in Australia, Canada, the UK and the USA. The analysis showed that, despite regular reference to the importance of dietary patterns, the majority of research questions still focused on single food group or nutrient relationship with health outcomes. In addition, there were only a limited number of research questions that addressed age and stage of life variations. No questions addressed social determinants of food consumption, and consumer concerns and sustainability were secondary issues. The healthiness of a diet is dependent not only its composition and construction but also requires consideration of how attractive and achievable and sustainable it is for consumers to adopt.

3.20. Trends in Package Size of Discretionary Foods

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Understanding changes to discretionary food package sizes provides insight into consumption trends associated with obesity. The aim of this study was to determine the trends in food package sizes of carbonates and confectionery over the last 15 years. A scoping review was performed using the Joanna Brigg's Institute framework. Package sizes of carbonates and confectionery were investigated for Australia, the USA, Canada and the UK, between the years of 2005 and 2019 with unit sales data extracted from the Passport Euromonitor database. Per-capita carbonate sales data showed increased purchases of smaller package sizes (<300 mL) and decreased purchases of larger package sizes (≥2000 mL) in all four countries over time. In contrast, confectionery package size sales data showed no consistent trends across countries. In Australia, sales of single-serve confectionery (<25 g and 25–49 g) packs decreased and sales of larger package sizes (50–99 g, and >100 g) increased. The most popular package size also varied by countries, with >100 g being most popular in Australia, 25–49 g in USA and UK and 50–99 g in Canada. In conclusion, changes in package sizes have been identified for some energy-dense, nutrient-poor foods in high-income countries in the past 15 years, with a trend towards smaller package sizes for carbonates.

3.21. Efficacy of Functional Foods, Beverages and Supplements Claiming to Alleviate Air Travel Symptoms: Systematic Review with Meta-Analysis

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Airline passengers experience a range of symptoms when travelling on long flights. This review evaluated the efficacy of functional foods, beverages and supplements claiming to address the effects of air travel for healthy adults. Products were identified in a scoping review of electronic databases, search engines and the grey literature during March to August 2019. A systematic review of the efficacy of product ingredients using five electronic databases from inception to 2019 was conducted. Articles were screened, data extracted and risk of bias assessed independently by two researchers. Meta-analysis was performed using a random-effects model. Of the 3421 studies identified, 23 met selection criteria: melatonin ($n = 10$), pycnogenol ($n = 4$), various macronutrients ($n = 2$), caffeine ($n = 2$), centella asiatica ($n = 1$), elderberry ($n = 1$), echinacea ($n = 1$), fluid ($n = 1$) and pinokinase ($n = 1$). Meta-analysis showed favourable impacts of melatonin on jetlag in eastbound ($n = 5$) and westbound ($n = 4$) flights: standard mean difference −1.68 (95%CI −3.09 to −0.28, I^2 90%, $p = 0.02$) and −1.51 (95%CI −3.34 to 0.33, I^2 95%, $p = 0.11$), respectively. Pycnogenol for oedema ($n = 3$) was also favourable,

with standard mean difference −4.25 (95%CI −6.46 to −2.04, I^2 = 98%, *p* = 0.0002). Overall, only 12 out of 183 ingredients contained in 199 products had evidence to support claims.

3.22. Development and Validation of a Vitamin D Screening Tool for Detecting Hypovitaminosis D in Australian Adults

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Vitamin D deficiency is thought to affect up to half the world's population. Calcitriol is the bioactive form of vitamin D, with its precursors obtained through food and ultraviolet-B (UVB) light exposure. Current hypovitaminosis D diagnosis relies on biomarker testing. The aim of this study was to develop a novel screening tool to detect vitamin D deficiency in Australian adults. A systematic literature review informed the tool development by identifying trends in vitamin D screening, finding that current tools are largely not validated. Screening tool development needs to consider the country of use to capture local food, environmental and cultural practices. Four key elements were included in the instrument: (1) a food frequency questionnaire using new Australian food data; (2) a UVB exposure survey; (3) identification of skin type; and (4) vitamin D supplement use. An expert panel confirmed face and content validity testing prior to validation against serum 25(OH)D concentration, personal dosimeters and skin spectrometry in a clinical study with pre- and postmenopausal women. The novel tool was found to be valid for use in research.

3.23. Diet Quality Is Associated with Ultra-Processed Food Consumption in Australian Adults: Findings from a Nationally Representative Cross-Sectional Study

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Diets high in ultra-processed foods (UPFs) have the least healthful nutrient profile; however, there is no evidence investigating associations between UPF consumption and overall diet quality in Australia. This study examined whether diet quality varied by consumption of UPFs in a cross-sectional nationally representative survey of Australian adults. Dietary data from the Australian Health Survey 2011–2013 (*n* = 8209, aged ≥ 19 years; mean age 49.5 years (SD 17.1)) were used. UPFs were identified using the NOVA classification system. Diet quality was assessed using the Dietary Guideline Index (total and sub-components). Linear regression analyses, adjusted for demographics and lifestyle characteristics, were used to examine associations between dietary share of UPF (% of total energy intake) and diet quality. The dietary energy share of UPFs was inversely associated with diet quality (Coefficient: −0.5, 95%CI −0.5 to −0.4). Higher dietary energy share of UPF was associated with lower diet quality sub-component scores for food variety and fruit and vegetable intake, and higher scores for discretionary food and extra sugars intake. This research adds to the global body of evidence on how UPF consumption is detrimental to overall diet quality and can be used to inform the development of policies and guidelines to improve diets for Australians.

3.24. *Performance of Estimative Dietary Equations Quantifying Net Endogenous Acid Production and the Potential Renal Acid Load*

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While dietary estimates of net endogenous acid production (NEAP) and potential renal acid load (PRAL) continue to be investigated for associations with health outcomes, a limited number of studies have assessed the accuracy and precision of their methods of measurement. We investigated the performance of methods quantifying the diet-dependent acid-base load. Seventeen healthy participants (mean ± SD age, 60 ± 8 years; BMI, 23 ± 2 kg/m^2) were fed both acid and base-forming diets, prepared by a research kitchen, for six days each and concurrently collected 24-h urine samples for analysis. This enabled calculation of NEAP and PRAL via reference urinary analysis, as well as estimative diet equations (by Frassetto et al., Remer and Manz, Sebastian et al. and Lemann et al.). Bland-Altman analysis showed accurate diet equations included PRAL by Sebastian et al. (Bias: −4 mEq/d, 95%CI −8 to 0) as well as NEAP by Lemann et al. (Bias: 4 mEq/d, 95%CI −1 to 9) and Remer and Manz (Bias: −1 mEq/d, 95%CI −6 to 3). All dietary estimates were imprecise. Researchers are encouraged to collect biochemical measures of NEAP and PRAL.

3.25. *Can an App Accurately Record the Food and Drinks That Are Sold over the Counter in Tasmanian Primary School Canteens?*

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In Tasmania, very few school canteens have cash registers, making it difficult to collect information on items sold. Data on food and beverages that are pre-ordered can be used; however, this does not capture items sold over the counter, which are often less healthy. This study examined if an app can accurately record food and drinks sold over the counter (sales) in school canteens. The app was on a tablet and customised for each school. During Term 4, 2019, students or canteen staff used the app to record sales at five Tasmanian primary schools each day the canteen was open for one week. A researcher counted items available for sale over the counter before and after recess and lunch (manual sales). Each day, the difference in the number sold was calculated as app sales minus manual sales. Sales were recorded for a total of 14 days. The number of items available over the counter ranged from 9 to 25. Mean difference between app and manual sales was 0.46 (range −1.5 to 3.6) items/day. The app was an accurate method for collecting counter sales. Combined with pre-ordered sales, it would enable scalability for assessing interventions to influence the sale of healthy foods.

3.26. *The Central Australian Expedition (21 August 1844–15 January 1846) Captain Charles Sturt Quest for the Inland Sea*

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During his tortuous inland journey from Adelaide, Charles Sturt with 15 men was frequently delayed by drought and serious water shortage. They were trapped at Depot Glen (north-west New

South Wales) in the height of summer for six months. Sturt then established a forward depot camp at Fort Grey and stubbornly made three exploratory journeys northwards to Lake Torrens, the Coopers Creek area and beyond over the next six months. The dietary adequacy and food security over time for the party on the six stages of the journey was investigated. Diaries kept by Captain Sturt and two of his companions (Dr Harris Browne, Daniel Brock) were examined by systematic thematic analysis. An objective qualitative method was developed to assess available food group diversity and food variety scores over time (days). These scores were used as a proxy for dietary adequacy and food security throughout the journey, which deteriorated. An interested observer of indigenous people, Sturt took aboriginal guides whenever possible. The main wild foods the party ate were fish and birds when they were available, and other foods gifted by the aboriginal people. The men suffered grievously from scurvy, with James Poole losing his life.

3.27. Is the Mediterranean Dietary Pattern Integrated in Routine Australian Dietetic Practice for Management of Chronic Conditions? A National Survey of Dietitians

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Evidence supports recommending the Mediterranean dietary pattern (MDP) in the management of cardiovascular disease (CVD), type 2 diabetes (T2D) and non-alcoholic fatty liver disease (NAFLD). However, the evidence-practice gap is unclear within non-Mediterranean countries. We investigated integration of MDP in Australian dietetic practice, and barriers and enablers to MDP implementation for chronic disease management. Australian dietitians treating patients with CVD, T2D and/or NAFLD (n = 178, mean age 37 ± 11 years, 97% female) completed an 87-item online survey in November 2019. Fewer than 50% of participants counsel patients with CVD (48%), T2D (26%) and NAFLD (31%) on MDP in majority of their practice. MDP principles always recommended by >50% of participants were promoting vegetables and fruit and limiting processed foods and sugary drinks. Principles recommended sometimes, rarely or never by >50% of participants included limiting red meat and including tomatoes, onion/garlic and liberal extra virgin olive oil. Barriers to counselling on MDP included consultation time and competing priorities. Access to evidence, professional development and education resources were identified enablers. An evidence-practice gap in Australian dietetic practice exists with <50% of participants routinely counselling relevant patient groups on MDP. Strategies to support dietitians to counsel complex patients on MDP within limited consultations are needed.

3.28. The Effectiveness of Digital Delivered Interventions on Nutrition Behaviours and Nutrition-Related Health Outcomes for Underserved People with Type 2 Diabetes: Systematic Review

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A systematic review was conducted to assess the effectiveness of digital delivered interventions for improving nutrition behaviours and nutrition-related health outcomes, including clinical parameters and obesity indices, among underserved people with type 2 diabetes (T2D). Seven databases were searched for studies published between 1990 and 2019. Nine out of 1588 identified records were included, comprising 373 participants. Three digital platforms, including websites, short message services and smartphone applications were used to deliver dietary recommendations. Significant improvements in

dietary behaviours were reported in four out of nine studies, representing improvements in eating habits, healthier food choices or increases in dietary knowledge and skills. Two studies found significant mean reductions for HbA1c ranging from −0.43% to −0.84%. One study reported −0.7 kg/m^2 reduction in BMI and one reported significant decrease in weight (1.2 kg) and waist circumference (2.23 cm), compared to the control group. These limited studies show digital delivered interventions have a small beneficial effect on improving nutritional outcomes. However, they were heterogeneous in scope and utilised different modes of intervention delivery which leads to findings that are difficult to integrate and interpret. Therefore, there is a need for further research into how underserved people with T2D may benefit from digital approaches.

3.29. Flavonoids as Human Intestinal Carbohydrate Digestive Enzyme Inhibitors

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Flavonoids are the largest family of plant-based (poly)phenolic bioactive compounds, with growing evidence showing health-protecting effects, particularly against diabetes. Some compounds influence glucose metabolism by inhibiting enzymes involved in carbohydrate digestion and suppress intestinal glucose absorption. In this study, the ability of four flavonols (quercetin, kaempferol, quercetagetin and galangin) to inhibit α-glucosidases (sucrase, maltase and isomaltase) were evaluated individually, compared with acarbose and EGCG. Cell-free extracts from human intestinal Caco2/TC7 cells highly expressing brush border α-glucosidases were used. Glucose, sucrose, fructose, isomaltose and maltose were detected using HPAE-PAD with high accuracy, precision and sensitivity. Acarbose showed inhibition of sucrase, maltase and isomaltase activities at comparably lower IC$_{50}$ values of 1.65, 13.9 and 39.1 μM, respectively. A similar inhibition pattern but higher values were observed with EGCG. Stronger sucrase inhibition was seen with quercetagetin, similar to acarbose, followed by galangin and kaempferol, and weakest by quercetin and EGCG. Similar results were observed for maltase but with a lower inhibition. All flavonols showed a similar isomaltase inhibition to acarbose at a lower inhibition (<29%), while higher EGCG concentration was required to achieve maximum inhibition. This highlights the potential of flavonoids to inhibit human intestinal enzyme activities in the breakdown of carbohydrates.

3.30. Cacti as a Potential Functional Food Candidate and a Protective Agent Against Chronic Disease—A Review of Literature

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The health benefits of consuming natural foods and functional food products are a primary topic of interest in human nutrition. Cacti are an unconventional and affordable plant, commonly used to improve the structure and consistency of food products, whose potential health benefits are starting to be investigated. The plant has the capacity to retain large quantities of water, and is fleshy and pulpy, with the ability to grow and develop in barren areas. Cacti and its constituents possess a high antioxidant concentration, are rich in phytonutrients and can provide food product preservation and health benefits through several technological and biological pathways. Cacti are versatile, being utilised for human food, included in animal feed and medicinal applications, for wastewater treatment and agricultural development and rehabilitation. Cacti have the potential to exhibit protective effects against chronic metabolic conditions, such as obesity, cardiovascular disease, diabetes mellitus and cancer. However, there is currently an absence of rigorous evidence to recommend its use as a complementary therapy to minimise the incidence or management of non-communicable diseases. Nevertheless, the current literature demonstrates strong potential for functional food product development and beneficial health effects that warrant further investigation.

3.31. Perceptions of Nut Consumption in Australian Health Professionals and Consumers

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Habitual nut consumption is associated with reduced risk of chronic diseases such as coronary heart disease; however, consumption levels in Australia are below recommendations. Previous research has identified confusion regarding the benefits of nut intake among health professionals and consumers. The aim of this study was to explore perceptions of nut consumption in Australian health professionals and consumers. Two self-administered online surveys were developed. A total of 204 health professionals and 71 consumers completed the surveys. Health professionals demonstrated basic nutrition knowledge regarding nut consumption; however, non-dietitians/nutritionists lacked knowledge of long-term health benefits of nut consumption such as the effects of nut intake on blood cholesterol and risk of cardiovascular disease. Similar findings were observed among consumers. Confusion on the effects of nut intake on body weight was prominent among both health professionals and consumers with 12% and 16%, respectively, believing regularly consuming nuts causes weight gain. Health professionals could greatly benefit from further education, and they should be encouraged to promote regular nut consumption to patients and clients to help address misinformation among consumers. Further education among consumers would also be beneficial. Collectively this could improve population nut intakes in Australia.

3.32. Is a Higher Protein-Lower Glycaemic Index Diet More Nutritious Than a Conventional Diet? A Preview Sub-Study

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High protein diets and low glycaemic index (GI) diets have been associated with improved diet quality. This post hoc analysis of the PREVIEW study included 161 Australian participants with overweight and pre-diabetes assigned to either a higher protein-lower GI diet (HPLG: 25% energy

from protein, dietary GI < 50, *n* = 85) or a moderate protein-moderate GI diet (MPMG: 15% energy from protein, dietary GI > 56, *n* = 76). Food records were collected at 0-, 6-, 12-, 24- and 36-mo. Linear mixed models were used to compare the changes from 0-mo of total energy, macro- and micronutrients, dietary GI and glycaemic load between the two diets. The HPLG group showed significantly higher protein intake and lower dietary GI and GL than the MPMG group (group fixed effect $p < 0.001$ for all three parameters). The reported dietary intakes of zinc (group fixed effect $p = 0.05$), selenium ($p = 0.01$), niacin ($p = 0.01$), vitamin B12 ($p = 0.01$) and cholesterol (group-by-time fixed effect $p = 0.001$) were higher in the HPLG group than in the MPMG group. We found that an HPLG diet was more nutritious in relation to some micronutrients, but not cholesterol, than an MPMG diet.

3.33. Formative Evaluation of a Novel Plant-Based Dietary Approach for People with Chronic Kidney Disease: Perspectives of Australian Renal Dietitians

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This study aimed to explore the perceptions of Australian renal dietitians regarding plant-based diets for people with chronic kidney disease (CKD), as well as obtain their critical evaluation of a novel plant-based dietary prescription and accompanying educational resources for use in a future clinical trial and practice. Initial concept-testing using a short online survey informed the development of a series of supplementary education resources. Critical evaluation was then conducted using semi-structured interviews. Thematic content analysis was undertaken using an inductive approach. Forty-seven renal dietitians participated in this research. For successful implementation, dietitians would need to challenge existing organisational norms and overcome barriers such as lack of time, limited capacity to follow-up patients, differing nutritional priorities and fragmented dietary advice. The focus on food-based strategies and emphasis on overall healthy eating behaviours, together with recipes and flexibility in food choices within the design were identified as strengths. Several improvements and considerations were also discussed. The dietary prescription and accompanying educational resources could be useful additions to dietetic practice. However, future investigations are still required to examine the perspectives of the target population and assess the practicality, safety and efficacy of this dietary approach before translating such strategies into practice.

3.34. Evaluation of a Diet Quality Scoring Tool to Determine Data-Driven Dietary Patterns in Adults with Multiple Sclerosis

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Understanding the dietary characteristics of people with relapsing-remitting multiple sclerosis (RRMS) may assist in the planning of nutritional interventions for patients. The aim of the study was to evaluate the validity and psychometric properties of the Dietary Habits Questionnaire (DHQ). A secondary aim was to assess the variation in dietary intake within the sample. Repeated 24-h recall dietary assessments using the Automated Self-administered Assessment-24 (ASA-24) tool were modelled to usual dietary intakes. The DHQ sub-scores of key nutrients and food groups were calculated and statistically compared with usual intakes. A total of 96 people with RRMS completed the DHQ (median = 84.50; IQR: 77.04, 91.83). Higher DHQ score quartiles were associated with higher intakes of vegetables and fruits ($p = 0.005$). The absolute correlation between the DHQ scores and ASA-24 intake for fruit and vegetables was 0.436 ($p < 0.001$). Principal component analysis using 21 food groups identified five dietary patterns, explained 42.1% of the total variance of intakes.

The variations in food intake were for grains, fats and oils, fish and seafood, meats and vegetables. The results demonstrated that the DHQ might be suitable for use in studies focused on the intake of fruit and vegetables in people with RRMS.

3.35. *Implementation of the Lifestyle PCOS Guidelines: Perspectives of Allied Health Professionals*

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Polycystic ovary syndrome (PCOS) is a common condition affecting up to 13% of reproductive-aged women. Weight and lifestyle management is a key treatment for women with PCOS as recommended in International Evidence-based Guidelines 2018. The perspectives of allied health professionals relating to the provision of lifestyle and weight management with women with PCOS is not known. Semi-structured interviews were conducted in allied health professionals (dietitians, exercise physiologists and psychologists) involved in the management of PCOS in Australia. Interviews were audio-recorded and professionally transcribed. The transcripts were coded inductively and thematically analysed. Fifteen (nine dietitians, five exercise physiologists, one psychologist) allied health professionals were interviewed. Barriers relating to women with PCOS include insufficient knowledge on lifestyle management, lack of time, socio-economic disadvantage preventing access to lifestyle support and psychological issues such as eating disorders or depression. Barriers relating to health professionals include insufficient knowledge in PCOS and insufficient time during consultation. Barriers relating to the health system include lifestyle recommendations in the PCOS guidelines being too general and weight-focused, funding system does not facilitate long-term care and low integration of care between health professionals. These barriers need to be addressed for the implementation of lifestyle management in PCOS care.

3.36. *Design and Development of a Mediterranean Diet Intervention for Individuals with Irritable Bowel Syndrome and Comorbid Anxiety or Depressive Symptoms*

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Dietary modification is a first-line therapy for management of irritable bowel syndrome (IBS). However, dietary intervention for individuals with IBS and comorbid mental health disorder has not been evaluated. There is evidence that the Mediterranean diet (MD) can reduce depressive symptoms; it also confers broad health benefits and positively impacts the microbiome. We aimed to design an MD intervention for individuals with IBS and concurrent anxiety or depression for use in a future randomised controlled trial (RCT). Large-scale MD RCTs were reviewed to guide food group targets and lifestyle traditions. Factors relevant to disease context were taken into account, e.g., FODMAP composition was considered for participant acceptability and to enhance internal validity of the trial. A two-week meal plan was devised and analysed for macro-, micronutrient and FODMAP content. The diet preserved the traditional MD components and adhered to food group targets. Macronutrient content aligned with published MD interventions and micronutrients broadly met nutrient reference values. Participant resources were created to assist with dietary implementation and adherence. An MD intervention for individuals with IBS was successfully developed. The menu plan and resources produced will support individualised dietetic advice for participants. Feasibility, acceptability and clinical effectiveness will inform its future clinical use.

3.37. An Evaluation of Dietetic Service in Functional Dyspepsia: Comparison of Low FODMAP Advice with Standard Dietetic Advice

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Certain dietary constituents may provoke symptoms of functional dyspepsia (FD, e.g., postprandial pain, early satiety). Evidence for specific dietary approaches is lacking, but a low FODMAP diet (LFD) is frequently used in practice. This service evaluation aimed to compare the effectiveness of LFD with standard advice (STD, e.g., caffeine/alcohol restriction) in FD. Data were collected from 59 consecutive eligible patients with FD attending an initial and review dietetic outpatient appointment at Princess Alexandra Hospital. Of these, 40 received LFD advice and 19 received STD advice. As part of usual care, the Structured Assessment of Gastrointestinal Symptoms (SAGIS) was used to assess epigastric (max 28 points) and overall gastrointestinal symptoms (max 88 points). Symptom change was compared between groups adjusting for baseline differences. There was a greater reduction in epigastric score for LFD versus STD (-3.6 [-4.9, -2.2] vs. -0.9 [-2.9, 1.1], $p = 0.032$) and total symptom score (-9.4 [-12.4, -6.4] vs. -3.3 [-7.7, 1.1] $p = 0.026$). A greater proportion receiving LFD advice achieved a 30% reduction in epigastric score versus STD (50% vs. 16%, $p = 0.012$). Dietary adherence did not differ between groups ($p = 0.497$). The LFD may be beneficial for improving FD symptoms. A randomised controlled trial is required to substantiate these findings.

3.38. Perceptions of How Diet and 'Cancer-Related Cognitive Impairment' Influence Each Other: A Qualitative Study

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Cancer survivors commonly experience long-term physical and cognitive disruptions that persist beyond treatment cessation. These disruptions can significantly affect quality of life, often resulting in psychosocial changes that require navigation. Diet is important to an individual's psychophysiology. However, understanding how cancer survivors' diets and cognition are related has largely been unresearched. We aimed to explore: (1) post-treatment dietary changes in cancer survivors with self-reported cancer-related cognitive impairment (CRCI) and, (2) how survivors perceive their diet and cognitive changes to influence each other. Semi-structured interviews were completed with $n = 15$ Australian breast ($n = 13$) and colorectal ($n = 2$) cancer survivors with CRCI (mean ± SD time since treatment: 18.7 ± 17.7 months). Interviews were recorded and major themes identified from transcripts using thematic analysis. Participants reported post-treatment dietary changes: meal timing shifts, less variety, more plant-based food and using more ready-made foods. Post-treatment survivors described finding meal planning more onerous, cooking to have become harder and having difficulty limiting unhealthy food. A healthy diet was perceived to support cognition, particularly via energy/fatigue, although some participants reported diet had no impact. Many survivors perceived a bidirectional relationship between diet and cognitive function. Future research is needed to explore dietary interventions and dietary support needs of cancer survivors with CRCI.

3.39. The Modified Casein Diet in Mental Health and Cognition: A Systematic Review of Intervention and Observational Studies

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Exogenous opioid peptides released from the digestion of casein variants (i.e., A1 beta-casein) have been linked to pathways of central importance to mental and brain health (e.g., inflammation). As such, casein-free diets are suggested to have benefits for mental disorders (e.g., schizophrenia), although evidence for its use is equivocal. This systematic review aimed to evaluate associations between modified casein intakes (e.g., casein-free or A2 beta-casein diets) and both mental health symptoms and cognitive function. CINAHL, Embase, Cochrane, Scopus and PudMed databases were searched from inception to August 2020. Studies (intervention or observational) that (1) compared restricted or controlled intake of casein to comparator diets and (2) measured mental health symptoms (e.g., anxiety, depression, bipolar disorder or schizophrenia) or cognitive function were included. Animal, supplemental and studies in developmental disorders were excluded. After de-duplication ($n = 1384$), the abstract and titles of 2594 studies were screened. Preliminary findings revealed three studies met eligibility criteria; all studies examined differences between consumption of milk containing A1/A2 beta-casein vs. A2 beta-casein on cognitive function. No studies evaluated the impact of a casein-free diet on mental health symptoms. Findings point towards the need for prospective trials evaluating the impacts of casein-free diets on mental health symptoms.

3.40. The 'Omega Kid' Feasibility Study: A Double-Blind Randomised Placebo-Controlled Trial Investigating the Effect of Omega-3 Supplementation on Self-Regulation in Preschool-Aged Children

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Self-regulation in early childhood impacts children's success at school and is a predictor of health, wealth and criminal outcomes in adulthood. There is evidence that self-regulation may be optimised by supplementation of omega-3 long-chain polyunsaturated fatty acids (n-3 LCPUFA). The aim of the 'Omega Kid Study' is to investigate the feasibility of n-3 LCPUFA supplementation on self-regulation in preschool-aged children. A double-blind, randomised placebo-controlled trial of 12-weeks duration

assessed the effect of 1.6 g of eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) per day in a microencapsulated powder compared to placebo. Children (n = 78) aged 3–5 years old were recruited and randomly allocated to the treatment or placebo group. The HS-Omega-3 index served as a manipulation check for the intervention. Fifty-eight children (76%) completed the intervention. Compliance to the study protocol was high, with 92% of children providing a finger-prick blood sample at baseline and high adherence to the study intervention (88%). Results indicate that the protocol is feasible and the data from this trial can be used for a sample size calculation to design an adequately powered clinical trial to further test the hypothesis that n-3 LCPUFA supplementation will improve the self-regulation of preschool-aged children.

3.41. Dairy Consumption and Menopausal Symptoms: A Cross-Sectional Study among Iranian Postmenopausal Women

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Dietary approaches, as part of lifestyle factors, are of paramount importance in the management of symptoms. Dairy foods are rich sources of key nutrients for maintaining good bone health in the elderly, particularly women after menopause. Milk consumption has been linked to elevated plasma oestradiol concentrations in postmenopausal women suggesting the implication of dairy foods in menopause-related symptoms. This study aimed to investigate the association between dairy food consumption and menopausal symptoms in postmenopausal Iranian women (n = 393). A food frequency questionnaire was applied to assess dietary intake. Menopausal symptoms were assessed using a menopause rating scale (MRS) questionnaire. After adjustment for age, years since menopause, education level, body mass index (BMI), physical activity, energy intake, healthy eating index and fibre intake; higher total dairy intake was related to lower somatic (β = −0.184; $p < 0.001$), psychological (β = −0.155; $p = 0.002$) and total MRS (β = −0.184; $p < 0.001$) scores. In terms of fat content, higher intake of low-fat dairy was associated with lower somatic (β = −0.175; $p < 0.001$), psychological (β = −0.181; $p < 0.001$) and total MRS (β = −0.189; $p < 0.001$) scores. Our findings demonstrated that regular consumption of low-fat dairy could be advised for managing the somatic and psychological complaint of menopause.

3.42. A Systematic Review of the Short-Term and Long-Term Effects of Dietary Patterns on Cardiometabolic Health in Older Adults

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Ageing increases the risk of cardiometabolic disease development. Diet has been shown to have protective and causal effects on cardiometabolic health. The aim was to consolidate the current

evidence on the short-term and long-term effects of dietary patterns on cardiometabolic health in adults aged 65 years and over. Ten databases and two trial registries were searched, identifying a total of 40,042 records. Quality assessment was conducted, and the certainty of evidence was assessed. Thirteen articles were included, and 12 dietary patterns were evaluated. The low-fat dietary pattern showed reduced risk for adiposity; however, no effects were shown for hypertension incidence, composite coronary heart disease incidence (including myocardial infarction, coronary heart disease and coronary revascularisation), high-density lipoprotein cholesterol and also increased blood pressure in the long-term. The Mediterranean dietary pattern showed reduced triglycerides and systolic blood pressure and showed no effects on diastolic blood pressure, high-density lipoprotein cholesterol and glucose in the short-term. The Mediterranean dietary pattern showed the most benefits without harm to cardiometabolic health in older adults. The current body of evidence is small, with further research warranted to help identify the most effective dietary pattern for cardiometabolic health benefits in older adults to inform future guidelines.

3.43. *Texture-Modified Foods for Aged Care: Current Challenges, Future Opportunities*

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Dysphagia prevalence is increasing in residential aged care. Producing texture-modified foods (TMF) for dysphagia sufferers at the correct consistency and nutrient density is complex and requires time and specific knowledge. Better understanding of current practices and challenges is essential to develop adequate solutions, in the form of products or services, that improve the quality of TMF. An online survey was sent to 1700 residential aged care homes across Australia. The survey included 59 questions on menu planning, meal choice, kitchen set up, equipment, challenges associated with TMF and residents' complaints. The findings of this survey elucidated the challenges associated with TMF in aged care. Opportunities exist to leverage new technologies to improve product appearance, flavour and consistency while ensuring ease of preparation in aged care. Improved TMF can provide dysphagia sufferers with appealing, tasty and nutritious products that will improve their health and well-being.

3.44. *Energy and Macronutrient Intake in the Elderly Predicted by Sour Taste Gene (KCNJ2)*

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KCNJ2 gene polymorphisms have been linked to sour taste and preference. While variations in other taste receptor genes have been shown to influence dietary intakes, the influence of sour genotypes on diet is not clear. Therefore, relationships between KCNJ2 polymorphisms, energy and macronutrient intake were investigated. FoodWorks[TM] software was used to analyse food frequency questionnaire data from an elderly population ($\geq$65 years; n = 531). Logistic regression analyses were used to compare mean intakes by carriage of the *KCNJ2*-rs236514 variant allele (A), with adjustments for age and sex. Presence of the A allele was associated with lower intakes of energy (9048 vs. 8161 kj/day; p = 0.007), carbohydrate (236 vs. 216 g/day; p = 0.04), protein (99 vs. 91 g/day; p = 0.007) and fats (77 vs. 68 g/day; p = 0.01); however, there were no differences in alcohol consumption by allele carriage (p > 0.05). Results were maintained for total energy, protein and fat intake when analyses were adjusted for age and sex. Percentage energy contribution did not differ by allele carriage for macronutrients or alcohol (p > 0.05). The influence of the KCNJ2 polymorphism on energy and macronutrient intake established that sour taste may relate to dietary intakes or appetite in the elderly, with possible implications on health.

3.45. Dose-Dependent Effects of Vitamin B12 on Promonocytic Lymphoma Cells

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Vitamin B12 could be preventive for cancer due to its role in maintaining healthy function of the immune system and moderation of homocysteine levels, yet its role in tumorigenesis is unclear. Numerous studies indicate that increased serum B12 is associated and prognostic to cancer outcomes. The question raised is, can high serum B12 levels cause cancer or does cancer cause high serum B12? Is there a dosage spectrum effect of B12 intake, whereby higher doses are harmful, but lower doses are necessary to prevent disease? We sought to examine cellular changes of a dose-dependent effect of B12 on U937 pro-monocytic lymphoma cells. Proliferation, apoptosis, cell migration, expression of PDL-1, VEGF and cytokines were determined in the presence of B12 high and low doses. It was noted that B12 (low dose) inhibited U937 cell proliferation and migration, which was not due to apoptosis or cell death. Conversely, vitamin B12 (high dose) promoted U937 cell proliferation and increased PD-L1 expression suggesting a pro-tumorigenic mechanism. These data give insights into the dose-dependent properties of vitamin B12 at a cellular level and could form the basis for future studies in understanding the mechanistic effects of B12 on cancer cells.

3.46. Orthorexic Traits Found in Individuals with Irritable Bowel Syndrome and Eating Disorders

Nessmah Sultan, Matilda Tonkovic, Jessica Biesiekierski and Caroline Tuck

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Orthorexia is defined as a harmful obsession with eating healthily and is a novel concept that is not well understood. It has been suggested that orthorexia can develop from illnesses characterised or treated by dietary restriction, including irritable bowel syndrome (IBS) and eating disorders. The aim of this cross-sectional online survey was to measure the prevalence of orthorexia in individuals with IBS and eating disorders compared to healthy controls. Participants with IBS ($n = 41$), eating disorders ($n = 10$) and healthy controls ($n = 40$) were recruited. Orthorexia was measured utilising the eating disorder 'Sick, Control, One, Fat, Food' (SCOFF) and eating habits (EHQ) questionnaires. One-way ANOVA and chi-square tests were used for data analysis. Results are reported as percentage of participants who scored >2 on the SCOFF and mean ± SD of EHQ scores. IBS participants exhibited significantly more orthorexic traits than healthy controls (63% vs. 34%, $p = 0.008$; 54.90 ± 10.34 vs. 43.85 ± 10.22, $p < 0.001$). Eating disorder participants also demonstrated greater orthorexic traits than controls (78% vs. 34%, $p = 0.016$; 59.56 ± 12.55 vs. 43.85 ± 10.22, $p < 0.001$). There were no significant differences found between IBS and eating disorder groups (63% vs. 78%, $p = 0.410$; 54.90 ± 10.34 vs. 59.56 ± 12.55, $p = 0.455$). To conclude, there may be a link between orthorexia and IBS. Future research should adopt a prospective study design to examine this relationship further.

3.47. Comparing Food-Related Quality-of-Life and Psychosocial Sensations between Healthy Controls, Patients with IBS, and Patients with a History of an Eating Disorder

Matilda Tonkovic, Nessmah Sultan, Caroline Tuck and Jessica Biesiekierski

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Irritable bowel syndrome (IBS) is a disorder where recurrent abdominal pain is associated with defecation or changes in bowel habits. Psychosocial sensations are reported at higher rates in people with IBS and eating disorders (EDs). The aim of this cross-sectional study was to compare anxiety, depression and food-related quality-of-life (FRQOL) scores in people with IBS and EDs compared to healthy controls. Ninety-one participants (54 IBS, 10 ED, 27 healthy controls) completed the Hospital Anxiety and Depression Scale (HADS) and the FRQOL questionnaire online. A one-way ANOVA and Post-Hoc tests were conducted to determine significant differences between groups. One-way

ANOVA showed statistically significant differences between the three groups in anxiety, depression, and FRQOL ($p < 0.05$). Tukey's post-hoc test found ED participants had significantly higher anxiety scores than healthy controls ($p = 0.01$) and IBS participants had higher depression scores than healthy controls ($p = 0.055$). Healthy controls had significantly better FRQOL scores than both IBS and ED participants ($p < 0.05$), and ED participants had better FRQOL scores than IBS participants ($p = 0.07$). There may be overlapping links between psychosocial sensations and FRQOL in participants with IBS and EDs. These findings may help improve understanding and clinical awareness of the psychosocial factors and FRQOL in IBS and EDs.

3.48. Lycopene from Orange Heirloom Tomatoes (Moonglow) Supress Bone Turnover in OVX Rats against Red Tomatoes

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In red tomatoes, 90% of lycopene is trans lycopene; in orange heirloom tomatoes, 90% of lycopene is the more bioavailable cis lycopene. This study compared plasma lycopene and bone turnover following red versus orange Moonglow tomato feeding in a rat model of postmenopausal osteoporosis. Female Sprague Dawley rats underwent sham or ovariectomy (OVX) surgery at age 16 weeks. Control sham and control OVX received no dietary supplement; post-red and post-Moonglow received tomato for eight weeks post-OVX surgery; pre-red and pre-Moonglow received tomato for eight weeks prior to plus eight weeks post-OVX surgery ($n = 15$/group). Tomato powder was fed at 0.35 mg lycopene/kg body weight/day. Mean plasma lycopene concentrations in pre and post-Moonglow groups were ~6× higher than pre- and post-red groups. OVX significantly increased bone turnover biomarkers CTx-1 and osteocalcin compared to sham. Serum CTx-1 was not significantly different among OVX tomato treatment groups. Pre-red, pre-Moonglow and post-Moonglow had significantly reduced serum osteocalcin. These results suggest that a six-fold higher intake of red tomatoes would be required to match plasma lycopene concentrations achieved by Moonglow, and that cis but not trans lycopene intake can significantly reduce bone turnover even after menopause-initiated osteoporosis.

3.49. Palmitic and Lauric Acid Differently Modulated Skeletal Muscle Mitochondrial Dynamics, Membrane Potential and Metabolic Inflammation in Human Primary Myotubes

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The chain-length of saturated fatty acids (SFA) may dictate their impact on inflammation and mitochondrial dysfunction, two pivotal players in the pathogenesis of insulin resistance. Thus, the aim of this study was to compare the effect of palmitic (PA) and lauric (LA) acid on skeletal muscle mitochondrial health and metabolic inflammation. Human primary myotubes were challenged with either PA or LA (500μM). After 24 h, the expression of *interleukin-6 (IL-6)* was assessed by qPCR, while Western blot was used to quantify the inhibitor of nuclear factor kappa-B (IkBα) and mitofusin-2 (MFN-2). Mitochondrial membrane potential and dynamics were evaluated using tetraethylbenzimidazolylcarbocyanine iodide (JC-1) and immunocytochemistry, respectively. PA, but not LA, triggered an inflammatory response marked by an upregulation of *IL-6* mRNA ($p < 0.01$) and a decrease in IkBα ($p < 0.05$). Furthermore, while PA and LA did not differently modulate the levels of mitochondrial electron transport chain complex proteins, PA-induced mitochondrial

fragmentation ($p < 0.001$), decreased MFN-2 ($p < 0.05$) and caused a drop in mitochondrial membrane potential compared to control ($p < 0.01$), with these effects being absent in LA-treated cells. Thus, LA, contrarily to PA, did not trigger pathogenetic mechanisms linked with insulin resistance and therefore represents a potentially healthier SFA to preserve skeletal muscle metabolic health.

3.50. A Pilot Tolerability Study of a Novel Dietary Strategy for Patients with an Ileoanal Pouch

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A proportion of patients with an ileoanal pouch following proctocolectomy experience bothersome bowel symptoms, and one-half develop pouchitis. Microbial metabolites are pathogenically implicated, leading to the development of a new dietary strategy—the 5URE diet. This pilot study aimed to evaluate the tolerability and nutritional adequacy of the diet and effect on pouch microbial fermentation. Patients with an ileoanal pouch received dietary education targeting intake of readily fermentable fibre, total and specific proteins, fructose, polyols and specific preservatives. After five weeks, tolerability (100 mm visual analogue scale), diet acceptability (Diet Satisfaction questionnaire) and nutritional intake were assessed, and faecal pH, and markers of carbohydrate (short-chain fatty acids, SCFA) and protein fermentation (ammonia and branched-chain fatty acids, BCFA) compared with those pre-intervention. Of 12 patients (six men, mean age 55 years), one with a known pre-pouch stricture withdrew following partial bowel obstruction. Majority (81%) reported good (75–100 mm) tolerability, 73% had high diet satisfaction scores and the diet met most nutritional requirements. Faecal BCFA concentration decreased at week five from 0.60 (SEM: 0.16) to 0.34 (0.09) μmol/g ($p = 0.07$), but faecal pH, SCFA and ammonia were unchanged. The 5URE diet was highly tolerated and acceptable and tended to reduce microbial protein fermentation. Further studies are needed.

3.51. Dietary Patterns of Australian Preschoolers and Associations with Haem and Non-Haem Iron

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Inadequate iron intake or intakes of iron with low bioavailability are major causes of iron deficiency among children of high-resource countries. This study aimed to describe Australian preschooler dietary patterns and examine their associations with dietary iron intakes. Data (2 × 24-h recalls) from the 2011–2012 National Nutrition and Physical Activity Survey were analysed ($n = 812$, 2 to <6 years old). Usual intakes were estimated via Multiple Source Method. Dietary patterns were extracted via principal component analysis. Associations between dietary patterns and energy-adjusted iron intakes were examined using linear regression. Mean (SD) usual total dietary and haem iron intakes were 6.3 (1.9) and 0.5 (0.3) mg/day, respectively. Three dietary patterns were identified. Pattern 1 (positive loadings for cheese, breads, fats and oils and water) was positively associated with dietary iron intakes ($\beta = 0.08$, 95%CI 0.01, 0.15). Pattern 3 (positive loadings for red meat, fortified fruit and vegetable products and sauces and spreads) was inversely associated with dietary iron ($\beta = -0.08$, 95%CI -0.14, -0.01) and non-haem iron ($\beta = -0.09$, 95%CI -0.15, -0.02) intakes. No dietary patterns were associated with haem iron intakes. Future research should target iron bioavailability of Australian pre-schooler diets.

3.52. Consumer Perceptions of Locally Grown Produce During the COVID-19 Pandemic

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The COVID-19 pandemic temporarily disrupted Australian food supply chains and social distancing restrictions impacted the experience of shopping for food. A cross-sectional survey from May to June 2020 explored consumer perceptions of locally grown produce during the COVID-19 pandemic, including the importance of locally grown produce and consumer shopping and consumption habits. Survey data ($n = 1170$) indicated that the majority of respondents (89%) highly valued locally grown produce. Most respondents (54%) reported that locally grown produce was more important as a result of the COVID-19 pandemic, with rural respondents ($\chi^2 = 13.3$; $p = 0.01$) and respondents aged >55 years ($\chi^2 = 40.1$, $p = 0.005$) more likely to report it was extremely important. Nearly half of respondents (43%) reported buying more locally grown produce, with fruits and vegetables the most commonly purchased foods. Respondents aged >55 years bought more locally grown produce in comparison to younger respondents ($\chi^2 = 59.4$, $p = 0.001$). Those who bought 'somewhat less' or 'a lot less' were more likely to experience food insecurity ($\chi^2 = 31.7$; $p < 0.001$). Locally grown produce was purchased at independent supermarkets (75%) and major supermarkets (65%), highlighting the convenience of these outlets. Respondents demonstrated a clear preference for locally grown produce and sustained purchasing of these foods throughout the recovery from the COVID-19 pandemic will assist with strengthening the local economy.

3.53. Identifying and Overcoming Australians Barriers to Accepting Edible Insects as an Emerging Protein Source

Indee Hopkins, Jessica Danaher, Asgar Farahnaky, Harsharn Gill and Lisa Newman

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Increasing populations and the limitations on finite resources will see greater pressure on an already strained food system and of particular concern is protein. Insects offer a nutritious and sustainable protein source, yet despite a rich history, Australians have been hesitant in adopting the practice. This study aimed to identify barriers and explore possible factors that may motivate Australians to accept edible insects as a new source of protein. Participants ($n = 601$; 76.2% female, 23.8% male; aged 18–35 years 40.8%, 36–54 years 43.6%, >55 years 15.6%) completed an online survey investigating Australian consumers' barriers to eating insects and what potential motivating factors may overcome these obstacles. Results indicated participants cited 'lack of opportunity' (56.3%) and 'disgust' (17.7%) as the main barriers to eating insects. 'Increased insect nutrition knowledge' (56.6%) and 'increased accessibility to insect-based products' (56.4%) were identified as a major factor that may help overcome barriers to consuming edible insects. The outcomes of this study indicate that by providing increased nutritional knowledge, opportunity and accessibility to insect-based products, it may be possible a higher proportion of Australians would be accepting of eating insects. Consumer-focused food product and process innovation for developing new food products containing insect ingredients is required.

3.54. Comparison of Extraction Methods and Solvent Composition for Australian Blueberry Anthocyanins

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Blueberry anthocyanins are known to contribute to various health benefits as protecting against diabetes, cancer and cardiovascular diseases. There are many factors affecting anthocyanin stability, including exposure to heat, light and oxygen, making it difficult to extract anthocyanins without denaturing their properties. The aim of this research was to determine a suitable extraction method and solvent composition for anthocyanin compounds. The method was evaluated for linearity, food matrix effect, instrumental detection and quantification limits. Fresh blueberry anthocyanins were extracted with different solvent compositions: methanol/water (60/40 *v/v*), methanol/water (70/30 *v/v*), methanol/water (80/20 *v/v*), ethanol/water (60/40 *v/v*), ethanol/water (70/30 *v/v*), ethanol/water (80/20 *v/v*) at pH 2.0 and pH 3.0 using ultra-sonication, geno grinder and dounce grinder methods and quantified by liquid chromatography mass spectrometry. All calibration curves showed linearity of 0.999 or higher. The total anthocyanin glucoside content ranged from 55.8 ± 0.7 mg to 84.9 ± 1.2 mg per 100 g of blueberries. Malvidin-3-glucoside was found to be the major anthocyanin extracted from all solvent compositions and extraction methods tested. This study showed that of the methods tested ultrasonication had the greatest effect on extraction yield, producing a reliable anthocyanin quantification method. These extraction procedures will allow potential use of blueberry anthocyanins in future research.

3.55. Sensory, Antioxidant and Physicochemical Influences on the Likeability of a Selection of Commercially Available Australian Honeys

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Honey's composition and appearance are largely influenced by floral and geographic origins. Australian honey is frequently sourced from supermarkets; however, properties associated with consumer preference are relatively unknown. A sensory and in-vitro analysis was completed on a selection of commercially available Australian honeys. Samples ($n = 32$) were analysed for visual, olfactory and taste characteristics, with overall likeability assessed by the trained sensory panel ($n = 24$; M = 12). In-vitro analysis included colour intensity (mAU), phenolic content, antioxidant characteristics (DPPH, CUPRAC) and physicochemical properties (pH, viscosity, Total Soluble Solids). When compared to the most liked honey sample, 23 samples were liked significantly less ($p < 0.05$). Likeability of honey was positively associated ($p = 0.005$) with perceived sweetness and it was negatively associated (All $p < 0.05$) with crystallisation; odour intensity; waxy, chemical, and fermented smell; mouthfeel; aftertaste; sourness; bitterness and pH. Price (USD/100 g) was not associated with likeability ($p = 0.143$), indicating price value potentially does not influence consumer preference. Conclusively, significant differences between the likeability of honey samples demonstrate that not all sampled honeys are of the same quality to consumers. Additionally, the number of negative associations with

likeability indicate consumer honey selection could occur due to the disapproval of properties, leading to their purchase rejections.

3.56. Molecular Mechanisms Towards Increasing the Nutrition Functionality of White Salted Noodles

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White salted noodles are popular wheat-based food around the globe. Compared to pasta, noodles have a higher glycaemic response. The present work aims to increase the nutritional functionally of noodles by (a) manipulating the starch crystallinity, (b) varying the protein content and (c) optimising cooking and storage conditions. The digestive enzyme susceptivity of noodles was found to be associated with both degrees of gelatinisation of starch (limiting catalytic action of α-amylase) as well as the gluten network encapsulating the starch granules (restricting the access of α-amylase). In terms of cooking, enzyme resistant starch (ERS), as well as the estimated glycaemic index (eGI) of microwaved and stir-fried noodles, were significantly higher (>20%) compared to conventionally cooked noodles through boiling and steaming. On the other hand, the ERS of cooked noodles stored at 25 °C was significantly higher than noodles stored at 4 °C. Supramolecular organisation (helical structure and crystallinity) had a more pronounced effect than the macroscopic structure such as compactness or bulk density in terms of nutritional functionality of noodles. The present study provided the molecular mechanisms as well as the formulation, cooking and storage conditions to decrease the eGI and increase the ERS of noodles important to both consumers and manufacturers.

3.57. Development of Raman Spectroscopy as a Tool to Verify Australian Beef Labelling Claims

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The current method of verifying the production systems of beef in Australia is dependent on audits and reliant on producers following the requirements set by processors, which vary for individual grain and grass-fed brands. Consequently, there is a need for a non-destructive on-site method to differentiate between production systems. This research tested the viability of Raman Spectroscopy to accurately discriminate between production systems. Subcutaneous fat from 505 beef cattle carcases was collected and scanned using a 785 nm Mira hand-held device (Metrohm) Raman device. Cattle represented 100-day grain-fed, 70-day grain-fed, grass supplemented and grass-fed production systems. Using Partial Least Squares Discriminant Analysis, a model was developed that was able to accurately predict the production systems of origin for 100-day grain-fed (97%), 70-day grain-fed (93%), grass supplemented (95%) and grass-fed (91%) carcases. This study assessed the viability for an objective carcase measurement for the verification of production system labels and found Raman spectroscopy to be a non-destructive and rapid tool with the ability to discriminate between various production systems.

3.58. Prediction of Intramuscular Fat Content of Fresh Intact Lamb Loin Using Near Infrared Spectroscopy

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The fat content of lamb varies greatly within cuts from the same animal and between animals due to environmental and genetic factors. While it is vital to the nutritional composition and eating quality of fresh lamb cuts, there is currently no method for the determination of fat content which is suitable for use by Australian lamb processors. Therefore, the aim of the current study was to determine the potential for Near Infrared (NIR) spectroscopy to predict the fat content of lamb loins. To this end, 299 lamb loins were measured using an ASD$^{®}$ TerraSpec4 high-resolution spectrometer with the ASD$^{®}$ contact probe attached via a fibre optic cable before a section was excised for wet chemistry analysis using a modified Soxhlet method. Prediction of the fat content using partial least squares (PLS) analysis indicated it is possible to predict the fat content with good accuracy ($R^2 = 0.6$ and RMSE = 0.84); however further work is needed to optimise models as the fat content of lamb loin is not normally distributed which is challenging for PLS analysis methods.

3.59. Maternal Diets Matter for Children's Dietary Quality: Seasonal Dietary Diversity and Animal-Source Foods Consumption in Rural Timor-Leste

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Improving the dietary quality of women and children is essential to reduce all forms of malnutrition. In Timor-Leste, the majority of the population are semi-subsistence farmers and undernourishment is widespread. Our aim was to examine the dietary quality of children 6–59 months old and their mothers living in rural Timor-Leste. We assessed child and maternal dietary diversity and animal-source foods (ASF) intake, using 1236 observations from combined data from 167 mother–child dyads. We used generalised linear and logistic mixed-effects models to examine their dietary differentials in two livelihood zones and across the seasons, as well as to identify household and agro-ecological characteristics associated with children's diets. We found dietary quality to be marginally better in coastal than in mid-altitude zones. Women's diets were strikingly poor and their intake of ASF was lower than among children. Mothers exhibited preferential allocation patterns of specific ASF to children. Seasonality predicted the intake of ASF. Maternal dietary quality and educational attainment, more so than agro-ecological characteristics, were explanatory factors of children's diet. Our study highlights that addressing the dietary quality of children in Timor-Leste would benefit from improving women's diets through better access to nutritious foods and to secondary education.

3.60. Selenium and Iodine Supplementation Protects First Trimester Human Placenta against Oxidative Stress

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Maternal nutrition is critical for foetal growth and development. The placenta is the key mediator of maternal nutrition to the foetus. Micronutrients such as selenium, iodine and copper are involved in neutralising oxidative stress. This study aimed to determine how selenium, iodine and copper impact oxidative stress in the placenta. Human placental explants were supplemented with selenium, iodide, their combination or copper for 72 h. The concentrations chosen reflected deficient, physiologically normal and supra-physiological levels. Placental explants were then treated with menadione or antimycin for 24 h to induce oxidative stress. Placental explants were harvested, fixed, processed and embedded in paraffin blocks. Laser Ablation Inductively Coupled Plasma Mass Spectrometry validated that placenta uptakes selenium and copper. Selenium and iodide reduced DNA damage and apoptosis ($p < 0.05$). Following oxidative stress induction, a higher concentration of selenium was needed to reduce oxidative damages ($p < 0.05$). A high concentration of copper increased apoptosis and DNA damage ($p < 0.05$), but this effect was not significant in oxidative stress. An excess level of copper impacts the placenta, adversely. Selenium and iodine, alone or in combination, protect the placenta from oxidative stress. An optimal level of micronutrients is essential for the placenta's health and survival.

3.61. Nutrition Information in Pregnancy: Where Do Women Seek Advice and Has This Changed over Time?

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Nutrition during pregnancy is fundamental to both the health of the mother and her baby. The present study aimed to: (1) identify where women source their nutrition information during pregnancy and (2) assess the accuracy of nutrition information for pregnancy available online. A survey instrument that identified the main sources of nutrition information was administered to 68 pregnant women recruited online. Data were compared to similar surveys conducted in 2008, 2011 and 2014. A content analysis of websites was simultaneously conducted to assess accuracy of available information. The main source of nutrition information for a variety of topics was verbal communication from health professionals (% affirmative responses; 6.6% to 69% across survey years). There was an increasing trend in internet sourced information for most nutrition, with it being the main source of information for listeria/food safety (15.3–32.4%) and healthy eating (25–42%). Of the $n = 165$ websites identified by content analysis, 82.4% ($n = 136$) were rated as accurate, with government (96.9%) and business (100%) sites having the highest accuracy. Verbal communication from health professionals remains the most important source of nutrition information for pregnancy but the high credibility of websites identifies this as another important resource.

3.62. Quantification of 25-Hydroxyvitamin D during Pregnancy Using Liquid Chromatography—Tandem Mass Spectrophotometry: Comparison of Serum vs. Plasma Samples

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The aims of this study were to assess the agreement of total 25-hydroxyvitamin D (25(OH)D) concentration, and its three analytes, in plasma and serum samples collected during pregnancy, and to examine the proportion of women who change vitamin D category based on sample type. Plasma and

serum samples were collected from n = 114 non-fasting women between 12 and 25 weeks gestation in Newcastle, Australia. Samples were analysed by liquid chromatography–tandem mass spectrometry (LC–MS/MS) to quantify total 25(OH)D and its analytes and examined using Bland-Altman plots, Pearson correlation (r), intraclass correlation coefficient and Cohens kappa test. Serum total 25(OH)D ranged from 33.8 nmol/L to 169.8 nmol/L and plasma ranged from 28.6 nmol/L to 211.2 nmol/L. There was a significant difference for total 25(OH)D based on sample type, with a measurement bias of 7.63 mol/L (95%CI 5.36, 9.90, $p < 0.001$). The mean difference between plasma and serum concentrations was statistically significant for 25(OH)D$_3$ (7.38 nmol/L; 95%CI 5.28, 9.48 $p < 0.001$) and Epi-25(OH)D$_3$ (0.39 nmol/L; 95%CI 0.14, 0.64, $p = 0.014$). Of 114 participants, 28% of participants were classified as vitamin D deficient (<50 nmol/L) or insufficient (<75 nmol/L) based on plasma sample and 36% based on serum sample. Nineteen (16.7%) participants changed vitamin D status category based on sample type. 25-hydroxyvitamin D quantification differed significantly between serum and plasma samples, yielding a higher value in plasma; this influenced vitamin D status based on accepted cut-points.

3.63. *Betaine (Tri-Methyl-Glycine) Supplementation During Summer Lactation Did Not Affect Subsequent Oestrus-to-Ovulation Interval of Sows That Exhibited a Normal Weaning-to-Oestrus Interval*

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Sows lactating during hot conditions may have a prolonged oestrus-to-ovulation interval (OOI), which can complicate the insemination timing for subsequent breeding. Betaine supplementation in lactating sows under hot conditions may facilitate follicle development and normalise OOI; therefore, we investigated the effect of betaine supplementation on subsequent OOI in sows lactating during summer. Lactating multiparous sows were supplemented with (n = 183) and without (n = 195) 0.16% betaine (tri-methyl-glycine) during summer (December 2019–March 2020; 25.4 ± 5.01 °C (mean ± SD)). Wean-to-oestrus interval was similar between treatments (av. 4.3 days). The OOI was quantified in a subset of sows (n = 46 for betaine and n = 54 for control) selected from those showing behavioural oestrus on the 4th and 5th day post-weaning (representing 88% of total sows). Ovaries were scanned using trans-rectal ultrasound every 24 h from the 2nd day post-behavioural oestrus until preovulatory follicles (diameter ≥ 5.0 mm) disappeared. Ovulation was assumed to have occurred 12 h before the preovulatory follicles were no longer seen on the ovaries. Results showed betaine supplementation did not affect OOI (1.2 ± 0.09 vs. 1.3 ± 0.08 days (mean ± SE) for control vs. betaine group, $p = 0.59$) in multiparous sows that exhibited normal weaning-to-oestrus intervals after summer lactation. Insemination at onset of oestrus remains the best timing for such an OOI.

3.64. *Using Antenatal Colostrum Expression as a Tool to Help New Mums with Breastfeeding*

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The use of antenatal colostrum expression in the weeks prior to birth teaches mothers the skill of hand expression and also allows for colostrum to be collected and stored before baby's arrival. As a result, new mothers may be less likely to use formula in hospital and breastfeed for longer, but few large-scale studies exist. Typically, antenatal colostrum expression instruction relies on personal education, making large interventions costly. We aimed to determine whether an expert instructional video can improve knowledge and confidence around antenatal colostrum expressing, and be implemented into a hospital trial. With feedback from our community committee and an

International Board-Certified Lactation Consultant, we developed an instructional video on antenatal expressing and storage of colostrum. Pregnant women were asked to complete a questionnaire pre- and post-watching the instructional video online. Ninety-five pregnant women completed both pre- and post-questionnaires. Total antenatal colostrum expression knowledge scores improved by 106% after watching the video ($p < 0.001$) and confidence also improved by 69% ($p < 0.001$). We have now begun an intervention trial investigating whether the video is equivalent to personal instruction and whether it can help avoid formula use in hospital and improve long-term breastfeeding rates.

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