Dietary Patterns

Plant-Based Diets for Children as a Means of Improving Adult Cardiometabolic Health

Significance: Plant-based diets have been shown to reduce CVD risk factors in adults. Applying a plant-based diet in children may produce the most favorable reduction in CVD mortality.

Cardiovascular disease (CVD) is the largest contributor to global mortality, and this trend is expected to continue. Although mortality rates have been falling, adverse developments in obesity and diabetes threaten to reverse this. It has been estimated that the only viable strategy to reduce the epidemic is to focus on population-wide risk factor reduction. Primordial prevention, a strategy aimed at avoiding the development of risk factors before the disease onset, has been shown to reduce the CVD epidemic substantially. Plant-based diets appear beneficial for prevention of cardiometabolic diseases, with adult vegetarians and vegans having lower CVD risk than nonvegetarians. Atherosclerosis starts in childhood and progresses in relation to classical CVD risk factors, which, along with dietary habits, track to adulthood. Based on this evidence, it is proposed that plant-based diets in childhood could promote cardiometabolic health in adults and thereby reduce CVD and promote longevity and health. However, the need for additional research to establish the safety of predominantly or exclusively plant-based diets in children is noted.

Healthy Plant-Based Diets are Associated with Lower Risk of All-Cause Mortality in US Adults

Significance: A healthful plant-based diet index score is associated with a reduced risk of all-cause mortality.

Background: Plant-based diets, often referred to as vegetarian diets, are associated with health benefits. However, the association with mortality is less clear. Objective: We investigated associations between plant-based diet indexes and all-cause and cardiovascular disease mortality in a nationally representative sample of US adults. Methods: Analyses were based on 11,879 participants (20–80 y of age) from NHANES III (1988–1994) linked to data on all-cause and cardiovascular disease mortality through 2011. We constructed an overall plant-based diet index (PDI), which assigns positive scores for plant foods and negative scores for animal foods, on the basis of a food-frequency questionnaire administered at baseline. We also constructed a healthful PDI (hPDI), in which only healthy plant foods received positive scores, and a less-healthful (unhealthy) PDI (uPDI), in which only less-healthful plant foods received positive scores. Cox proportional hazards models were used to estimate the association between plant–based diet consumption in 1988–1994 and subsequent mortality. We tested for effect modification by sex. Results: In the overall sample, PDI and uPDI were not associated with all-cause or cardiovascular disease mortality after controlling for demographic characteristics, socioeconomic factors, and health behaviors. However, among those with an hPDI score above the median, a 10-unit increase in hPDI was associated with a 5% lower risk in all-cause mortality in the overall study population (HR: 0.95; 95% CI: 0.91, 0.98) and among women (HR: 0.94; 95% CI: 0.88, 0.99), but not among men (HR: 0.95; 95% CI: 0.90, 1.01). There was no effect modification by sex (P-interaction > 0.10). Conclusions: A nonlinear association between hPDI and all-cause mortality was observed. Healthy plant-based diet scores above the median were associated with a lower risk of all-cause mortality in US adults. Future research exploring the impact of quality of plant-based diets on long-term health outcomes is necessary.
Skipping Breakfast is Associated with Lower Diet Quality in Young US Children

**Significance:** In children of 2-12 years of age, skipping breakfast is associated with reduced overall diet quality.

**Background/objectives:** Breakfast consumption has been shown to impact children's growth and development, but the influence of breakfast skipping on total daily intakes is not known. The purpose of this study was to examine the differences in nutritional intakes and food consumption between children who consume breakfast versus those who do not. **Subjects/methods:** Dietary recall data were assessed for 2-year-old to 5-year-old children (n = 3443) and 6-year-old to 12-year-old children (n = 5147) from NHANES 2005-2012. Dietary intakes and diet quality scores were compared across breakfast consumption and skipping with means and 95% confidence interval. **Results:** Children who skipped breakfast on the day of intake had significantly lower energy intakes for the total day (5911 vs 6723 kJ) but had greater energy intakes from non-breakfast meals and snacks. Children who skipped breakfast consumed nearly 40% of the day’s intake (2332 kJ of 5911 kJ) from snacks, with 586 kJ from snacks as added sugars. Breakfast skipping was also related to significantly lower intakes of fiber, folate, iron, and calcium intakes. Overall diet quality scores, as well as fruit, whole fruit, whole grains, dairy and empty calorie subscale scores were significantly better in children who ate breakfast. **Conclusions:** Children who skipped breakfast presented poorer overall diet quality and lower total intakes commonly obtained at breakfast. To address missed opportunities, nutrition professionals should encourage children's consumption of a nutritious breakfast to support overall diet quality.

**Dietary Guidelines for Americans:**
The History and Future of Dietary Guidance in America

**Significance:** This review provides a historical overview of dietary guidance in the United States, and describes present and future applications of the Dietary Guidelines for Americans.

Evidence-based dietary guidance in the United States has progressed substantially since its inception >100 y ago. This review describes the historical development and significance of dietary guidance in the United States, including the Dietary Guidelines for Americans (DGAs), and emphasizes the foundations upon which they were developed, the process in the formation of past and current guidelines, and present and future applications. Dietary guidance during the first half of the 20th century was focused primarily on food groups in a healthy diet, food safety, safe food storage, and the role of some minerals and vitamins in the prevention of disease. This was punctuated by World War II messaging to reduce food waste and increase food storage. In 1980, the first DGA report was released, and later, the USDA and the Department of Health and Human Services (HHS) were given a mandate for reissuance and reassessment every 5 y. An ad hoc advisory committee made up of nongovernmental experts was established for each edition to review the scientific evidence and provide content recommendations to the Secretaries of the USDA and the HHS. Wording was changed from negative (avoid) to positive (choose) and emphasis was increasingly placed on reducing the prevalence of overweight and obesity and prevention of chronic diseases. Today, the DGAs guide all federally funded feeding and educational programs, including food policies, food assistance programs, and consumer education programs, as well as these programs at the regional, state, and local levels. Additional users include dietitians and other health professionals, food service personnel, food and beverage manufacturers, schools, and day care facilities. Currently, the DGAs are intended for individuals aged ≥2 y. Future editions of the DGAs will include guidance for infants and children <2 y, as well as pregnant women.

**Protein:**
Perspective: Protein Requirements and Optimal Intakes in Aging: Are We Ready to Recommend More Than the Recommended Daily Allowance?

**Significance:** This paper summarizes the existing evidence and research gaps regarding optimal protein intake in older adults.

The Dietary Reference Intakes set the protein RDA for persons >19 y of age at 0.8 g protein · kg body weight$^{-1}$ · d$^{-1}$. A growing body of evidence suggests, however, that the protein RDA may be inadequate for older individuals. The evidence for recommending a protein intake greater than the RDA comes from a variety of metabolic approaches. Methodologies centered on skeletal muscle are of paramount importance given the age-related decline in skeletal muscle mass and function (sarcopenia) and the degree to which dietary protein could mitigate these declines. In addition to evidence from short-term experimental
trials, observational data show that higher protein intakes are associated with greater muscle mass and, more importantly, better muscle function with aging. We are in dire need of more evidence from longer-term intervention trials showing the efficacy of the consumption of protein intakes that are higher than the RDA in older persons to support skeletal muscle health. We propose that it should be recommended that older individuals consume ≥1.2 g protein · kg⁻¹ · d⁻¹ and that there should be an emphasis on the intake of the amino acid leucine, which plays a central role in stimulating skeletal muscle anabolism. Critically, the often-cited potential negative effects of consuming higher protein intakes on renal and bone health are without a scientific foundation in humans.

A Small Dose of Whey Protein Co-Ingested with Mixed-Macronutrient Breakfast and Lunch Meals Improves Postprandial Glycemia and Suppresses Appetite in Men with Type 2 Diabetes: A Randomized Controlled Trial


Significance: Consuming a small dose of intact whey protein before a meal may improve glycemic response and satiety in men with type 2 diabetes.

Background: Large doses of whey protein consumed as a preload before single high-glycemic load meals has been shown to improve postprandial glycemia in type 2 diabetes. It is unclear if this effect remains with smaller doses of whey co-ingested at consecutive mixed-macronutrient meals. Moreover, whether hydrolyzed whey offers further benefit under these conditions is unclear. Objective: The aim of this study was to investigate postprandial glycemic and appetite responses after small doses of intact and hydrolyzed whey protein co-ingested with mixed-nutrient breakfast and lunch meals in men with type 2 diabetes. Design: In a randomized, single-blind crossover design, 11 men with type 2 diabetes [mean ± SD age: 54.9 ± 2.3 y; glycated hemoglobin: 6.8% ± 0.3% (51.3 ± 3.4 mmol/mol)] attended the laboratory on 3 mornings and consumed 1) intact whey protein (15 g), 2) hydrolyzed whey protein (15 g), or 3) placebo (control) immediately before mixed-macronutrient breakfast and lunch meals, separated by 3 h. Blood samples were collected periodically and were processed for insulin, intact glucagon-like peptide 1 (GLP-1), gastric inhibitory polypeptide (GIP), leptin, peptide tyrosine tyrosine (PYY3-36), and amino acid concentrations. Interstitial glucose was measured during and for 24 h after each trial. Subjective appetite was assessed with the use of visual analog scales. Results: Total postprandial glycemia area under the curve was reduced by 13% ± 3% after breakfast following the intact whey protein when compared with control (P < 0.05). Hydrolyzed whey attenuated early glucose after breakfast when compared with control (P < 0.05). Glycemia was improved postlunch after the intact whey protein only when compared with control (P < 0.05). Greater satiety was observed after the intact whey protein only after both meals when compared with control (P < 0.05). Insulin concentrations increased after both the intact and hydrolyzed whey protein, showing strong positive correlations with increases in valine and isoleucine (P < 0.05). Incretin and appetite regulatory hormone responses were similar across trials (P > 0.05). Conclusions: The consumption of a small 15-g dose of intact whey protein immediately before consecutive mixed-macronutrient meals improves postprandial glycemia, stimulates insulin release, and increases satiety in men with type 2 diabetes. This trial was registered at www.clinicaltrials.gov as NCT02903199.

Effects of Protein Supplements Consumed with Meals, versus Between Meals, on Resistance Training-Induced Body Composition Changes in Adults: A Systematic Review


Significance: This systematic review found that protein supplements may control weight and reduce fat mass more effectively when consumed with meals than between meals.

Context: The impact of timing the consumption of protein supplements in relation to meals on resistance training-induced changes in body composition has not been evaluated systematically. Objective: The aim of this systematic review was to assess the effect of consuming protein supplements with meals, vs between meals, on resistance training-induced body composition changes in adults. Data Sources: Studies published up to 2017 were identified with the PubMed, Scopus, Cochrane, and CINAHL databases. Data Extraction: Two researchers independently screened 2077 abstracts for eligible randomized controlled trials of parallel design that prescribed a protein supplement and measured changes in body composition for a period of 6 weeks or more. Results: In total, 34 randomized controlled trials with 59 intervention groups were included and qualitatively assessed. Of the intervention groups designated as consuming protein supplements with meals (n = 16) vs between meals (n = 43), 56% vs 72% showed an increase in body mass, 94% vs 90% showed an increase in lean mass, 87% vs 59% showed a reduction in fat mass, and 100% vs 84% showed an increase in the ratio of lean mass to fat mass over time, respectively. Conclusions: Concurrently with resistance training, consuming protein supplements with meals, rather than between meals, may more effectively promote weight control and reduce fat mass without influencing improvements in lean mass.
Effect of Whey Protein Supplementation on Body Composition Changes in Women: A Systematic Review and Meta-Analysis

Significance: This systematic review and meta-analysis found that whey protein supplementation improves body composition, particularly when combined with energy restriction, by increasing lean body mass.

Context: A preponderance of evidence supports the beneficial effects of whey protein (WP) supplementation on body composition in men; however, there is currently insufficient evidence to make an equivalent claim in women. Objective: This systematic review and meta-analysis assessed the effects of WP supplementation with or without energy restriction (ER) and resistance training (RT) on changes in body mass, lean mass, and fat mass in women. Data Sources: Pubmed, Scopus, Cochrane, and CINAHL were searched using the keywords “whey protein,” “body composition,” and “lean mass.” Data Extraction: Two researchers independently screened 1845 abstracts and extracted 276 articles. Thirteen randomized controlled trials with 28 groups met the inclusion criteria.

Results: Globally, WP supplementation increased lean mass (WMD, 0.37 kg; 95% confidence interval [CI], 0.06 to 0.67) while not influencing changes in fat mass (-0.20 kg; 95%CI, -0.67 to 0.27) relative to non-WP control. The beneficial effect of WP on lean mass was lost when only studies with RT were included in the analysis (n = 7 comparisons; 0.23 kg; 95%CI, -0.17 to 0.63). The beneficial effect of WP on lean mass was more robust when only studies with an ER component were included (n = 6 comparisons; 0.90 kg; 95%CI, 0.31 to 1.49). There was no effect of WP on lean mass in studies without ER (n = 9 comparisons; 0.22 kg; 95%CI, -0.12 to 0.57). Conclusion: Whey protein supplementation improves body composition by modestly increasing lean mass without influencing changes in fat mass. Body composition improvements from WP are more robust when combined with ER.

Carbohydrate:
The Effect of Dietary Glycemic Index and Glycemic Load on Inflammatory Biomarkers: A Systematic Review and Meta-Analysis of Randomized Clinical Trials

Significance: This systematic review and meta-analysis found no relationship between glycemic index or glycemic load and circulating biomarkers of inflammation.

Background: To our knowledge, there is no study available that summarizes earlier findings on the effect of dietary glycemic index (GI) and glycemic load (GL) on inflammatory biomarkers. Objective: This systematic review and meta-analysis was conducted to systematically review the available clinical trials that examined the effects of low-GI (LGI) and low-GL (LGL) diets on several inflammatory biomarkers in adults. Design: We searched for relevant articles published up to June 2017 through PubMed, Medline, SCOPUS, EMBASE, and Google Scholar with the use of relevant keywords. Clinical trials that examined the effect of dietary GI and GL on inflammation in adults were included. Results: Overall, 28 randomized controlled trials (RCTs) including 2961 participants (59% women, 41% men) were included in this meta-analysis. By combining findings from 14 studies on high-sensitivity C-reactive protein (hs-CRP) concentrations, we found no significant effect of LGI or LGL diets on serum hs-CRP concentrations compared with the control diet [weighted mean difference (WMD) for dietary GI: -0.05 mg/L (95% CI: -0.21, 0.10 mg/L); and WMD for dietary GL: 0.08 mg/L (95% CI: -0.26, 0.42 mg/L), respectively]. After combining effect sizes from 5 studies, we did not find significant changes in serum tumor necrosis factor α (TNF-α) concentrations comparing control diets with LGI (WMD: -0.18 mg/L; 95% CI: -0.43, 0.06 mg/L) or LGL (WMD: -0.20 mg/L; 95% CI: -0.33, 0.07 mg/L) diets. Significant changes were also not seen in leptin and interleukin 6 (IL-6) concentrations after the consumption of LGI or LGL diets. Conclusion: We did not find any significant effect of dietary GI or GL on serum concentrations of inflammatory cytokines, including hs-CRP, leptin, IL-6, and TNF-α in adults. Additional RCTs in particular, feeding trials are required to shed light on this issue.

Prospective Association Between Added Sugars and Frailty in Older Adults

Significance: Consumption of added sugars was associated with frailty in a cohort of Spanish adults aged ≥60 years.

Background: Sugar-sweetened beverages and added sugars (monosaccharides and disaccharides) in the diet are associated with obesity, diabetes, and cardiovascular disease, which are all risk factors for decline in physical function among older adults. Objective: The aim of this study was to examine the association between added sugars in the diet and incidence of frailty in older people. Methods: Data were taken from 1973 Spanish adults ≥60 y old from the Seniors-ENRICA cohort. In 2008-2010 (baseline), consumption of added sugars (including those in fruit juices) was obtained using a validated diet history. Study participants were followed up until 2012-2013 to assess frailty based on Fried’s criteria. Statistical analyses were performed with logistic regression.
adjusted for age, sex, education, smoking status, body mass index, energy intake, self-reported comorbidities, Mediterranean Diet Adherence Score (excluding sweetened drinks and pastries), TV watching time, and leisure-time physical activity. **Results:** Compared with participants consuming <15 g/d added sugars (lowest tertile), those consuming ≥36 g/d (highest tertile) were more likely to develop frailty (OR: 2.27; 95% CI: 1.34, 3.90; P-trend = 0.003). The frailty components “low physical activity” and “unintentional weight loss” increased dose dependently with added sugars. Association with frailty was strongest for sugars added during food production. Intake of sugars naturally appearing in foods was not associated with frailty. **Conclusions:** The consumption of added sugars in the diet of older people was associated with frailty, mainly when present in processed foods. The frailty components that were most closely associated with added sugars were low level of physical activity and unintentional weight loss. Future research should determine whether there is a causal relation between added sugars and frailty.

**Perspective: Total, Added, or Free? What Kind of Sugars Should We Be Talking About?**


**Significance:** This paper discusses the evidence base for total, added and free sugar recommendations. There is consistent public guidance to limit sugars intakes. However, WHO recommendations are for “free” sugars, whereas some other guidance documents and public discussion focus on “added” sugars, and globally most food labeling states “total” sugars. Total sugars comprise all mono- and disaccharides, regardless of source, whereas both added and free sugars exclude the sugars that naturally occur in dairy products and intact fruit and vegetables. Definitions of added and free sugars differ mainly in their respective exclusion or inclusion of sugars in juiced or pureed fruit and vegetables. To date, there has been little evidence-based analysis of the scientific basis for these different sugar classifications or implications of their adoption for consumer communication and nutrition labeling. Evidence of discriminating relations of total compared with added or free sugars with weight gain or energy intake, type 2 diabetes, and dental caries was identified from recent systematic reviews and meta-analyses. The relations were weakest for total sugars and most consistent for dietary sources corresponding to free sugars (including sugars added to and in fruit juices). Consideration of these health outcomes suggests that the emphasis for intake monitoring, public health guidance, and consumer communication should be on free sugars. However, at present, the adoption of free sugars for these purposes would also carry challenges related to implementation, including consumer understanding, consensus on specifications, and current (labeling) regulations.

**Sugar-Sweetened Beverages:**

**Perspective: Cardiovascular Responses to Sugar-Sweetened Beverages in Humans: A Narrative Review with Potential Hemodynamic Mechanisms**


**Significance:** This review describes the association between sugar-sweetened beverage intake and cardiovascular and metabolic disease, and identifies potential mechanisms that underlie this relationship. Cardiovascular diseases are still the primary cause of mortality worldwide, with high blood pressure and type 2 diabetes as major promoters. Over the past 3 decades, almost in parallel with the rise in cardiovascular disease incidence, the consumption of sugar-sweetened beverages (SSBs) has increased. In this context, SSBs are potential contributors to weight gain and increase the risk for elevations in blood pressure, type 2 diabetes, coronary heart disease, and stroke. Nevertheless, the mechanisms underlying the cardiovascular and metabolic responses to SSBs, in particular on blood pressure, are poorly understood. We discuss and propose potential mechanisms underlying differential effects of sugars on postprandial blood pressure regulation; provide evidence for additional molecular contributors, i.e., fibroblast growth factor 21, towards sugar-induced cardiovascular responses; and discuss potential cardiovascular neutral sugars. Furthermore, we explore whether pre-existing glucose intolerance in humans exacerbates the cardiovascular responses to SSBs, thus potentially aggravating the cardiovascular risk in already-susceptible individuals.

**Review of 100% Fruit Juice and Chronic Health Conditions: Implications for Sugar-Sweetened Beverage Policy**


**Significance:** This systematic review found no conclusive evidence that consumption of 100% fruit juice has adverse health effects. Whether or not drinking 100% fruit juice causes poor health is controversial. Although 100% fruit juice may contain as much sugar as regular soda, it provides needed nutrients to Americans’ diets. We systematically reviewed the current evidence of
the association of 100% fruit juice consumption and chronic health conditions in children and adults. We focused on data from systematic reviews and meta-analyses about cardiometabolic health outcomes, liver disease, and caries. Aside from increased risk of tooth decay in children and small amounts of weight gain in young children and adults, there is no conclusive evidence that consumption of 100% fruit juice has adverse health effects. Guidelines from groups like the American Academy of Pediatrics and Dietary Guidelines for Americans recommending that 100% fruit juice may be consumed in moderation are consistent with the available evidence and should be used to inform food policies.

**Low-Calorie Sweeteners:**

**Aspartame Consumption for 12 Weeks Does Not Affect Glycemia, Appetite, or Body Weight of Healthy, Lean Adults in a Randomized Controlled Trial**


**Significance:** This study found no effect of aspartame on glycemia, appetite or body weight after 12 weeks in healthy, lean adults.

**Background:** Low-calorie sweeteners are often used to moderate energy intake and postprandial glycemia, but some evidence indicates that they may exacerbate these aims. **Objective:** The trial's primary aim was to assess the effect of daily aspartame ingestion for 12 wk on glycemia. Effects on appetite and body weight were secondary aims. **Methods:** One hundred lean [body mass index (kg/m2): 18-25] adults aged 18-60 y were randomly assigned to consume 0, 350, or 1050 mg aspartame/d (ASP groups) in a beverage for 12 wk in a parallel-arm design. At baseline, body weight and composition were determined, a 240-min oral-glucose-tolerance test (OGTT) was administered, and measurements were made of appetite and selected hormones. Participants also collected a 24-h urine sample. During the intervention, the 0-mg/d ASP group consumed capsules containing 680 mg dextrose and 80 mg para-amino benzoic acid. For the 350-mg/d ASP group, the beverage contained 350 mg aspartame and the 1050-mg/d ASP group consumed the same beverage plus capsules containing 680 mg dextrose and 700 mg aspartame. Body weight, blood pressure, heart rate, and waist circumference were measured weekly. At weeks 4, 8, and 12, participants collected 24-h urine samples and kept appetite logs. Baseline measurements were repeated at week 12. **Results:** With the exception of the baseline OGTT glucose concentration at 60 min (and resulting area under the curve value), there were no group differences for glucose, insulin, resting leptin, glucagon-like peptide 1, or gastric inhibitory peptide at baseline or week 12. There also were no effects of aspartame ingestion on appetite, body weight, or body composition. Compliance with the beverage intervention was ~95%. **Conclusions:** Aspartame ingested at 2 doses for 12 wk had no effect on glycemia, appetite, or body weight among healthy, lean adults. These data do not support the view that aspartame is problematic for the management of glycemia, appetite, or body weight. This trial was registered at www.clinicaltrials.gov as NCT02999321.

**Micronutrients:**

**Dairy Products and Total Calcium Intake at 13 Years of Age and its Association with Obesity at 21 Years of Age**

Marabujo T, Ramos E, Lopes C. *Eur J Clin Nutr.* 2018 Apr;72(4):541-547. doi: 10.1038/s41430-017-0082-x. [Article Link](#)

**Significance:** In a longitudinal study of 2,159 individuals, calcium intake in adolescence did not affect BMI at age 21.

**Background/Objectives:** Dairy products and specifically calcium have been suggested to play a role in obesity development but more longitudinal evidence is still needed. The objective of this study was to assess the association between dairy products and total calcium intake at age 13 and body mass index at age 21. **Subjects/Methods:** This longitudinal study included 2159 individuals from the Epidemiological Health Investigation of Teenagers cohort (EPITeen), Porto, Portugal, evaluated at ages 13 and 21. Assessment consisted of anthropometrics measurements and structured questionnaires namely a semi-quantitative food frequency questionnaire to appraise food consumption in the past 12 months. Linear regression models were run in 941 individuals with complete information of confounders: gender, follow-up period, parents' education, physical activity, energy, and total calcium intake. **Results:** Negative association was found on total calcium intake at age 13 with BMI at age 21 (model 0: β = -0.059 [95% CI: -0.113, -0.004] and model 1: -0.057 [95% CI: -0.110, -0.002]), however, no statistically significant association was found when adjusting for energy intake (model 2: β = -0.031 [95% CI: -0.110, 0.047]). There were no associations between milk, yogurt, and cheese consumption at age 13 and BMI at age 21 when adjusting for confounders. **Conclusions:** This study did not support an independent effect of dairy products or total calcium intake in adolescence on later early adulthood adiposity.
Estimating the Health and Economic Effects of the Proposed US Food and Drug Administration Voluntary Sodium Reformulation: Microsimulation Cost-Effectiveness Analysis


Significance: This paper quantifies the potential health and economic impacts of the US Food and Drug Administrations’ voluntary sodium reduction program.

Background: Sodium consumption is a modifiable risk factor for higher blood pressure (BP) and cardiovascular disease (CVD). The US Food and Drug Administration (FDA) has proposed voluntary sodium reduction goals targeting processed and commercially prepared foods. We aimed to quantify the potential health and economic impact of this policy. Methods and findings: We used a microsimulation approach of a close-to-reality synthetic population (US IMPACT Food Policy Model) to estimate CVD deaths and cases prevented or postponed, quality-adjusted life years (QALYs), and cost-effectiveness from 2017 to 2036 of 3 scenarios: (1) optimal, 100% compliance with 10-year reformulation targets; (2) modest, 50% compliance with 10-year reformulation targets; and (3) pessimistic, 100% compliance with 2-year reformulation targets, but with no further progress. We used the National Health and Nutrition Examination Survey and high-quality meta-analyses to inform model inputs. Costs included government costs to administer and monitor the policy, industry reformulation costs, and CVD-related healthcare, productivity, and informal care costs. Between 2017 and 2036, the optimal reformulation scenario achieving the FDA sodium reduction targets could prevent approximately 450,000 CVD cases (95% uncertainty interval: 240,000 to 740,000), gain approximately 2.1 million discounted QALYs (1.7 million to 2.4 million), and produce discounted cost savings (health savings minus policy costs) of approximately $41 billion ($14 billion to $81 billion). In the modest and pessimistic scenarios, health gains would be 1.1 million and 0.7 million QALYS, with savings of $19 billion and $12 billion, respectively. All the scenarios were estimated with more than 80% probability to be cost-effective (incremental cost/QALY < $100,000) by 2021 and to become cost-saving by 2031. Limitations include evaluating only diseases mediated through BP, while decreasing sodium consumption could have beneficial effects upon other health burdens such as gastric cancer. Further, the effect estimates in the model are based on interventional and prospective observational studies. They are therefore subject to biases and confounding that may have influenced also our model estimates. Conclusions: Implementing and achieving the FDA sodium reformulation targets could generate substantial health gains and net cost savings.

Bioactives:

Can Curcumin Counteract Cognitive Decline? Clinical Trial Evidence and Rationale for Combining ω-3 Fatty Acids with Curcumin


Significance: This review outlines specific recommendations for future studies to examine the effects of curcumin on cognitive decline in humans.

The rate of cognitive decline in the elderly is highly variable. One potential factor contributing to accelerated cognitive decline is chronic systemic inflammation, because it has been linked to cognitive impairment and increased dementia risk. Certain lifestyle factors, such as excess body weight and sedentary behavior, can exacerbate a proinflammatory state in older adults, resulting in chronic low-grade inflammation. Supplementing the diet with curcumin, an anti-inflammatory polyphenolic compound from the curry spice turmeric, is a potential approach to prevent accelerated cognitive decline by counteracting chronic inflammatory processes. Although the anti-inflammatory effects of curcumin are well established, the potential cognitive benefits of curcumin were discovered more recently. Several animal and epidemiologic studies on the effect of curcumin supplementation on cognition showed promising results; however, randomized controlled trials in humans are limited. In this review, we identified 5 randomized controlled trials, of which only 2 observed a beneficial effect of curcumin supplementation on cognition by improving working memory. By critically examining the methodologies of those studies, we identified some limitations, one of which is that none of the studies explored the possibility that anti-inflammatory mechanisms were mediating cognitive benefits (i.e., no study tested participants with low-grade inflammation or measured inflammatory biomarkers). Other factors influencing the likelihood of conclusive outcomes include choice of study population (cognitively unimpaired compared with impaired), study duration, curcumin dose and its bioavailability, and neurocognitive test battery. On the basis of these findings, we offer recommendations for future studies to examine the potential cognitive benefits of curcumin in humans, which include evaluating its effects on cerebral endothelial vasodilator function and boosting its cognitive effects by combining it with long-chain omega-3 (n–3) fatty acids.
Dietary Lipids:

Avocado Consumption and Risk Factors for Heart Disease: A Systematic Review and Meta-Analysis

**Significance:** This systematic review and meta-analysis found that avocado consumption is associated with increased serum HDL cholesterol, but not with total cholesterol, LDL cholesterol or triglycerides.

**Background:** Nutrients in avocados are associated with cardiovascular benefits. **Objective:** The aim of this study was to determine the effect of avocado intake on cardiovascular disease (CVD) risk with the use of a systematic review and meta-analysis. **Design:** MEDLINE, Cochrane Central, and Commonwealth Agricultural Bureau abstracts were searched from 1946 through September 2017 for publications on avocado intake and CVD risk. All designs except for cross-sectional studies that evaluated avocado intake were included. Two investigators independently screened citations and extracted data. Random-effects models meta-analysis was used when ≥3 studies reported the same outcome. **Results:** Of 18 eligible studies (481 subjects), 7 studies compared avocado intake with no intake, 3 studies compared avocado plus monounsaturated fat intake with a control, and 8 studies reported data for qualitative synthesis. In 7 studies, avocado intake significantly increased HDL cholesterol (summary net change: 2.84 mg/dL; 95% CI: 0.18, 5.49 mg/dL), with significant heterogeneity. This remained consistent in sensitivity and subgroup analyses. There was no significant difference between avocado intake and the control for the outcomes of serum total cholesterol (TC), LDL cholesterol, triglycerides (TGs), ratios of TC to HDL cholesterol and LDL cholesterol to HDL cholesterol, and body weight. In qualitative synthesis, there was no significant difference between groups for blood glucose (2 studies), homeostasis model assessment (1 of 2 studies), oxidized LDL (2 studies), high-sensitivity C-reactive protein (2 studies), or apolipoprotein B (2 studies) or, in 1 study each, for body mass index, systolic and diastolic blood pressure, arterial compliance, fibrinogen, interleukin 6, tumor necrosis factor α, and serum nitric oxide. No studies reported incident clinical outcomes of CVD, including myocardial infarction, stroke, and other clinical endpoints. **Conclusions:** Avocado intake resulted in no difference in serum TC, LDL-cholesterol, and TG concentrations, but it did increase serum HDL-cholesterol concentrations, with significant heterogeneity. The association between avocado intake and CVD risk should be confirmed by well-conducted prospective observational studies or long-term trials.

Microbiome:

Relationship Between the Gut Microbiome and Brain Function

**Significance:** This review article summarizes the evidence on gut microbiome-brain interactions, and how each may influence the functioning of the other.

It has become increasingly evident in recent years that the gut microbiome and the brain communicate in a bidirectional manner, with each possibly affecting the other’s functions. Substantial research has aimed to understand the mechanisms of this interaction and to outline strategies for preventing or treating nervous system-related disturbances. This review explores the evidence demonstrating how the gut microbiome may affect brain function in adults, thereby having an impact on stress, anxiety, depression, and cognition. In vitro, in vivo, and human studies reporting an association between a change in the gut microbiome and functional changes in the brain are highlighted, as are studies outlining the mechanisms by which the brain affects the microbiome and the gastrointestinal tract. Possible modes of action to explain how the gut microbiome and the brain functionally affect each other are proposed. Supplemental probiotics to combat brain-related dysfunction offer a promising approach, provided future research elucidates their mode of action and possible side effects. Further studies are warranted to establish how pre- and probiotic interventions may help to balance brain function in healthy and diseased individuals.