Dietary Patterns

Consumption of Sugars, Saturated Fat, and Sodium Among US Children from Infancy through Preschool Age, NHANES 2009-2014


Significance: The leading sources of sugars, saturated fats and sodium among US infants and children are described. For many children, consumption of these nutrients exceeds recommended guidelines before they reach school age.

Background: Expert guidelines advise that intake of added sugars (ASs), free sugars, and saturated fats be limited to <10% total energy (TE), and that children’s sodium not exceed 1500-1900 mg, yet intake among many older children and adolescents exceeds these limits. Although research suggests young children’s diets influence future eating patterns, little is known about the intake of these nutrients throughout early childhood. Objective: The objective of this study was to describe intake and leading sources of sugars, saturated fats, and sodium among US children from infancy through preschool age. Design: Cross-sectional data from the NHANES 2009-2014 were used to estimate 1) mean intake of sugars (%TE from ASs, naturally occurring sugars (NOSs), and free sugars), saturated fats (%TE), and sodium (milligrams), 2) the proportion exceeding recommended limits, and 3) the leading sources of these nutrients in the diets of US (nonbreastfeeding) children <5 y old (n = 3345). Sampling weights and procedures to account for the complex sampling design were used to estimate intake by age and to compare across race/ethnicity, sex, and income subgroups. Results: Nonbreastfeeding children <5 y old consumed a mean ± SE %TE of 10.1% ± 0.2% from ASs, 13.9% ± 0.2% from free sugars, 12.8% ± 0.1% from saturated fats, and 1804 ± 26 mg Na. Sugary beverages (sugar-sweetened beverages + 100% juices) contributed 6.7% ± 0.2% TE, with consumption lowest among higher-income children. AS and sodium consumption rose rapidly from infancy to age 1-<2 y and gradually thereafter. Saturated fat intake was highest in infancy and decreased to a mean ± SE of 11.3% ± 0.3% TE among 4-<5-y-olds. Intake exceeded recommended limits for ASs, free sugars, saturated fats, and sodium for 45%, 63%, 72%, and 67% of all children, respectively. Conclusion: The consumption of sugars, fats, and sodium exceeds recommended guidelines before many US children reach school age.

Protein

Protein Supplementation after Exercise and before Sleep Does Not Further Augment Muscle Mass and Strength Gains During Resistance Exercise Training in Active Older Men


Significance: Relative to an energy-matched placebo, protein supplementation did not augment skeletal muscle mass or strength gains in active older men when taken after exercise and before sleep.

Background: The proposed benefits of protein supplementation on the skeletal muscle adaptive response to resistance exercise training in older adults remain unclear. Objective: The present study assessed whether protein supplementation after exercise and before sleep augments muscle mass and strength gains during resistance exercise training in older individuals. Methods: Forty-one older men [mean ± SEM age: 70 ± 1 y; body mass index (kg/m²): 25.3 ± 0.4] completed 12 wk of whole-body resistance exercise training (3 sessions/wk) and were randomly assigned to ingest either protein (21 g protein, 3 g total leucine, 9 g carbohydrate, 3 g fat; n = 21) or an energy-matched placebo (0 g protein, 25 g carbohydrate, 6 g fat; n = 20) after exercise and each night before sleep. Maximal strength was assessed by 1-repetition-maximum (1RM) strength testing, and muscle hypertrophy was assessed at the whole-body (dual-energy X-ray absorptiometry), upper leg (computed tomography scan), and muscle fiber (biopsy) levels. Muscle protein synthesis rates were assessed during week 12 of training with the use of deuterated water (2H2O)
administration. Results: Leg-extension 1RM increased in both groups (placebo: 88 ± 3 to 104 ± 4 kg; protein: 85 ± 3 to 102 ± 4 kg; P < 0.001), with no differences between groups. Quadriceps cross-sectional area (placebo: 67.8 ± 1.7 to 73.5 ± 2.0 cm²; protein: 68.4 ± 1.4 to 72.3 ± 1.4 cm²; P < 0.001) increased in both groups, with no differences between groups. Muscle fiber hypertrophy occurred in type II muscle fibers (placebo: 5486 ± 418 to 6492 ± 429 µm²; protein: 5367 ± 301 to 6259 ± 391 µm²; P < 0.001), with no differences between groups. Muscle protein synthesis rates were 1.62% ± 0.06% and 1.57% ± 0.05%/d in the placebo and protein groups, respectively, with no differences between groups. Conclusion: Protein supplementation after exercise and before sleep does not further augment skeletal muscle mass or strength gains during resistance exercise training in active older men. This study was registered at the Netherlands Trial Registry (www.trialregister.nl) as NTR5082.

Carbohydrates

Effect of Psyllium (Plantago ovata) Fiber on LDL Cholesterol and Alternative Lipid Targets, Non-HDL Cholesterol and Apolipoprotein B: A Systematic Review and Meta-Analysis of Randomized Controlled Trials


Significance: This systematic review and meta-analysis found that psyllium fiber effectively improves several lipid markers associated with cardiovascular disease in individuals with and without hypercholesterolemia.

Background: Studies have identified viscous dietary fiber as potentially attenuating cholesterol, including psyllium, which reduces LDL cholesterol and thus may complement cardiovascular disease (CVD) treatment. Objectives: The aims of this study were to update evidence on the effect of psyllium on LDL cholesterol and to provide an assessment of its impact on alternate markers: non-HDL cholesterol and apolipoprotein B (apoB). Design: Medline, EMBASE, CINAHL, and the Cochrane Central Register of Controlled Trials were searched through 3 October 2017. Independent reviewers extracted relevant data and assessed risk of bias. We included randomized controlled trials with a duration of ≥3 wk that assessed the effect of psyllium on blood lipids in individuals with or without hypercholesterolemia. Data were pooled by using the generic inverse variance method with random-effects models and expressed as mean differences (MDs) with 95% CIs. Heterogeneity was assessed by by using the GRADE (Grading of Recommendations Assessment, Development, and Evaluation) approach. Results: We included 28 trials in our analysis (n = 1924). Supplementation of a median dose of ~10.2 g psyllium significantly reduced LDL cholesterol (MD = -0.33 mmol/L; 95% CI: -0.38, -0.27 mmol/L; P < 0.00001), non-HDL cholesterol (MD = -0.39 mmol/L; 95% CI: -0.50, -0.27 mmol/L; P < 0.00001), and apoB (MD = -0.05 g/L; 95% CI: -0.08, -0.03 g/L; P < 0.0001). Effect estimates for LDL cholesterol and non-HDL cholesterol were graded as moderate quality on the basis of downgrades for inconsistency and graded as high quality for apoB. Conclusion: Psyllium fiber effectively improves conventional and alternative lipid markers, potentially delaying the process of atherosclerosis-associated CVD risk in those with or without hypercholesterolemia. This trial is registered at www.clinicaltrials.gov as NCT03346733.

The Soluble Fiber α-Cyclodextrin Does Not Increase the Fecal Losses of Dietary Fat in Adults-A Double-Blind, Randomized, Placebo-Controlled, Crossover Trial


Significance: This randomized, double-blind, placebo-controlled crossover study found that soluble fiber α-Cyclodextrin does not increase fecal loss of dietary fat in humans.

Background: α-Cyclodextrin (α-CD), a soluble dietary fiber, may improve abnormal plasma lipids and promote weight loss. Preliminary evidence suggests that it may exert these effects by binding dietary fat and reducing absorption; this has not been tested in humans. Objective: The primary objective was to test whether supplemental α-CD increases fecal content of dietary lipids in humans. Methods: This was a randomized, double-blind, placebo-controlled, crossover study completed at the Mayo Clinic. Eight healthy volunteers, 5 premenopausal women and 3 men ages 23-54 y with body mass index (BMI; kg/m²) 18-27, underwent 2 separate study visits with a ≥2-wk washout period. The first morning of each visit volunteers consumed a standardized breakfast (14.5% protein, 27.5% fat, 60% carbohydrate, and 1.5 kcal/mL) containing [14C]tripalmitin and [3H]triolein with 2 g of α-CD or placebo, followed by 2 g of α-CD or placebo per meal for 2 more days. Volunteers consumed 100 g/d of dietary fat. Feces were collected for 72 h after the labeled breakfast to measure radiotracer content and total fecal fat. Radiotracer appearance in plasma TGs was measured at intervals after the labeled meal as a secondary outcome. Results: Virtually no [3H] radiotracer, but an average of ~20% of the [14C] radiotracer was recovered in fecal lipids, with no difference between α-CD and placebo. Total fecal fat content and radiotracer appearance in postprandial plasma TGs did not differ between the α-CD and placebo treatments. Plasma appearance of [14C]-TG was 37% ± 14% less (P < 0.0001) than [3H]-TG. Conclusions: α-CD supplementation did not increase loss of dietary lipid in stool or total fecal fat compared with placebo in healthy adults. Greater stool loss and lesser appearance in plasma TGs of tripalmitin-derived [14C] compared with triolein-derived [3H] TGs imply different metabolic handling of these 2 dietary fat tracers. This trial was registered at www.clinicaltrials.gov as NCT03002168.
Bioactives

Carotenoids, Vitamin A, and their Association with the Metabolic Syndrome: A Systematic Review and Meta-Analysis


**Significance:** This systematic review and meta-analysis found that total carotenoids, and in particular β-carotene, α-carotene and β-cryptoxanthin, are associated with the occurrence of the metabolic syndrome.

Context: Modifiable factors that reduce the burden of the metabolic syndrome (MetS), particularly plant-derived biomarkers, have been a recent focus of rising interest. **Objective:** This systematic review and meta-analysis, which follows PRISMA guidelines, evaluates evidence from a period of 20 years that links vitamin A and carotenoids with the occurrence of MetS and following the PRISMA guidelines. **Data Sources:** PubMed and Cochrane databases (January 1997 through March 2017) were systematically assessed for studies, including case-control, cross-sectional, and cohort studies, that evaluated the associations of MetS with carotenoids and retinyl esters and retinol (vitamin A). **Data Extraction:** Key measures of associations were harmonized into odds ratios (ORs) and 95% confidence intervals (95%CI) of MetS per 1 standard deviation (SD) of exposure using forest plots and random effects models that pooled data points from 11 cross-sectional studies. Begg’s funnel and harvest plots were constructed. **Results:** An inverse association between total carotenoids and MetS was found [ORpooled, 0.66; 95%CI, 0.56-0.78; 1 SD ~ 0.82 µmol/L; n = 5 studies]. This association was the strongest for β-carotene, followed by α-carotene and β-cryptoxanthin. No association was detected between retinol and MetS (ORpooled, 1.00; 95%CI, 0.88-1.13; 1 SD ~ 2.14 µmol/L; n = 6 studies). Publication bias was absent, and harvest plots indicated consistency upon replication for β-carotene and total carotenoid exposures. **Conclusions:** This review and meta-analysis suggests that, unlike retinol, total and individual carotenoids were inversely related to MetS.

Micronutrients

Perspective: Should Vitamin E Recommendations for Older Adults Be Increased?


**Significance:** This perspective highlights evidence that should be considered while determining vitamin E requirements in older adults.

Current vitamin E requirements are uniformly applied across the population for those >14 y of age. However, aging is associated with alterations in cellular and physiologic functions, which are affected by vitamin E. Therefore, it is questionable whether vitamin E requirements can be uniformly applied to all adult age categories. With aging, there is dysregulation of the immune system in which there are decreased cell-mediated and pathogen defense responses coupled with an overactive, prolonged inflammatory state. Both animal and human studies in the aged suggest that intake above currently recommended levels of vitamin E may improve immune and inflammatory responses and be associated with a reduced risk of infectious disease. We review the evidence that was considered in establishing the current requirements for vitamin E and highlight data that should be considered in determining the vitamin E requirements in older adults, particularly focusing on the evidence suggesting a benefit of increased vitamin E intake on immune function and inflammatory processes and resistance to infection. The main objective of this Perspective is to initiate the discussion of whether the current Dietary Reference Intake for vitamin E should be increased for the older population. We make this suggestion on the basis of mechanistic studies showing biological plausibility, correction of a major cellular dysfunction in older adults, and strong evidence from several animal and a few human studies indicating a reduction in risk and morbidity from infections.

Lipids

Changes in Types of Dietary Fats Influence Long-term Weight Change in US Women and Men


**Significance:** Replacing saturated and trans fats with unsaturated fats, particularly polyunsaturated fats, may facilitate prevention of age-related weight gain.
ω-6 Polyunsaturated Fatty Acids and Cardiometabolic Health: Current Evidence, Controversies, and Research Gaps


Significance: The findings from this review support current recommendations to replaced saturated fats with polyunsaturated fatty acids to support cardiometabolic health.

The 2015 Dietary Guidelines for Americans recommend limiting the intake of saturated fatty acids (SFAs) to <10% of energy/d and replacing dietary SFAs with unsaturated fatty acids. A Presidential Advisory from the American Heart Association recently released its evaluation of the relation between dietary fats and cardiovascular disease (CVD), and also recommended a shift from SFAs to unsaturated fatty acids, especially polyunsaturated fatty acids (PUFAs), in conjunction with a healthy dietary pattern. However, the suggestion to increase the intake of PUFAs in general, and omega-6 (n-6) PUFAs in particular, continues to be controversial. This review was undertaken to provide an overview of the evidence and controversies regarding the effects of ω-6 PUFAs on cardiometabolic health, with emphasis on risks and risk factors for CVD (coronary heart disease and stroke) and type 2 diabetes mellitus (T2D). Results from observational studies show that higher intake of ω-6 PUFAs, when compared with SFAs or carbohydrate, is associated with lower risks for CVD events (10-30%), CVD and total mortality (10-40%), and T2D (20-50%). Findings from intervention studies on cardiometabolic risk factors suggest that ω-6 PUFAs reduce concentrations of LDL cholesterol and non-HDL cholesterol in a dose-dependent manner compared with dietary carbohydrate, and have a neutral effect on blood pressure. Despite the concern that ω-6 fatty acids increase inflammation, current evidence from studies in humans does not support this view. In conclusion, these findings support current recommendations to emphasize consumption of ω-6 PUFAs as a replacement of SFAs; additional randomized controlled trials with cardiometabolic disease outcomes will help to more clearly define the benefits and risks of this policy.

Microbiome

Dietary Patterns Affect the Gut Microbiome-The Link to Risk of Cardiometabolic Diseases


Significance: This review examines how the gut microbiome mediates the relationship between the Mediterranean and vegetarian diet patterns and cardiometabolic disease risk.

Clusters of bacterial species within the gut microbiome, or gut enterotype, have been correlated with cardiometabolic disease risk. The metabolic products and metabolites that bacteria produce, such as short-chain fatty acids, secondary bile acids, and trimethylamine, may also affect the microbial community and disease risk. Diet has a direct impact on the gut microbiome by providing substrates to and promoting the colonization of resident bacteria. To date, few dietary patterns have been evaluated for their effect on the gut microbiome, but the Mediterranean diet and Vegetarian diets have shown favorable effects for both the gut microbiome and cardiometabolic disease risk. This review examines the gut microbiome as a mediator between these dietary patterns and cardiometabolic disease risk.
**Taste**

**Evaluation of Dietary Taste Patterns as Assessed by FFQ Against 24-h Recalls and Biomarkers of Exposure**

van Langeveld AWB, Teo PS, Mars M, Feskens EJM, de Graaf C, de Vries JHM. *Eur J Clin Nutr.* 2018 Sep 25. doi: 10.1038/s41430-018-0300-1. [Article Link](#)

**Significance:** A taste database is available and can be combined with food intake data to assess relationships between dietary taste patterns and subgroups at risk of cardiometabolic disease.

**Background/Objective:** Taste is of key importance in food choice and dietary patterns, but studies on taste profiles are limited. We previously assessed dietary taste patterns by 24 h recalls (24hR), but for epidemiological studies food frequency questionnaires (FFQ) may also be suitable. This study compared dietary taste patterns based on FFQ against 24hR and biomarkers of exposure.

**Subjects/Methods:** A taste database including 467 foods' sweet, sour, bitter, salt, umami and fat sensation values was combined with food intake data to assess dietary taste patterns: the contribution to energy intake of 6 taste clusters. The FFQ's reliability was assessed against 3-d 24hR and urinary biomarkers for sodium (Na) and protein intake (N) in Dutch men (n = 449) and women (n = 397) from the NQplus validation study (mean age 53 ± 11 y, BMI 26 ± 4 kg/m²).

**Results:** Correlations of dietary taste patterns ranged from 0.39-0.68 between FFQ and 24hR (p < 0.05). Urinary Na levels, but not N levels, were positively associated with % energy intake from ‘salt, umami & fat’ tasting foods (Na; FFQ, r = 0.24, 24hR, r = 0.23, p < 0.001, N; FFQ, r = 0.08, p = 0.1394, 24hR, r = 0.05, p = 0.3427).

**Conclusions:** The FFQ’s reliability against 24hR was acceptable to good for ranking of adults’ dietary taste patterns. Associations between dietary taste patterns and urinary Na and N were similar for FFQ and 24hR. These findings suggest that both FFQ and 24hR can be used in combination with our taste database, to investigate potential relationships between dietary taste patterns and subgroups at risk of obesity and chronic diseases such as cardiovascular disease.

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**Personalized Nutrition**

**Classification of Obesity Targeted Personalized Dietary Weight Loss Management Based on Carbohydrate Tolerance**

Astrup A, Hjorth MF. *Eur J Clin Nutr.* 2018 Sep;72(9):1300-1304. doi: 10.1038/s41430-018-0227-6. [Article Link](#)

**Significance:** Glucose metabolism may underlie the large variability in weight loss response to dietary interventions in obese individuals.

No abstract available.