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Nutrition Briefs



Dietary Patterns

Commonalities among Dietary Recommendations from 2010 to 2021 Clinical Practice Guidelines: A Meta-Epidemiological Study from the American College of Lifestyle Medicine

Kelly C Cara, David M Goldman, Brooke K Kollman, Stas S Amato, Martin D Tull, Micaela C Karlsen. *Adv Nutr.* 2023 May;14(3):500-515. doi: 10.1016/j.advnut.2023.03.007. [Article link](#)

Significance: A meta-epidemiological study showed consistent alignment of current clinical practice recommendations with various dietary guidelines. These recommended increasing plant food vegetables, fruits and whole grains and reducing salt and alcohol and specific food group messaging to diabetes and CVD patients.

Clinical practice guidelines (CPGs) provide recommendations to clinicians based on current medical knowledge to guide and reduce variability in clinical care. With advances in nutrition science research, CPGs increasingly include dietary guidance; however, the degree of consistency in dietary recommendations across CPGs has not been investigated. Using a systematic review approach adapted for meta-epidemiologic research, this study compared dietary guidance from current guidelines developed by governments, major medical professional societies, and large health stakeholder associations owing to their often well-defined and standardized processes for guideline development. CPGs making recommendations for dietary patterns and food groups or components for generally healthy adults or those with prespecified chronic diseases were eligible. Literature from January 2010 to January 2022 was searched in 5 bibliographic databases and augmented by searches in point-of-care resource databases and relevant websites. Reporting followed an adapted PRISMA statement and included narrative synthesis and summary tables. Seventy-eight CPGs for major chronic conditions (autoimmune, 7; cancers, 5; cardiovascular-related, 35; digestive, 11; diabetes, 12; weight-related, 4; or multiple, 3) and general health promotion (n = 1) were included. Nearly, all (91%) made dietary pattern recommendations, and approximately half (49%) endorsed patterns centered on plant foods. Overall, CPGs were most closely aligned in promoting consumption of major plant food groups (vegetables = 74% of CPGs, fruit = 69%, whole grains = 58%), whereas discouraging intake of alcohol (62%) and salt or sodium (56%). CVD and diabetes CPGs were similarly aligned with additional messaging to consume legumes/pulses (60% of CVD CPGs; 75%, diabetes), nuts and seeds (67%, CVD), and low-fat dairy (60%, CVD). Diabetes guidelines discouraged sweets/added sugars (67%) and sweetened beverages (58%). This alignment across CPGs should boost clinician confidence in relaying such dietary guidance to patients in accordance with their relevant CPGs.



Carbohydrates

Effect of Oat Consumption on Blood Pressure: A Systematic Review and Meta-Analysis of Randomized Controlled Trials

Huihui Xi, Wei Zhou, Yirou Niu, Ruiting Zhu, Saikun Wang, Yingze Guo, Wenqing Liu, et. al. *J Acad Nutr Diet.* 2023 May;123(5):809-823. doi: 10.1016/j.jand.2022.11.010. [Article link](#)

Significance: Oat consumption is effective in reducing systolic blood pressure levels in subjects with hypertension, or when compared to control subjects on isocaloric refined grains.

Background: Current clinical trials have had controversial results regarding the effects of oat consumption on blood pressure (BP) in adults. Objective: The meta-analysis was conducted to systematically evaluate the effects of oat consumption on BP in adults. **Methods:** Electronic databases including PubMed, Web of Science, Scopus, Cochrane Library, and Embase were searched until December 13, 2021, for eligible randomized controlled trials (RCTs). RCTs published in English and that explored the effects of oat consumption on BP in adults under matched total energy intake were included. Meta-analysis using a random-effects model was performed. The pooled effect size was expressed as mean difference and 95% CI. I² statistics were used to quantify heterogeneity. The risk of bias was assessed using the Cochrane Risk-of-Bias Tool, version 2. **Results:** Twenty-one RCTs involving 1,569 participants were included. The pooled results indicated that consuming oats reduced systolic blood pressure (SBP) significantly (mean difference = -2.82 mm Hg; 95% CI -4.72 to -0.93 mm Hg; P = .004). Subgroup analyses indicated that oat consumption reduced SBP significantly in hypertensive participants, or when compared with control group participants who consumed refined grains. No significant reduction in diastolic blood pressure (DBP) was observed after oat consumption (mean difference = -1.16 mm Hg; 95% CI -2.37 to 0.04 mm Hg; P = .060). However, the sensitivity analysis of DBP, removal of individual studies, or “leave one out meta-analysis,” showed a significant reduction in DBP, suggesting that the pooled result in the main analysis was not robust. Subgroup analyses showed that oat consumption did significantly reduce DBP in participants with baseline BP in the prehypertensive range. Both SBP and DBP were significantly reduced when the dosage of oat consumption was ≥ 5 g/day β -glucan, or the oat consumption duration was ≥ 8 weeks. **Conclusions:** Oat consumption is effective in reducing SBP levels, particularly in individuals whose baseline BP is in the hypertensive range or when compared with control group participants consuming refined grains at matched total energy intake.

Protein

Underpinning the Food Matrix Regulation of Postexercise Myofibrillar Protein Synthesis by Comparing Salmon Ingestion with the Sum of Its Isolated Nutrients in Healthy Young Adults

Kevin Jm Paulussen, Takeshi M Barnes, Andrew T Askow, Amadeo F Salvador, Colleen F McKenna, Susannah E Scaroni, Alexander Fliflet, et. al. *J Nutr.* 2023 May;153(5):1359-1372. doi: 10.1016/j.tjnut.2023.02.037. [Article link](#)

Significance: No difference was found in post-exercise ingestion of salmon in a whole food mixture or in a crystalline amino acid-fish oil mixture on post-exercise myofibrillar protein synthesis rate in young healthy adults, suggesting similar effects of the two-food matrix conditions.

Background: Protein is most commonly consumed as whole foods as opposed to single nutrients. However, the food matrix regulation of the postprandial muscle protein synthetic response has received little attention. Objectives: The purpose of this study was to assess the effects of eating salmon (SAL) and of ingesting the same nutrients as an isolated mixture of crystalline amino acids and fish oil (ISO) on the stimulation of postexercise myofibrillar protein synthesis (MPS) and whole-body leucine oxidation rates in healthy young adults. **Methods:** Ten recreationally active adults (24 ± 4 y; 5 men, 5 women) performed an acute bout of resistance exercise, followed by the ingestion of SAL or ISO in a crossover fashion. Blood, breath, and muscle biopsies were collected at rest and after exercise during primed continuous infusions of L-[ring-2H₅]phenylalanine and L-[1-13C]leucine. All data are presented as means \pm SD and/or mean differences (95% CIs). **Results:** Postprandial essential amino acid (EAA) concentrations peaked earlier (P = 0.024) in the ISO group than those in the SAL group. Postprandial leucine oxidation rates increased over time (P < 0.001) and peaked earlier in the ISO group (1.239 ± 0.321 nmol/kg/min; 63 ± 25 min) than those in the SAL group (1.230 ± 0.561 nmol/kg/min; 105 ± 20 min; P = 0.003). MPS rates for SAL (0.056 ± 0.022 %/h; P = 0.001) and ISO (0.046 ± 0.025 %/h; P = 0.025) were greater than the basal rates (0.020 ± 0.011 %/h) during the 0- to 5-h recovery period, with no differences between conditions (P = 0.308). **Conclusion:** We showed that the postexercise ingestion of SAL or ISO stimulate postexercise MPS rates with

no differences between the conditions. Thus, our results indicate that ingesting protein from SAL as a whole-food matrix is similarly anabolic to ISO in healthy young adults.

Low- and No-Calorie Sweeteners

Artificially Sweetened Beverages and Health Outcomes: An Umbrella Review

Cristina Diaz, Leandro F M Rezende, Angelo Sabag, Dong Hoon Lee, Gerson Ferrari, Edward L Giovannucci, Juan Pablo Rey-Lopez. *Adv Nutr.* 2023 May 13;S2161-8313(23)00315-0. doi: 10.1016/j.advnut.2023.05.010.

[Article link](#)

Significance: An umbrella review of current evidence concluded that artificially sweetened beverages were linked to higher risk of obesity, Type II diabetes, all-cause mortality, hypertension and cardiovascular disease incidence. More cohort and clinical studies are warranted to better understand impacts on health outcomes.

Background: The consumption of Artificially Sweetened Beverages (ASBs) is increasing in some countries. However, some meta-analyses have found that habitual consumers of ASBs (versus low or no consumption) had an increased risk on some health outcomes. **Objective:** We performed an umbrella review of meta-analyses to grade the credibility of the evidence of claimed observational associations between ASBs and health outcomes. **Methods:** Data was searched in Web of Science, Embase and PubMed for systematic reviews published up to 25 of May 2022, examining association between ASBs and any health outcomes. Certainty of the evidence for each health outcome was obtained based on statistical results of tests used in umbrella reviews. The AMSTAR-2 tool (16 items) was used to identify high-quality systematic reviews. Answers of each item were rated as: Yes, No, or Partial Yes (for a partial adherence to the standard). **Results:** We included data of 11 meta-analyses with unique Population, Exposure, Comparison group, Outcome (PECO) obtained from 7 systematic reviews (51 cohort studies and 4 case-control studies). ASBs were associated with higher risk of obesity, type II diabetes, all-cause mortality, hypertension, and cardiovascular disease incidence (supported by highly suggestive evidence). Evidence for other outcomes (colorectal cancer, pancreatic cancer, gastrointestinal cancer, cancer mortality, cardiovascular mortality, chronic kidney disease, coronary heart disease and stroke) was weak. Results of the quality assessment of systematic reviews using AMSTAR-2 showed some notable deficiencies: unclear sources of funding of eligible studies, lack of pre-defined study protocols to guide authors. **Conclusions:** The consumption of ASBs was associated with a higher risk of obesity, type II diabetes, all-cause mortality, hypertension, and cardiovascular disease incidence. However, further cohort studies and clinical trials in humans are still needed to understand the impact of ASBs on health outcomes.

Cognitive Health

Integrating Nutrient Biomarkers, Cognitive Function, and Structural MRI Data to Build Multivariate Phenotypes of Healthy Aging

Tanveer Talukdar, Christopher E Zwilling, Aron K Barbey. *J Nutr.* 2023 May;153(5):1338-1346. doi: 10.1016/j.tjnut.2023.03.016. [Article link](#)

Significance: This study provides a convergence of multi-disciplinary methods to elucidate how nutrition, cognition and brain health are integrated through lifestyle choices that affect healthy aging.

Background: Research in the emerging field of nutritional cognitive neuroscience demonstrates that many aspects of nutrition-from entire diets to specific nutrients-affect cognitive performance and brain health. **Objectives:** Although previous research has primarily examined the bivariate relationship between nutrition and cognition or nutrition and brain health, this study sought to investigate the joint relationship between these essential and interactive elements of human health. **Methods:** We applied a state-of-the-art data fusion method, coupled matrix tensor factorization, to characterize the joint association between measures of nutrition (52 nutrient biomarkers), cognition (Wechsler Abbreviated Test of Intelligence and Wechsler Memory Scale), and brain health (high-resolution MRI measures of structural brain volume) within a cross-sectional sample of 111 healthy older adults, with an average age of 69.1 y, 62% being female, and an average body mass index of 26.0 kg/m². **Results:** Data fusion uncovered latent factors that capture the joint association between specific nutrient profiles, cognitive measures, and cortical volumes, demonstrating the respects in which these health domains are coupled. A hierarchical cluster analysis further revealed systematic differences between a subset of variables contributing to the underlying latent factors, providing evidence for multivariate phenotypes that represent high

and low levels of performance across multiple health domains. The primary features that distinguish between each phenotype were as follows: 1) nutrient biomarkers for monounsaturated and polyunsaturated fatty acids; 2) cognitive measures of immediate, auditory, and delayed memory; and 3) brain volumes within frontal, temporal, and parietal cortexes. **Conclusions:** By incorporating innovations in nutritional epidemiology (nutrient biomarker analysis), cognitive neuroscience (high-resolution structural brain imaging), and statistics (data fusion), this study provides an interdisciplinary synthesis of methods that elucidate how nutrition, cognition, and brain health are integrated through lifestyle choices that affect healthy aging.

Lipids

Effects of Dietary Fat Type and Emulsification on Carotenoid Absorption: A Randomized Crossover Trial

Yuanhang Yao, Zimin Yang, Baoer Yin, Hongyi Manfred Goh, Darel Wee Kiat Toh, Jung Eun Kim. *Am J Clin Nutr.* 2023 May;117(5):1017-1025. doi: 10.1016/j.ajcnut.2023.03.011. [Article link](#)

Significance: Type and emulsification of dietary fat are important for carotenoid absorption. This insight is useful in the design of excipient emulsions for better absorption of fat-soluble compounds.

Background: Although emerging evidence has suggested that the absorption and emulsification of dietary fat may be important to carotenoid absorption, these effects have not yet been validated in a human trial. Objectives: This study aimed to examine the effects of dietary fat type and emulsification on the bioaccessibility and bioavailability of carotenoids from a carotenoid-rich salad. **Methods:** An identical salad was used for the in vitro and the human trial. This was paired with 28 g of one of the following 4 different fats: 1) nonemulsified olive oil, 2) emulsified olive oil, 3) nonemulsified coconut oil, and 4) emulsified coconut oil. The bioaccessibility of total carotenoids (TCs) was assessed by a simulated in vitro digestion model. Sixteen subjects consumed salad with 4 test fats in random order, and plasma triglyceride and carotenoid (lutein, zeaxanthin, α -carotene, β -carotene, and lycopene) concentrations were determined hourly for 10 h following the consumption. The absorption of TC and individual carotenoids was evaluated by the positive incremental AUC (iAUC) of plasma carotenoid concentrations. **Results:** The bioaccessibility of TC was greater with olive oil (24.0%) than with coconut oil (14.9%), and with the oil being emulsified (23.5%) rather than that being nonemulsified (15.4%). Similarly, the positive iAUC_{1-10h} of TC, α -carotene, and lycopene were 55.2%, 110.8%, and 45.8%, respectively, higher with olive oil than with coconut oil. Emulsified fat induced 40.0% greater positive iAUC_{1-10h} of TC than nonemulsified fat. **Conclusions:** The type and emulsification of dietary fat are both essential to carotenoid absorption. Findings from this study may provide scientific support for designing excipient emulsions as potential dietary strategies to optimize the absorption of fat-soluble compounds.

Sodium

Perspective: Challenges and Strategies to Reduce the Sodium Content of Foods by the Food Service Industry

Paula R Trumbo, Katie M Kirkpatrick, Jennifer Roberts, Pam Smith, Patricia Zecca. *Adv Nutr.* 2023 May 4;S2161-8313(23)00298-3. doi: 10.1016/j.advnut.2023.04.013. [Article link](#)

Significance: This report highlights the challenges and current strategies used in the food service industry to reduce dietary salt /sodium in foods prepared and consumed away from home. Because of the widespread consumption of FAFH, implementation of suggested reduction strategies may further impact on sodium reduction in the American diet.



This paper was supported by [IAFNS Sodium Health Committee](#).

Most Americans have dietary sodium intakes that exceed the recommended limits, which is a risk factor for hypertension and CVD. The share of total food expenditures for foods prepared and consumed away from home (FAFH) is 55%. These foods are consumed at various venues, including restaurants, workplaces, schools and universities, military installations, and assisted living/long-term care facilities. The food service industry has dealt with and continues to deal with various challenges in its attempt to reduce the sodium content in the foods that they prepare and sell. Despite these challenges, there have been various successful strategies used to reduce the sodium content in FAFH. This perspective article provides an overview of the challenges and strategies that have been used by the food service industry to reduce sodium in FAFH, as well as future sodium reduction strategies. Because of the widespread consumption of FAFH, implementing such future strategies could have a profound impact on the sodium content of the American diet.

Gut Microbiome

Modulating the Early-Life Gut Microbiota Using Pro-, Pre-, and Synbiotics to Improve Gut Health, Child Development and Growth

Benjamin Momo Kadia, Mary Iwaret Otiti, Anouschka S Ramsteijn, Doudou Sow, Babacar Faye, Claire Heffernan, Lindsay J Hall, et. al. *Nutr Rev.* 2023 May 11;nuado50. doi: 10.1093/nutrit/nuado50. [Article link](#)

Significance: Dietary supplementation in children with pro-, pre-, or synbiotics is a safe and pragmatic approach to build gut microbiota resilience against adverse environmental factors and prevent future environmental enteric dysfunction.

In children exposed to poor hygiene and sanitation, invasion of the gut by pathogenic microbes can result in a subclinical enteropathy termed “environmental enteric dysfunction” (EED) that contributes to undernutrition, growth faltering, and impaired organ development. EED may already be present by age 6-12 weeks; therefore, interventions that can be started early in life, and used alongside breastfeeding, are needed to prevent or ameliorate EED. A healthy gut microbiota is critical for intestinal development and repair, nutrient digestion and absorption, and resisting colonization or overgrowth by pathogens. However, its development can be impaired by several environmental factors. Dietary supplementation with pro-, pre-, or synbiotics may be a pragmatic and safe means of building the resilience of the developing gut microbiota against adverse environmental factors, thereby preventing EED.

Emerging Science Areas

Emerging Science Area: Nutrition

Leisure-Time Physical Activity and Mortality from Influenza and Pneumonia: A Cohort Study of 577 909 US Adults

Bryant J Webber, Heather C Yun, Geoffrey P Whitfield, Webber BJ, et al. *Br J Sports Med* 2023;0:1–8. doi:10.1136/bjsports-2022-106644. [Article Link.](#)

Significance: In a large US adult cohort followed over 9 years, anaerobic exercise even at below weekly recommended level may be associated with reduced influenza and pneumonia mortality, and a J-shaped muscle-strengthening activity relationship.

Objective: To examine the association of leisure-time physical activity with mortality from influenza and pneumonia. **Methods:** A nationally representative sample of US adults (aged ≥ 18 years) who participated in the National Health Interview Survey from 1998 to 2018 were followed for mortality through 2019. Participants were classified as meeting both physical activity guidelines if they reported ≥ 150 min/week of moderate-intensity equivalent aerobic physical activity and ≥ 2 episodes/week of muscle-strengthening activity. Participants were also classified into five volume-based categories of self-reported aerobic and muscle-strengthening activity. Influenza and pneumonia mortality was defined as having an underlying cause of death with an International Classification of Diseases, 10th Revision code of J09–J18 recorded in the National Death Index. Mortality risk was assessed using Cox proportional hazards, adjusting for sociodemographic and lifestyle factors, health conditions and influenza and pneumococcal vaccination status. Data were analyzed in 2022. **Results:** Among 577 909 participants followed for a median of 9.23 years, 1516 influenza and pneumonia deaths were recorded. Compared with participants meeting neither guideline, those meeting both guidelines had 48% lower adjusted risk of influenza and pneumonia mortality. Relative to no aerobic activity, 10–149, 150–300, 301–600 and >600 min/week were associated with lower risk (by 21%, 41%, 50% and 41%). Relative to <2 episodes/week of muscle-strengthening activity, 2 episodes/week was associated with 47% lower risk and ≥ 7 episodes/week with 41% higher risk. **Conclusions:** Aerobic physical activity, even at quantities below the recommended level, may be associated with lower influenza and pneumonia mortality while muscle-strengthening activity demonstrated a J-shaped relationship.

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IAFNS 2023 Annual Summer Science Symposium

June 13 – June 14, 2023, at the National Press Club, Washington, DC.

A gathering of scientific and regulatory experts to address food and nutrition science, FDA perspectives, artificial intelligence, food packaging innovation, bioactives, food classification systems, science communications and more.

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The Science and Implementation of the Low FODMAP Diet

July 12, 2023, Washington DC, Virtual

This webinar will delve into the 3 phases of the FODMAP diet, provide helpful hints for success, grocery shopping tips and also particular nutrients that may be of concern with long-term implementation.

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What's In Food? How USDA's FoodData Central and the Global Branded Food Products Database Supports Nutrition Research

August 30, 2023, Virtual Event

The USDA Global Branded Food Products Database (GBFPD) is a component of USDA's FoodData Central and the result of a Public-Private Partnership between USDA, IAFNS, GS1 US, 1WorldSync, NielsenIQ Label Insight and the University of Maryland.

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