November 2022

Nutrition Briefs

IAFNS Science Innovation Showcase - 2022

Virtual Event, December 13–15, 2021

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Diet Patterns

A Low-Energy-Dense Dietary Pattern: A Narrative Review

Kaelyn F Burns, Shannon M Robson, Hollie A Raynor. *Nutr Rev*. 2022 Nov 7;80(12):2301-2311. doi: 10.1093/nutrit/nuac037. **Article link**

Significance: A narrative review of eight articles found both energy density classification and food component modification approaches were used successfully to lower energy density. However, only the classification method allowed participants to establish specific behavioral goals to achieve dietary energy density.

Background: Dietary recommendations have promoted the consumption of a low-energy-dense dietary pattern; however, guidelines to implement this dietary pattern are lacking. **Objectives:** The objectives of this narrative review are to discuss approaches used to implement a low-energy-dense dietary pattern within dietary interventions and to understand if these approaches achieve a lower energy-dense diet. **Methods**: Interventions that modified the diet for the purpose of altering energy density were referenced. Articles were chosen on the basis of the authors' knowledge of the energy density literature, reviewing relevant articles' reference lists, and discussion among coauthors. **Results:** Eight articles were chosen for this review. Two approaches have been used to alter energy density: 1) modification to the consumption of dietary components that influence energy density (e.g., reducing fat, increasing fruits and vegetables) or 2) use of an energy density classification method based on the numeric energy density value of foods. Although both approaches were used successfully to lower energy density, only the approach that used an energy density classification method allowed for the establishment of specific behavioral goals for participants to achieve regarding energy density. **Conclusion:** The use of an energy density classification method to develop specific intake goals may aid in the behavioral implementation of a low-energy-dense dietary pattern, but more high-quality studies are needed to draw stronger conclusions. Furthermore, barriers to consuming a low-energy-dense dietary pattern,

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such as dietary costs, need to be considered.

Carbohydrates

The Role of Dietary Sugars, Overweight and Obesity in Type 2 Diabetes Mellitus: A Narrative Review

Meike Veit, Renske van Asten, Andries Olie, Philip Prinz. *Eur J Clin Nutr*. 2022 Nov;76(11):1497-1501. doi: 10.1038/s41430-022-01114-5. **Article link**

Significance: A narrative review of systematic review and meta-analysis studies concluded that the major risk factor for Type 2 diabetes is overweight, and obesity resulting from increased energy intake and reduced physical activity. Any effect of dietary sugar or sugar-sweetened beverage to Type 2 diabetes might be linked to excess energy intake.

Nowadays, there is still a popular belief that dietary sugars, in particular sucrose, are directly linked to the development of type 2 diabetes mellitus (T2DM). Furthermore, since insulin action is impaired in T2DM, it is still believed that excluding dietary sugars from the diet can adequately treat T2DM. This might be based on the assumption that dietary sugars have a stronger impact on blood glucose levels than other carbohydrates. Therefore, the aim of this review is to discuss the effects of dietary sugars intake, including sugar-sweetened beverages (SSBs) against the background of overall energy intake and weight gain in the development of T2DM. Furthermore, the effect of dietary sugars, including SSBs on glycemic control will be discussed. Results from various systematic reviews and meta-analyses do not support the idea that the intake of sucrose and other dietary sugars is linked to T2DM. Long-chain or complex carbohydrates can have a greater impact on postprandial glycemic response than sucrose. SSBs do not affect glycemic control if substituted for other calorie sources. Current scientific evidence clearly points toward excess energy intake followed by excess body fat gain being most relevant in the development of T2DM.

Protein

The Acute Effects of Insect vs. Beef-Derived Protein on Postprandial Plasma Aminoacidemia, Appetite Hormones, Appetite Sensations and Energy Intake in Healthy Young Men

Jiaying Dai, Jamie Lov, Patrick W Martin-Arrowsmith, Ari Gritsas, Tyler A Churchward-Venne. *Eur J Clin Nutr*. 2022 Nov;76(11):1548-1556. doi: 10.1038/s41430-022-01157-8. **Article link**

Significance: Acute intake of cricket and beef-derived protein led to differences in postprandial plasma amino acid levels, but similar effects on appetite hormones and sensations in a study of 20 young males.

Background/Objectives: The purpose of this study was to evaluate the acute effects of ingesting beef- and insect-derived protein on postprandial plasma amino acid and appetite hormone concentrations, appetite sensations, and ad libitum energy intake. **Subjects/Methods**: In a randomized, double-blind, crossover study, 20 young men (23 (SD: 4) y) completed two trials during which arterialized blood samples and VAS questionnaires were collected at baseline, and over 300-min after ingestion of beverages with similar energy and macronutrient content containing 25 g beef- or insect-derived (cricket) protein. Blood samples were analyzed for plasma amino acid and appetite hormone concentrations, while VAS questionnaires were applied to assess appetite sensations. After each trial, an ad libitum meal was immediately provided to assess energy intake. **Results**: Adjusted mean postprandial incremental area under the curve (iAUC) was greater for cricket vs. beef-derived protein for plasma leucine, branched-chain amino acid, and essential amino acid concentrations (all P < 0.0001). Adjusted mean postprandial iAUC for hunger was lower following beef (-3030 (SE: 860)) vs. cricket-derived (-1197 (SE: 525)) protein (Difference: -1833 (95% CI: -3358, -308); P = 0.02), but was not different for other appetite sensations or appetite hormones (all P > 0.05). Adjusted mean ad libitum energy intake was 4072 (SE: 292) and 4408 (SE: 316) kJ following beef- and cricket-derived protein (Difference: -336 (95% CI: -992, 320); P = 0.30). **Conclusion:** Acute ingestion of cricket and beef-derived protein leads to differences in postprandial plasma amino acid concentrations, but elicits similar effects on appetite hormones, appetite sensations, and ad libitum energy intake in young men.

Low- and No-Calorie Sweeteners

Consumption of Low-Calorie Sweetened Drinks is Associated with 'Sweet Satiation', but not with 'Sweet-Taste Confusion': A Virtual Study

Angelica M Monge, Danielle Ferriday, Simon Heckenmueller, Jeffrey M Brunstrom, Peter J Rogers. *Appetite*. 2022 Nov 1;178:106273. doi: 10.1016/j.appet.2022.106273. **Article link**

Significance: Results from a virtual study of young adults showed inconsistency in the predictions of the taste-confusion hypothesis for low-calorie sweetened drinks but showed a 'sweet satiation' effect.

Originating from studies on rats, the 'taste confusion' hypothesis predicts that exposure to low-calorie sweeteners (LCS) will impair compensatory responses to sugar intake, resulting in increased overall calorie intake. We conducted a virtual study in which young adult human participants (n = 332), who differed in their history of exposure to sweet drinks (e.g., drank 'diet' (LCS) soft drinks or 'regular' (sugar-sweetened) soft drinks), imagined consuming a cheese sandwich and two-thirds of a 500 ml drink (still water, sparkling water, diet Coca Cola, regular Coca Cola, or semi-skimmed milk), or no drink, as a hypothetical lunch-time meal. They then used a screen-based tool to select the amount of a sweet snack (chocolate M&M's) or savoury snack (salted peanuts) that they would eat immediately with the remaining third of their drink (i.e., a total of 12 drink and snack combinations per participant). The results were inconsistent with the predictions of the taste confusion hypothesis; specifically, the extent to which consumption of sugar cola compared with water (still or sparkling) reduced snack intake did not differ between habitual diet (LCS) and habitual sugar soft-drink consumers. Other results showed a 'sweet satiation' effect (i.e., lower sweet versus savoury snack intake when the drink accompanying the meal was sweet compared with when it was water), and negligible compensation in snack food intake for the difference in the energy content of diet versus sugar cola.

Cognitive Health

Association of Dietary Intake of Flavonols with Changes in Global Cognition and Several Cognitive Abilities

Thomas Monroe Holland, Puja Agarwal, Yamin Wang, Klodian Dhana, Sue E Leurgans, Kyla Shea, Sarah L Booth et. al. *Neurology*. 2022 Nov 22;10.1212/WNL.0000000000201541. **Article link**

Significance: Higher dietary intakes of total flavonols and flavonol constituents were linked to slower rates of decline in global cognition and other cognitive domains according to a 6.9-year follow-up prospective study of older adults.

Background and Objective: Previous research has examined the association between cognition and flavonoids: bioactives found in foods, known to possess anti-inflammatory and antioxidant properties. We extend this research by investigating associations of dietary intakes of total flavonols and constituents (kaempferol, quercetin, myricetin, isorhamnetin) on the change in cognitive performance in global cognition, episodic memory, semantic memory, visuospatial ability, perceptual speed, and working memory. **Methods**: The study was conducted using 961 participants (60-100 years) of the Rush Memory and Aging Project, a prospective cohort of community-dwelling Chicagoans who were followed for an average of 6.9 years. Diet was assessed using a validated semi-quantitative food frequency questionnaire. Cognitive performance was assessed annually with a battery of 19 standardized tests. Flavonol intake was analyzed as a continuous variable using linear mixed effects models. Cognitive domain scores were regressed on baseline calorie-adjusted flavonol variables. **Results**: Higher dietary intake of total flavonols and flavonol constituents were associated with a slower rate of decline in global cognition and multiple cognitive domains. In continuous models adjusted for age, sex, education, APOE-4, late life cognitive activity, physical activity, and smoking, total flavonol intake was associated with slower decline in global cognition β estimate=0.004 (95% CI=0.001, 0.006), episodic memory β=0.004 (95% CI: 0.002, 0.006), semantic memory β=0.003 (95% CI: 0.001, 0.007), perceptual speed β=0.003 (95% CI: 0.001, 0.004), and working memory β=0.003 (95% CI: 0.001, 0.005) and marginally associated with visuospatial ability β=0.001 (95% CI: -0.001, 0.003). Analyses of individual flavonol constituents demonstrated that intakes of kaempferol and quercetin were associated with slower global cognitive decline [β=0.01 (95% CI: 0.006, 0.02) and β=0.004 (95% CI: 0.0005, 0.007)], respectively. Myricetin and isorhamnetin were not associated with global cognition. **Conclusion**: Results suggest dietary intakes of total flavonols and several flavonol constituents may be associated with slower decline in global cognition and multiple cognitive abilities with older age.

Lipids

Effect of Honey on Cardiometabolic Risk Factors: A Systematic Review and Meta-Analysis

Amna Ahmed, Zujaja Tul-Noor, Danielle Lee, Shamaila Bajwah, Zara Ahmed, Shanza Zafar, Maliha Syeda et. al. *Nutr Rev*. 2022 Nov 16;nuac086. doi: 10.1093/nutrit/nuac086. **Article link**

Significance: The effect of honey on cardiometabolic risk factors was assessed by systematic review and meta-analysis of controlled trials. The review found honey from robinia and clover, and unprocessed raw honey may play a role in improving glycemic control and lipid levels when used in a healthy dietary pattern.

Context: Excess calories from free sugars are implicated in the epidemics of obesity and type 2 diabetes. Honey is a free sugar but is generally regarded as healthy. **Objective:** The effect of honey on cardiometabolic risk factors was assessed via a systematic review and meta-analysis of controlled trials using the GRADE (Grading of Recommendations, Assessment, Development, and Evaluation) approach. **Data Sources**: MEDLINE, Embase, and the Cochrane Library databases were searched up to January 4, 2021, for controlled trials ≥1 week in duration that assessed the effect of oral honey intake on adiposity, glycemic control, lipids, blood pressure, uric acid, inflammatory markers, and markers of nonalcoholic fatty liver disease. Data Extraction: Independent reviewers extracted data and assessed risk of bias. Data were pooled using the inverse variance method and expressed as mean differences (MDs) with 95%CIs. Certainty of evidence was assessed using GRADE. **Data Analysis:** A total of 18 controlled trials (33 trial comparisons, N = 1105 participants) were included. Overall, honey reduced fasting glucose (MD = -0.20 mmol/L, 95%CI, -0.37 to -0.04 mmol/L; low certainty of evidence), total cholesterol (MD = -0.18 mmol/L, 95%CI, -0.33 to -0.04 mmol/L; low certainty), low-density lipoprotein cholesterol (MD = -0.16 mmol/L, 95%CI, -0.30 to -0.02 mmol/L; low certainty), fasting triglycerides (MD = -0.13 mmol/L, 95%CI, -0.20 to -0.07 mmol/L; low certainty), and alanine aminotransferase (MD = -9.75 U/L, 95%CI, -18.29 to -1.21 U/L; low certainty) and increased high-density lipoprotein cholesterol (MD = 0.07 mmol/L, 95%CI, 0.04-0.10 mmol/L; high certainty). There were significant subgroup differences by floral source and by honey processing, with robinia honey, clover honey, and raw honey showing beneficial effects on fasting glucose and total cholesterol. **Conclusion:** Honey, especially robinia, clover, and unprocessed raw honey, may improve glycemic control and lipid levels when consumed within a healthy dietary pattern. More studies focusing on the floral source and the processing of honey are required to increase certainty of the evidence.

Sodium

How to Decide the Iodine Content in Salt for a Country-China as an Example

Lijun Fan, Yang Du, Fangang Meng, Lixiang Liu, Ming Li, Peng Liu, Dianjun Sun. *Nutrients*. 2022 Nov 1;14(21):4606. doi: 10.3390/nu14214606. **Article link**

Significance: A process in China to establish iodine fortification in salt led to the recommendation of an iodine content preset at 20, 25 and 30 milligrams per kilogram for the general population. The advice was 30 and 35 mg/kg for pregnant women. During manufacturing, sodium is sprayed with iodine.

Globally, many countries have implemented universal salt iodization to prevent and control iodine deficiency disorders. Therefore, it is important to determine the optimal iodine content in salt and to adjust it in a timely manner. This article aims to establish a process for selecting, deciding, and evaluating the iodine content in salt for China and, if possible, providing references for other countries. Information on salt intake, water iodine, and iodine stability in salt was collected. A field investigation was carried out in different populations in four provinces. Iodine intake was calculated and the appropriate iodine content for salt preliminarily obtained, then verified for suitability with 2020 China National Iodine Deficiency Disorders Surveillance data. In total, 2837 children, 1660 adults, and 2145 pregnant women were enrolled, and their iodine intake from food was 3.7-96.1, 60.0-156.0 and 65.0-112.0 μg/d, respectively. After calculation, when the iodine content in salt was 20, 25 and 30 mg/kg, for children and adults, the total iodine intake ranged from 173.4 to 253.5 μg/d and 230.3 to 379.8 μg/d, respectively. When the iodine content in salt was 30 and 35 mg/kg, for pregnant women, the total iodine intake was 296.8-408.9 μg/d, which was between the recommended nutrient intake and tolerable upper intake level. Therefore, in China, the iodine content in salt in the general population can be preset as 20, 25 and 30 mg/kg, and that in pregnant women 30 and 35 mg/kg, with a variation of ±5 mg/kg based on the automatic spraying technique used in the salt processing plant. Iodine nutritional status was then evaluated according to the preset iodine content in the salt, and it reached the appropriate level for the different populations. The iodine content in salt in China was decided and verified, and the procedure of selecting the iodine content in salt was established for the reference of different countries.

Gut Microbiome

Artificial Intelligence in Food Science and Nutrition: A Narrative Review

Taiki Miyazawa, Yoichi Hiratsuka, Masako Toda, Nozomu Hatakeyama, Hitoshi Ozawa, Chizumi Abe, Ting-Yu Cheng, et. al. *Nutr Rev*. 2022 Nov 7;80(12):2288-2300. doi: 10.1093/nutrit/nuac033. **Article link**

Significance: A narrative review of how Artificial Intelligence advances made in the bioengineering and biomedical fields have led to technological advances in the food, nutrition and agricultural sciences. Applications include immunity-boosting foods, dietary assessment, gut microbiome profile analysis and toxicity prediction of food ingredients.

In the late 2010s, artificial intelligence (AI) technologies became complementary to the research areas of food science and nutrition. This review aims to summarize these technological advances by systematically describing the following: the use of AI in other fields (e.g., engineering, pharmacy, and medicine); the history of AI in relation to food science and nutrition; the AI technologies currently used in the agricultural and food industries; and some of the important applications of AI in areas such as immunity-boosting foods, dietary assessment, gut microbiome profile analysis, and toxicity prediction of food ingredients. These applications are likely to be in great demand in the near future. This review can provide a starting point for brainstorming and for generating new AI applications in food science and nutrition that have yet to be imagined.

Emerging Science Areas

Emerging Areas: Nutrition

Position of the Society for Nutrition Education and Behavior: Nutrition Educator Competencies for Promoting Healthy Individuals, Communities, and Food Systems: Rationale and Application

Sarah Ash, Isobel Contento, Melissa D.Olfert, Pamela A.Koch. *Journal of Nutrition Education and Behavior*. 11 November 2022. https://doi.org/10.1016/j.jneb.2022.07.010. **Article link**

Significance: A new position of the Society for Nutrition Education and Behavior recommends that nutrition educators meet six content competencies and four process competencies to reflect the changing breadth of the nutrition educational field. These recommendations can be applied when planning institutional education programs, curricula and policies.

The position of the Society for Nutrition Education and Behavior that to improve the health of individuals, communities, and food systems, it is essential that nutrition educators meet each of 6 content competencies (basic food and nutrition knowledge, nutrition across the life cycle, food science, physical activity, food and nutrition policy, and agricultural production and food systems) and 4 process competencies (behavior and education theory; nutrition education program design, implementation and evaluation; written, oral, and social media communication; and nutrition education research methods). These competencies reflect the breadth of the nutrition education field and are grounded in peer-reviewed research. The rationale and evidence base for these competencies are presented. They are designed for educational institutions to plan curricula and programs; public, private, and nonprofit organizations for training; individuals for professional development; and policymakers and advocates to inform strong, comprehensive nutrition education policy.

Engage with IAFNS

Can Diet Impact the Gut Microbiome to Support a "Healthy" Immune Response? What We Know Today
January 11, 2023
Virtual Event

- Join IAFNS as Dr Philip Calder, Head of the School of Human Development and Health, and Professor of Nutritional Immunology at the University of Southampton, provides an overview of the knowns and unknowns related to how diet can support a "healthy" immune response, considering nutritional modulation of the gut microbiome.

  Register **here.**

Logical Fallacies in the Food and Nutrition Conversation: How to Spot Them & Diffuse Them
January 18, 2023
Virtual, Event

- Join us! This Food for Thought webinar will explore logical fallacies and how when those fallacies are applied to food and beverage decisions, misinformation may result. Join us for a dialogue on Logical Fallacies in the Food and Nutrition Conversation: How to Spot Them & Diffuse Them.

  Register **here.**