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## Dietary Patterns

### Adherence to the Mediterranean Diet in Children and Adolescents and Association with Multiple Outcomes: An Umbrella Review

Alice Masini, Laura Dallolio, Francesco Sanmarchi, Francesco Lovecchio, Mario Falato, Yari Longobucco, Marcello Lanari, et al. *Healthcare (Basel)*. 2024 Feb 9;12(4):449. doi: 10.3390/healthcare12040449. [Article link](#)

The Mediterranean Diet (MD) has been linked to numerous health benefits. This umbrella review aims to synthesize evidence from systematic reviews on the MD's impact on children and adolescents aged 6 to 19 years. Following Joanna Briggs Institute guidelines, we included 11 systematic reviews focusing on the MD's effects on health outcomes, such as asthma, anthropometric measures, physical fitness, and inflammatory markers. The results indicate a protective role of the MD against childhood asthma due to its antioxidant-rich components. However, evidence for its impact on allergic conditions like rhinitis and eczema is inconclusive. Findings regarding anthropometric outcomes, particularly BMI, are limited and inconsistent. A positive correlation was observed between MD adherence and increased physical activity, improved physical fitness, quality of life, and reduced sedentary behavior. Additionally, the MD showed an inverse relationship with pro-inflammatory biomarkers, suggesting anti-inflammatory benefits. The inconsistency in BMI findings and the potential anti-inflammatory properties of the MD warrant further longitudinal research. Future studies should explore the MD's impact on cognitive functions, academic performance, and mental health in this age group, highlighting the significance of establishing healthy eating habits early in life.

### Infants' Dietary Pattern Characterized by Ultraprocessed Foods is Associated with Rapid Weight Gain and Overweight/Obesity Risk: National Health and Nutrition Examination Survey 2009-2018

Daniela Neri, Eurídice Martínez Steele, Fernanda Rauber, Caroline dos Santos Costa, Maria Helena D'Aquino Benicio, Renata Bertazzi Levy. February 05, 2024. *Jrnl of Academy of Nutr and Dietetics*. <https://doi.org/10.1016/j.jand.2024.02.003>. [Article link](#)

Background: Global trends toward childhood obesity have been associated with several factors, including suboptimal infant feeding practices, the increasing availability of ultraprocessed foods in the world's food supply, and the corresponding changes in children's dietary patterns. Objective: To describe infants' dietary patterns and assess their associations with weight status outcomes in a nationally representative sample of US infants. Design: Cross-sectional analyses were performed on data collected from infants participating in the 2009-2018 National Health and Nutrition Examination Survey. Participants/Setting: Participants included 744 infants aged 6 to 12 months who had data from at least 1 day of valid 24-hour dietary recall data. Main Outcome Measures: Rapid weight gain and overweight/obesity risk. Statistical Analyses Performed: Principal component analysis was used to identify dietary patterns considering the energy intake of 39 Nova food subgroups (expressed in calories per day), including breast milk. Associations were evaluated using logistic regression adjusted for potential confounders. Results: A total of 42% infants experienced rapid weight gain, and 33% were at risk of overweight/obesity. Most infants (65.5%) were started on solid foods early. Three main dietary patterns were derived. The first pattern, labeled Natural or Minimally Processed Foods, had positive loadings for a variety of natural or minimally processed foods, some processed culinary ingredients, and a few processed and ultraprocessed foods. The second pattern, labeled Infant Formula, had high negative loading for breast milk, and high positive loading for infant formula and breakfast cereal. The third pattern, labeled Ultraprocessed Foods, had negative loadings for natural or minimally processed foods and processed culinary ingredients, positive loadings for other processed foods and for a variety of ultraprocessed foods, and negative loading for infant formula. Infants who adhere to the Ultraprocessed Foods dietary pattern were more likely to present rapid weight gain (adjusted odds ratio 1.3, 95% CI 1.1 to 1.5) and overweight/obesity risk (adjusted odds ratio 1.2, 95% CI 1.0 to 1.4). Conclusions: Higher adherence to a dietary pattern characterized by ultraprocessed foods was associated with a greater likelihood of both rapid weight gain and overweight/obesity risk early in life. Promoting breastfeeding and increasing consumption of unprocessed/minimally processed foods during early infancy while restricting ultraprocessed foods are key components to reducing the growing burden of childhood obesity.

## Carbohydrates

### Restricted Carbohydrate Diets below 45% Energy are not Associated with Risk of Mortality in the National Health and Nutrition Examination Survey, 1999–2018

Austin Angelotti, Corina Kowalski, LuAnn K. Johnson, Martha A. Belury, Zach Conrad. *Frontiers in Nutrition*. 05 February, 2024. <https://doi.org/10.3389/fnut.2024.1225674>. [Article link](#)



This work was supported by IAFNS' [Carbohydrates](#) and [Lipids](#) Committees.

Introduction: Cardiometabolic diseases (CMD) are the leading causes of death for people living in the United States. Dietary strategies, such as restricting carbohydrate intake, are becoming popular strategies for improving health status. However, there is limited and often contradictory evidence on whether restricting carbohydrate intake is related to all-cause, CMD, or cardiovascular disease (CVD) mortality. Methods: The objective of the present study was to evaluate the association between restricted carbohydrate diets (<45%en) and mortality from all-causes, CMD, and CVD, stratified by fat amount and class.

Data were acquired using the National Health and Nutrition Examination Survey (1999–2018) linked with mortality follow-up until December 31, 2019 from the Public-use Linked Mortality Files. Multivariable survey-weighted Cox proportional hazards models estimated hazard ratios for 7,958 adults ( $\geq 20$  y) that consumed <45% en from carbohydrates and 27,930 adults that consumed 45–65% en from carbohydrates. Results: During the study period a total of 3,780 deaths occurred, including 1,048 from CMD and 1,007 from CVD, during a mean follow-up of 10.2y. Compared to individuals that met carbohydrate recommendations.

### Physiologic Effects of Isolated or Synthetic Dietary Fiber in Children: A Scoping Review

Linfei Chen, Esther A Avendano, Angelica Valdes-Valderrama, Kara A Staffier, Nicola M McKeown, Nanguneri Nirmala. *Current Dev in Nutr.* Feb. 2024. <https://doi.org/10.1016/j.cdnut.2023.102074>. [Article link](#)



This work was supported by IAFNS' [Carbohydrates Committee](#).

**Background:** Fiber is an integral part of a healthy diet. Studies have shown that the fiber intake in children is below adequate amounts, leading to adverse health outcomes. **Objectives:** This study aimed to perform a scoping review to assess the available evidence for the impact of isolated and synthetic dietary fiber on children's health outcomes. **Methods:** A systematic literature search was conducted in Ovid Medline, Ovid Global Health, Embase, and Cochrane Library via Wiley to identify randomized controlled trials (RCTs) in healthy children aged 1–18 y at baseline who consumed added, isolated, or synthetic dietary fiber. The outcomes of interest were categorized based on the Food and Drug Administration's guidance for industry on nondigestible carbohydrates and the Vahouny Fiber Symposium criteria, which included reduced fasting blood glucose, total and/or LDL cholesterol concentrations, attenuation of postprandial glycemia/insulinemia, increased fecal bulk/laxation, reduced transit time, weight loss/reduction in adiposity, reduced energy intake from food consumption, increased satiety, bone health/enhanced mineral absorption, and blood pressure. We also cataloged additional reported outcomes. **Results:** Of 3837 randomized controlled parallel or crossover trials screened at the abstract level, 160 were eligible for full-text review, and 32 included for data extraction. This scoping review presents analysis of data from 32 RCTs in children who were healthy, overweight/obese or had mild hypercholesterolemia. Inulin-type fructans (41%) and psyllium (22%) were the most frequently administered fiber types, with weight/adiposity, markers of lipid metabolism (41%), and bone-related markers (38%) being the most frequently reported health outcomes. Only a few RCTs have investigated the effects of laxation (9%), and none specifically studied the impact of fiber on reducing postprandial glycemia/insulinemia. **Conclusions:** This scoping review demonstrates sufficient evidence for conducting systematic reviews and meta-analyses for several outcomes. Evidence gaps remain on the impact of isolated fibers on outcomes such as laxation, colonic transit time, and postprandial glycemia/insulinemia in children. Database providing information on randomized clinical trials on added fibers: <https://iafns.org/our-work/research-tools-open-data/dietary-fiber-database/>

## Protein

### Nutrition as the Foundation for Successful Aging: A Focus on Dietary Protein and Omega-3 Polyunsaturated Fatty Acids

Aubree L Hawley, Jamie I Baum. *Nutr Rev.* 2024 Feb 12;82(3):389-406. doi: 10.1093/nutrit/nuad061. [Article link](#)

Skeletal muscle plays a critical role throughout the aging process. People living with sarcopenia, a progressive and generalized loss of skeletal muscle mass and function, often experience diminished quality of life, which can be attributed to a long period of decline and disability. Therefore, it is important to identify modifiable factors that preserve skeletal muscle and promote successful aging (SA). In this review, SA was defined as (1) low cardiometabolic risk, (2) preservation of physical function, and (3) positive state of wellbeing, with nutrition as an integral component. Several studies identify nutrition, specifically high-quality protein (eg, containing all essential amino acids), and long-chain omega-3 polyunsaturated fatty acids (n-3 PUFAs), eicosapentaenoic acid (EPA), and docosahexaenoic acid (DHA), as positive regulators of SA. Recently, an additive anabolic effect of protein and n-3 PUFAs has been identified in skeletal muscle of older adults. The key mechanism(s) behind the enhanced effects of intake of protein and n-3 PUFAs needs to be defined. The first objective of this review is to evaluate skeletal muscle as a driver of cardiometabolic health, physical function, and wellbeing to promote SA. The second objective is to examine observational and interventional evidence of protein and n-3 PUFAs on skeletal muscle to promote SA. The final objective is to propose mechanisms by which combined optimal intake of high-quality protein and n-3 PUFAs likely play a key role in SA. Current evidence suggests that increased intake of protein above the RDA and n-3 PUFAs above the Dietary Guidelines for Americans recommendations for late middle-aged and older adults is required to maintain skeletal muscle mass and to promote SA, potentially through the mechanistical target of rapamycin complex 1 (mTORC1).

## Low- and No-Calorie Sweeteners

### Substitution of Sugar-Sweetened Beverages with Non-Caloric Alternatives and Weight Change: A Systematic Review of Randomized Trials and Meta-Analysis

Philip A-S Tobiassen, Rasmus Køster-Rasmussen. *Obes Rev.* 2024 Feb;25(2):e13652. doi: 10.1111/obr.13652. [Article link](#)

**Background:** Intake of sugar-sweetened beverages has been associated with weight gain. It is uncertain if replacing an existing use of sugar-sweetened beverages with non-caloric beverages results in long-term reduction in body weight. **Objective:** The objective of this study is to explore if a long-term reduction in body weight can be achieved by replacing an existing intake of sugar-sweetened beverages with non-caloric beverages. **Methods:** Systematic review and meta-analysis of randomized clinical trials in accordance with PRISMA guidelines. PubMed and EMBASE were searched for literature. Studies with a "substitution" design were included, that is, studies where subjects substituted an existing intake of sugar-sweetened beverages with either artificially sweetened beverages or unsweetened beverages/water. Studies with 6 months or longer follow-up of weight change were included. **Results:** Six trials with a total of 1729 participants were included in the meta-analysis. Replacing an existing intake of sugar-sweetened beverages with a non-caloric beverage resulted in a long-term BMI reduction of 0.31 kg/m<sup>2</sup> compared with the sugar-sweetened beverage-group (95% CI; 0.17-0.44). One study with 1 year's intervention and 2 years follow-up showed a regression towards baseline BMI after the intervention had ended. **Conclusion:** Replacing an existing use of sugar-sweetened beverages with artificially sweetened beverages or unsweetened beverages resulted in a long-term 0.31 kg/m<sup>2</sup> reduction in BMI equivalent to 0.5-1 kg in children and adults, respectively, as long as the interventions lasted.

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## Cognitive Health

### Dietary Fat, Telomere Length and Cognitive Function: Unravelling the Complex Relations

Hamza Mostafa, Laia Gutierrez-Tordera, Javier Mateu-Fabregat, Christopher Papandreou, Mònica Bulló. *Curr Opin Lipidol.* 2024 Feb 1;35(1):33-40. doi: 10.1097/MOL.0000000000000900. [Article link](#)

**Purpose of Review:** The review aims to explore the recent evidence on the associations between different dietary fat intake and cognitive function, and to understand the role of telomere length in this relationship. **Recent Findings:** Clinical and preclinical studies included in this review suggest that dietary fat intake is associated with cognitive function and telomere length. High intake of saturated fats and trans fats, commonly found in ultra-processed foods, appears to have negative effects on cognitive function and telomere length, while other dietary fats, such as omega-3 polyunsaturated fatty acids and monounsaturated fatty acids are associated with improved cognitive performance and reduced telomere attrition. Controversial results related to omega-6 polyunsaturated fatty acids intake and its impact on cognitive function were found. Dietary fats may affect telomere length and cognition through oxidative stress, inflammation, and insulin resistance. **Summary:** The current review illustrated the relationship between dietary fat and cognitive function by focusing on the role of telomere length as a potential intermediary. More future studies are required, however, in order to develop targeted interventions aimed at preserving cognitive well-being throughout life.

## Lipids

### Do Patients Benefit from Omega-3 Fatty Acids?

Samuel C R Sherratt, R Preston Mason, Peter Libby, Ph Gabriel Steg, Deepak L Bhatt. *Cardiovasc Res.* 2024 Feb 17;119(18):2884-2901. doi: 10.1093/cvr/cvad188. [Article link](#)

Omega-3 fatty acids (O3FAs) possess beneficial properties for cardiovascular (CV) health and elevated O3FA levels are associated with lower incident risk for CV disease (CVD.) Yet, treatment of at-risk patients with various O3FA formulations has produced disparate results in large, well-controlled and well-conducted clinical trials. Prescription formulations and fish oil supplements containing low-dose mixtures of eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) have routinely failed to prevent CV events in primary and secondary prevention settings when added to contemporary care, as shown most recently in the STRENGTH and OMEMI trials. However, as observed in JELIS, REDUCE-IT, and RESPECT-EPA, EPA-only formulations significantly reduce CVD events in high-risk patients. The CV mechanism of action of EPA, while certainly multifaceted, does not depend solely on reductions of circulating lipids, including triglycerides (TG) and LDL, and event reduction appears related to achieved EPA levels suggesting that the particular chemical and biological properties of EPA, as compared to DHA and other O3FAs, may contribute to its distinct clinical efficacy. In vitro and in vivo studies have shown different effects of EPA compared with DHA alone or EPA/DHA combination treatments, on atherosclerotic plaque morphology, LDL and membrane oxidation, cholesterol distribution, membrane lipid dynamics, glucose homeostasis, endothelial function, and downstream lipid metabolite function. These findings indicate that prescription-grade, EPA-only formulations provide greater benefit than other O3FAs formulations tested. This review summarizes the clinical findings associated with various O3FA formulations, their efficacy in treating CV disease, and their underlying mechanisms of action.

## Sodium

### Effect of a Salt Substitute on Incidence of Hypertension and Hypotension Among Normotensive Adults

Xianghui Zhang, Yifang Yuan, Chenglong Li, Xiangxian Feng, Hongxia Wang, Qianku Qiao, Ruijuan Zhang, et al. *J Am Coll Cardiol.* 2024 Feb 20;83(7):711-722. doi: 10.1016/j.jacc.2023.12.013. [Article link](#)

**Background:** Reports on the effects of salt substitution among individuals with normal blood pressure are scarce and controversial. **Objectives:** This study sought to assess the effects of a salt substitute (62.5% NaCl, 25% KCl, and 12.5% flavorings) on incidence of hypertension and hypotension among older adults with normal blood pressure. **Method:** A post hoc analysis was conducted among older adults with normal blood pressure participating in DECIDE-Salt, a large, multicenter, cluster-randomized trial in 48 elderly care facilities for 2 years. We used the frailty survival model to compare risk of incident hypertension and the generalized linear mixed model to compare risk of hypotension episodes. **Results:** Compared with usual salt group (n = 298), the salt substitute group (n = 313) had a lower hypertension incidence (11.7 vs 24.3 per 100 person-years; adjusted HR: 0.60; 95% CI: 0.39 to 0.92; P = 0.02) but did not increase incidence of hypotension episodes (9.0 vs 9.7 per 100 person-years; P = 0.76). Mean systolic/diastolic blood pressure did not increase from the baseline to the end of intervention in the salt substitute group (mean changes:  $-0.3 \pm 11.9/0.2 \pm 7.1$  mm Hg) but increased in the usual salt group ( $7.0 \pm 14.3/2.1 \pm 7.5$  mm Hg), resulting in a net reduction of  $-8.0$  mm Hg (95% CI:  $-12.4$  to  $-3.7$  mm Hg) in systolic and  $-2.0$  mm Hg (95% CI:  $-4.1$  to  $0.1$  mm Hg) in diastolic blood pressure between intervention groups. **Conclusions:** In Chinese older adults with normal blood pressure, replacing usual salt with a salt substitute may reduce the incidence of hypertension without increasing hypotension episodes. This suggests a desirable strategy for population-wide prevention and control of hypertension and cardiovascular disease, deserving further consideration in future studies.

## Gut Health

### Roadmap for the Integration of Gastro-Intestinal (GI) Tract Microbiomes (Human and Domestic Animal) in Risk Assessments under EFSA's Remit

Francisco Javier Moreno, Florencio Pazos, Manuel Garrido-Romero, Cyrielle Payen, Gonzalo Borrego-Yaniz, Mónica Chagoyen, Nieves Corzo, et al. 21 February 2024. <https://doi.org/10.2903/sp.efsa.2024.EN-8597>. [Article link](#)

This report describes the work developed during the execution of the Review Impact MICrobiome In Assesment (RIMICIA) project. This project has performed a comprehensive and critical assessment of the evidence-based research about: i) the impact of dietary compounds in the human and some domestic animals (i.e., poultry, ruminants and pigs) gut microbiome; ii) the most representative in vitro and in vivo models of the human gut microbiota currently used in microbiome research studies; and iii) the methodology used to measure changes in the microbiota. This project has also gathered and appraised information about the exposure to a series of dietary xenobiotics that may cause oxidative damage and inflammation in the gut, as well as on how this exposure may affect the host gastrointestinal tract architecture and/or organisation, such as disruption of the intestinal barrier, enhancement of bacteria and bacteria products translocation into the circulation, and immune cell toxicity in humans and domestic animals. However, research studies are generally scarce on the structure-function relationship, the underlying mechanisms of the host-microbiome interactions and dose-dependent effects. Based on this information, a roadmap is proposed encompassing a prioritisation strategy targeting dietary compounds with potential for disrupting the gut microbiome composition which are increasingly present in modern and westernised diets (e.g., additives, chemical contaminants) and an explanation as to why the safety assessment of these compounds could benefit from gut microbiome data integration in the future. A multidisciplinary research strategy is proposed to provide key information to fill knowledge and methodology gaps. At a later stage, this research strategy could also provide useful information for developing policy actions aiming at the elaboration of decision frameworks for the future incorporation of gut microbiome data into specific guidelines in Organisation for Economic Co-operation and Development (OECD) or other international test guidelines and, ultimately, into regulatory programs.

## Emerging Science Areas

*Emerging Areas: Children's Sensory Preferences*

### Sweet and Sour Sips: No Effect of Repeated Exposure to Sweet or Sour-Tasting Sugary Drinks on Children's Sweetness Preference and Liking

Carina Mueller a, Gertrude G. Zeinstra b, Ciarán G. Forde a, Gerry Jager *Appetite*. Feb 16, 2024. [Article link](#)

Health agencies advocate reducing children's sweetness exposure to lower sweetness preference or liking to ultimately lower sugar intake. However, the relationship between sweetness exposure, preference, and liking remains unclear. This work investigated the influence of exposure to a sucrose-containing sweet or sour-tasting drink on sweetness preference and liking for sweet and sour products in 4-7-year-old children (n = 65). The children were randomized into three groups with one daily exposure to either the sweet drink, sour drink, or water (control group) for 14 days. Sweetness preference was assessed at baseline (t1), day 15 (t2), and two months after the intervention (t3), using a forced-choice, paired comparison test with five beverages varying in sweetness intensity. Hedonic liking for the intervention drinks, a sweet and sour yogurt, and a sweet and sour candy was evaluated using a 5-point pictorial scale. Linear mixed models revealed a significant increase in sweetness preference from t1 to t3 ( $F(2) = 7.46, p < 0.001$ ). However, ANCOVA analysis indicated that this effect was not caused by the intervention. Based on linear mixed models, we observed that children's hedonic liking for sweet and sour products remained stable from t1 to t3 and was not influenced by the intervention. These findings suggest that 14 exposures to a sucrose-containing sweet or sour-tasting drink did not affect sweetness preference or liking in 4-7-year-old children.

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