

April 2022

Nutrition



Dietary Patterns

Plant-Predominant Eating Patterns - How Effective are they for Treating Obesity and Related Cardiometabolic Health Outcomes? - A Systematic Review

Alan Remde, Stephen N DeTurk, A Almandini, Lauren Steiner, Thomas Wojda. *Nutr Rev.* 2022 Apr 8;80(5):1094-1104. doi: 10.1093/nutrit/nuabo60. [Article link](#)

Significance: A systematic review reported plant-based diets, practiced as part of healthy lifestyle, could help improve weight control and cardiometabolic outcomes related to lipids, cardiovascular end points, blood pressure, insulin sensitivity, A1C, and fasting glucose, and a lower risk of diabetes compared with usual diets.



Context: The obesity epidemic is a main driver of the chronic disease epidemic; however, present treatment approaches have suboptimal efficacy. **Objectives:** To assess the efficacy of plant-predominant (vegan, vegetarian, plant-based whole foods [PBWFs]) diets in treating obesity and its main cardiometabolic sequelae: hyperlipidemia (HLD); indices of insulin resistance, glycemic control, and diabetes mellitus type 2 (DM2); and cardiovascular disease (CVD), including hypertension (HTN). **Data sources:** A systematic search of multiple databases was conducted for articles published between November

2019 and February 2020; databases searched included: PubMed, Medline (Ovid), Cochrane, CENTRAL, and CINAHL. Data extraction and analysis: All interventional trials (randomized controlled trials [RCTs] and trials of non-randomized experimental design) that met the inclusion criteria (English language, duration of at least 4 weeks, primary end point congruent with above objectives, no major flaws in research design that would prevent interpretation) were included in the review. A total of 3135 articles were scanned and 84 were selected. The articles were collated and summarized in 2 evidence tables. Risk of bias for RCTs was assessed using the Cochrane Risk-of-Bias tool 2 as a guide. For non-randomized trials, higher risk of bias was assumed, and the JBI Critical Appraisal tool was used as a guide to determine inclusion. **Results:** Plant-based diets, in general, demonstrated improved weight control and cardiometabolic outcomes related to lipids, cardiovascular end points, blood pressure, insulin sensitivity, A1C, and fasting glucose, and a lower risk of diabetes compared with usual diets and in some cases standard health-oriented diets such as the American Heart Association (AHA), American Diabetic Association (ADA), and Mediterranean diets. Preliminary studies suggest plant-predominant diets practiced as part of healthy lifestyle interventions may stabilize or even reverse DM 2 and CVD. The acceptability and sustainability of plant-predominant diets where measured were generally similar to other health-oriented diets. **Conclusion:** Plant-predominant diets can play a major role in reversing the obesity and chronic disease epidemics. In the setting of sustained lifestyle intervention programs, they may arrest or even reverse DM2 and CVD. Further higher-level RCTs are needed to confirm and expand on these findings.

Nutrient-Sensitive Approach for Sustainability Assessment of Different Dietary Patterns in Australia

Navoda Nirmani Liyanapathirana, Amanda Grech, Mengyu Li, Arunima Malik, Manfred Lenzen, David Raubenheimer. *Am J Clin Nutr.* 2022 Apr 1;115(4):1048-1058. doi: 10.1093/ajcn/nqab429. [Article link](#)

Significance: This study on food intakes of Australian adults presents a novel nutrient approach to addressing the relationship between sustainability indicators, foods and macronutrients. The research found protein, irrespective of source, is a significant driver of dietary environmental and economic impacts.

Background: Understanding the relation between sustainability and nutrients is important in devising healthy

and sustainable diets. However, there are no prevailing methodologies to assess sustainability at the nutrient level. **Objectives:** The aim was to examine and demonstrate the potential of integrating input-output analysis with nutritional geometry to link environmental, economic, and health associations of dietary scenarios in Australia with macronutrients. **Methods:** One-day dietary recalls of 9341 adult respondents (age ≥ 18 y) of the latest available cross-sectional National Nutrition and Physical Activity Survey-2011/12 of Australia were integrated with the input-output data obtained from the Australian Industrial Ecology Virtual Laboratory to calculate the environmental and economic impacts of dietary intakes in Australia. Australian adults' dietary intakes were classified into 3 dietary scenarios: "vegan," "pescatarian," and "omnivorous." Then, the relations between nutritional, economic, and environmental characteristics of the 3 dietary scenarios were demonstrated with the diets' macronutrient composition in a multidimensional nutritional geometry representation to link the sustainability indicators with macronutrients. **Results:** Nutrient density and economic and environmental indicators increased as the percentage of energy from proteins increased and decreased as the percentage of energy from fats increased for the 3 dietary scenarios, except for the nutrient density and water use of the "vegan" dietary scenario. Energy density increased as the percentage of energy from fats increased and decreased as the percentage of energy from proteins increased for "pescatarian" and "omnivorous" dietary scenarios. In the "vegan" dietary scenario, nutrient density and water use increased as the percentage of energy from proteins increased; however, these decreased as the percentage of energy from carbohydrates increased, instead of fats. **Conclusions:** The study presents a new approach to analyzing the relations between sustainability indicators, foods, and macronutrients and establishes that proteins, irrespective of the source of protein, are driving dietary environmental and economic impacts.

Carbohydrates

Comparison of Energy and Macronutrients between a Mobile Application and a Conventional Dietary Assessment Method in Korea

Jeongseon Kim, Hyejin Kim, Jeonghee Lee, Hyunyoung Ko, So-Youn Jung, Hak Jin Kim, Gyung-Ah Wie, et. al. *J Acad Nutr Diet.* 2022 Apr 14;S2212-2672(22)00232-5. doi: 10.1016/j.jand.2022.04.007 [Article link](#)

Significance: A study comparing traditional diet assessment approach with mobile applications in healthy Korean adults, found comparable values for daily fat intake and percent energy from carbohydrates intakes from both approaches. In contrast, higher values were reported for energy intake, protein, and carbohydrate when using a mobile app. Apps may be a viable tool for energy and macronutrient assessment with added benefit of workload reduction.

Background: The use of mobile apps for dietary evaluation avoids some of the disadvantages of costly and time-consuming traditional diet assessment. However, few studies have compared dietary intake data in smartphone apps with a conventional diet assessment. **Objective:** This study aimed to compare the dietary data collected on energy and macronutrients (proteins, fats, and carbohydrates) consumed for 3 nonconsecutive days using both a mobile application (Noom) and a conventional dietary assessment tool (CAN Pro). **Design:** This was a cross-sectional study. **Participants/setting:** A total of 119 healthy adults (68 males and 51 females) aged 19 to 65 years were recruited from the National Cancer Center in Korea between May and September 2019. **Main outcome measures:** The mean daily energy and macronutrient intake data were obtained for the dietary intakes consumed for 3 nonconsecutive days using Noom and CAN Pro. **Statistical analysis performed:** The estimates of energy and macronutrient intake between the two tools were compared using correlation coefficients and cross-classification. **Results:** While mean daily fat intake and % total energy from carbohydrate estimated by Noom were comparable with values provided by CAN Pro, mean daily estimated energy intake (kcal), protein (g, % total energy), and carbohydrate (g) were significantly higher with Noom than with CAN Pro. The correlation coefficients ranged from 0.79 to 0.99 for crude intake and from 0.77 to 0.88 for energy-adjusted values of intake after adjustment for sex and age. The percentages of participants classified into quartiles of "exact agreement and plus adjacent" varied between 95% and 99% for crude intake and between 93% and 97% for energy-adjusted values of intake. **Conclusions:** The findings indicate that Noom may be useful for monitoring the dietary intake of energy and macronutrients and reducing workload compared with that of a traditional dietary assessment in Korea. However, further research is needed to assess the validity and usability of Noom for estimating intake of micronutrients and other dietary components.

Protein

An Evaluation of the Serum Carbon Isotope Ratio as a Candidate Predictive Biomarker of the Dietary Animal Protein Ratio (animal protein/total protein) in a 15-day Controlled Feeding Study of US Adults

Diane M O'Brien, Virag Sagi-Kiss, Susana A Palma-Duran, Chris Cunningham, Brian Barrett, Carol S Johnston, Douglas Midthune, et. al. *Am J Clin Nutr.* 2022 Apr 1;115(4):1134-1143. doi:10.1093/ajcn/nqac004. [Article link](#)

Significance: A 15-day control feeding study of adults in Arizona, US concluded that serum carbo isotope ratio (CIR) along with nitrogen isotope ratio (NIR) can be a predictive dietary biomarker of the animal protein ratio (APR). Serum CIR was positively correlated with animal and inversely correlated with plant protein intake, with a strong correlation ($r_2 = 0.76$) with APR. This biomarker can be applied to estimate disease risk from protein sources.

Background: The serum natural abundance carbon isotope ratio (CIR) was recently identified as a candidate biomarker of animal protein intake in postmenopausal women. Such a biomarker would help clarify the relation between dietary protein source (plant or animal) and chronic disease risk. **Objectives:** We aimed to evaluate the performance of the serum CIR as a biomarker of dietary protein source in a controlled feeding study of men and women of diverse age and BMI. **Methods:** We conducted a 15-d feeding study of 100 adults (age: 18-70 y, 55% women) in Phoenix, AZ. Participants were provided individualized diets that approximated habitual food intakes. Serum was collected at the end of the feeding period for biomarker measurements. **Results:** Median [IQR] animal protein intake was 67 g/d [55-88 g/d], which was 64% of total protein. The serum CIR was positively correlated with animal protein and inversely correlated with plant protein intake, leading to a strong correlation ($r_2 = 0.76$) with the dietary animal protein ratio (APR; animal/total protein). Regressing serum CIR on the APR, serum nitrogen isotope ratio (NIR), gender, age, and body weight generated an R_2 of 0.78. Following the measurement error model for predictive biomarkers, the resulting regression equation was then inverted to develop a calibrated biomarker equation for APR. Added sugars ratio (added/total sugars intake) and corn intakes also influenced the serum CIR but to a much lesser degree than the APR; variations in these intakes had only small effects on biomarker-estimated APR. **Conclusions:** Based on our findings in this US cohort of mixed sex and age, we propose the serum CIR alongside NIR as a predictive dietary biomarker of the APR. We anticipate using this biomarker to generate calibrated estimates based on self-reported intake and ultimately to obtain more precise disease risk estimates according to dietary protein source.



Low- and No-Calorie Sweeteners

Potential Effects of Sucralose and Saccharin on Gut Microbiota: A Review

Susana Del Pozo, Sonia Gómez-Martínez, Ligia E Díaz, Esther Nova, Rafael Urrialde, Ascensión Marcos. *Nutrients*. 2022 Apr 18;14(8):1682. doi: 10.3390/nu14081682. [Article link](#)

Significance: A scientific review reported dose-dependent response of sucralose and saccharin intake to gut microbiota abundance and composition from *in vitro* and animal models. Longer human intake studies suggest a positive correlation between sweetener consumption and some bacterial groups. In contrast, short-term feeding studies at levels below the ADI, found no significant effect on these bacterial groups, suggesting a different basal microbiota-dependent response of metabolic markers influenced by other factors—such as diet and lifestyle.

Artificial sweeteners are additives widely used in our diet. Although there is no consensus, current evidence indicates that sucralose and saccharin could influence the gut microbiota. The aim of this study was to analyze the existing scientific evidence on the effects of saccharin and sucralose consumption on gut microbiota in humans. Different databases were used with the following search terms: sweeteners, non-caloric-sweeteners, sucralose, splenda, saccharin, sugartwin, sweet'n low, microbiota, gut microbiota, humans, animal model, mice, rats, and/or *in vitro* studies. *In vitro* and animal model studies indicate a dose-dependent relationship between the intake of both sweeteners and gut microbiota affecting both diversity and composition. In humans, long-term study suggests the existence of a positive correlation between sweetener consumption and some bacterial groups; however, most short-term interventions with saccharin and sucralose, in amounts below the ADI, found no significant effect on those groups, but there seems to be a different basal microbiota-dependent response of metabolic markers. Although studies *in vitro* and in animal models seem to relate saccharin and sucralose consumption to changes in the gut microbiota, more long-term studies are needed in humans considering the basal microbiota of participants and their dietary and lifestyle habits in all population groups. Toxicological and basal gut microbiota effects must be included as relevant factors to evaluate food safety and nutritional consequences of non-calorie sweeteners. In humans, doses, duration of interventions, and number of subjects included in the studies are key factors to interpret the results.

Cognitive Health

Dietary Patterns in Middle Age: Effects on Concurrent Neurocognition and Risk of Age-Related Cognitive Decline

Sarah Gauci, Lauren M Young, Lizanne Arnoldy, Annie-Claude Lassemillante, Andrew Scholey, Andrew Pipingas. *Nutr Rev*. 2022 Apr 8;80(5):1129-1159. doi:10.1093/nutrit/nuab047. [Article link](#)

Significance: This systematic review reported that adherence to the Mediterranean diet and other healthy dietary patterns in middle age can protect against neurocognition decline in later years.

Context: Diet plays a critical role in cognitive integrity and decline in older adults. However, little is known about the relationship between diet and cognitive integrity in middle age. **Objective:** To investigate the relationship between dietary patterns in healthy middle-aged adults and neurocognition both in middle age and later in life. **Data sources:** Using the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines, the following electronic databases were searched: Web of Science, Scopus, PubMed, and PsychInfo. Data extraction: Data from eligible articles was extracted by 2 reviewers. **Data analysis:** Articles included in the systematic review were synthesized (based on the synthesis without meta-analysis reporting guidelines) and assessed for quality (using the Joanna Briggs Institute checklist for randomized controlled trials, cohort studies, and cross-sectional studies) by 2 reviewers. **Results:** Of 1558 studies identified, 34 met the eligibility criteria for inclusion. These comprised 9 cross-sectional studies, 23 longitudinal or prospective cohort studies, and 2 randomized controlled trials. Findings were mixed, with some studies reporting a significant positive relationship between adherence to various “healthy” dietary patterns and neurocognition, but others reporting no such relationship. **Conclusion:** This systematic review demonstrated that adherence to the Mediterranean diet and other healthy dietary patterns in middle age can protect neurocognition later in life.

Lipids

A Randomized Trial of Omega-3 Fatty Acid Supplementation and Circulating Lipoprotein Subclasses in Healthy Older Adults

Darya Moosavi, Ivan Vuckovic, Hawley E Kunz, Ian R Lanza. *J Nutr.* 2022 Apr 7;nxaco84. doi:10.1093/jn/nxaco84. [Article link](#)

Significance: An exploratory study found supplementation of n3-PUFA in healthy older adults was associated with reduced total triglycerides, reduced systolic blood pressure and HDL maintenance in spite of increased circulating small, dense LDL particles. This study suggests the potential health benefits of n3-PUFA supplementation for healthy older adults without dyslipidemia.

Background: Omega-3 polyunsaturated fatty acids (n3-PUFAs) are recognized for triglyceride-lowering effects in people with dyslipidemia, but it remains unclear if n3-PUFA intake influences lipoprotein profiles in older adults without hypertriglyceridemia. **Objective:** The objective was to determine the effect of n3-PUFA supplementation on plasma lipoprotein subfractions in healthy older men and women in the absence of cardiovascular disease or hypertriglyceridemia. This is a secondary analysis and considered exploratory. **Methods:** Thirty young (20-35 years) and 54 older (65-85 years) men and women were enrolled in the study. Fasting plasma samples were collected. Following baseline sample collection, 44 older adults were randomized to receive either n3-PUFA ethyl esters (3.9 g/day) or placebo (corn oil) for 6 months. Pre- and post-intervention plasma samples were used for quantitative lipoprotein subclass analysis using high-resolution proton nuclear magnetic resonance spectroscopy. **Results:** The number of large, least-dense LDL particles decreased 17-18% with n3-PUFA compared to placebo (<1% change, $p < 0.01$). The number of small, dense LDL particles increased 26-44% with n3-PUFA compared to placebo (\square 11% decrease, $p < 0.01$). The cholesterol content of large HDL particles increased by 32% with n3-PUFAs and by 2% in placebo ($p < 0.01$). The cholesterol content of small HDL particles decreased by 23% with n3-PUFAs and by 2% in placebo ($p < 0.01$). **Conclusion:** Despite increasing abundance of small, dense LDL particles that are associated with cardiovascular risk, n3-PUFAs reduced total triglycerides, maintained HDL, reduced systolic blood pressure, and shifted the HDL particle distribution toward a favorable cardioprotective profile in healthy older adults without dyslipidemia. This study suggests potential benefits of n3-PUFA supplementation to lipoprotein profiles in healthy older adults without dyslipidemia, which should be considered when weighing the potential health benefits against the cost and ecological impact of widespread use of n3-PUFA supplements.

Sodium

Perspective: Appraisal of the Evidence-Base to Update Dietary Reference Intake Values - Lessons from the Past, Thoughts for the Future

Danielle S Cahoon, Shruti P Shertukde, Nanguneri Nirmala, Joseph Lau, Alice H Lichtenstein. *Adv Nutr.* 2022 Apr 11;nmac041. doi:10.1093/advances/nmac041 [Article link](#)

Significance: Future updates of the DRI values process may need to consider prospectively targeted research funding for studies that will most support re-evaluation of DRI values. Additional evaluation of data related to life stages, age, ethnicity, pregnancy/lactation states, obesity and overweight may be important to consider.

Updating evidence-based nutrient guidance is challenging. One set of recommendations for which a robust evidence

base is essential is the Dietary References Intakes (DRI). In the past ten years, DRI values for four essential nutrients have been re-evaluated in two groups: vitamin D and calcium, and sodium and potassium. To support the work of the committees tasked with evaluating the available evidence, the federal agencies that sponsor the DRI reviews contracted with the Agency for Healthcare Research and Quality (AHRQ) to perform systematic reviews on predefined questions for these nutrient groups. Our aims were to tabulate the studies included in these systematic reviews and then, within the context of prespecified outcomes, summarize the totality of the available evidence and identify areas for consideration to maximize the value of the end products for future DRI committees. For the outcomes of interest, the available studies did not tend to report age data consistent with the current DRI categories. For some life stage categories, particularly pregnancy and lactation, there is a dearth of data. A wide range of study interventions were used, making it challenging to combine data to accurately derive or re-evaluate DRI values. There is also an under representation of data on race/ethnicity and overweight/obesity, which is of concern, given the shifting demographic in the U.S. and Canadian populations. Moving forward, it may be advantageous to develop a process to prospectively target research funding for studies designed to generate data that will most closely support re-evaluation of DRI values.

Gut Microbiome

Fermentable Oligosaccharides, Disaccharides, Monosaccharides, and Polyols (FODMAPs) and Cancer Risk in the Prospective NutriNet-Santé Cohort

Charlotte Debras, Eloi Chazelas, Bernard Srour, Chantal Julia, Élodie Schneider, Emmanuelle Kesse-Guyot, Cédric Agaësse, et. al. *J Nutr.* 2022 Apr 1;152(4):1059-1069. doi:10.1093/jn/nxab379. [Article link](#)

Significance: Results from this large population-based study of over 100,000 French adults with cancer risk from the NutriNet-Santé cohort found significant association between FODMAP intake and the risk of cancer development. Future research is warranted to confirm these results and the mechanism underlying these associations.

Background: Fermentable oligosaccharides, disaccharides, monosaccharides, and polyols (FODMAPs) have been shown to be involved in gastrointestinal disorders. In view of their proinflammatory potential and their interactions with the gut microbiota, their contribution to the etiology of other chronic diseases such as cancer has been postulated. However, to our knowledge, no epidemiologic study has investigated this hypothesis so far. **Objectives:** Our objective was to investigate the associations between FODMAP intake (total and by type) and cancer risk (overall, breast, prostate, and colorectal) in a large prospective cohort. **Methods:** The study was based on the NutriNet-Santé cohort (2009-2020); 104,909 adult participants without cancer at baseline were included in our analyses (median follow-up time = 7.7 y, 78.7% women, mean \pm SD age at baseline 42.1 \pm 14.5 y). Baseline dietary intakes were obtained from repeated 24-h dietary records linked to a detailed food composition table. Associations between FODMAP intake (expressed in quintiles, Q) and cancer risks were assessed by Cox proportional hazard models adjusted for a large range of lifestyle, sociodemographic, and anthropometric variables. **Results:** Total FODMAP intake was associated with increased overall cancer risk (n = 3374 incident cases, HR for sex-specific Q5 compared with Q1: 1.21; 95% CI: 1.02, 1.44; P-trend = 0.04). In particular, oligosaccharides were associated with cancer risk: a trend was observed for overall cancer (HR Q5 compared with Q1: 1.10; 95% CI: 0.97, 1.25; P-trend = 0.04) and colorectal cancer (n = 272, HR Q5 compared with Q1: 1.78; 95% CI: 1.13-2.79; P-trend = 0.02). **Conclusions:** Results from this large population-based study on French adults from the NutriNet-Santé cohort show a significant association between FODMAP intake and the risk of cancer development. Further epidemiologic and experimental studies are needed to confirm these results and provide data on the potential underlying mechanisms.

Emerging Science Areas

Emerging areas: Nutrition

Emerging Area: Nutrition and Health

Category: Aging--Exercise and Behavioral Intervention and Functional Mobility

Effect of a Physical Activity and Behaviour Maintenance Programme on Functional Mobility Decline in Older Adults: the REACT (Retirement in Action) Randomized Controlled Trial

Afroditi Stathi, Colin J Greaves, Janice L Thompson, Janet Withall, Peter Ladlow, Gordon Taylor, Antonieta Medina-Lara, et. al. *Lancet Public Health.* 2022 Apr;7(4):e316-e326. doi:10.1016/S2468-2667(22)00004-4. . [Article link](#)

Significance: This RCT study conducted in the UK, presented evidence that a 1-year exercise intervention involving group-based physical activity sessions and social and behavioral elements improved physical functioning in older adults at risk of mobility disability living in community settings. The observed benefits were sustained for at least 24 months. recording study design and conduct, contribute to study irreproducibility.

were sustained for at least 24 months.

Background: Mobility limitations in old age can greatly reduce quality of life, generate substantial health and social care costs, and increase mortality. Through the Retirement in Action (REACT) trial, we aimed to establish whether a community-based active ageing intervention could prevent decline in lower limb physical functioning in older adults already at increased risk of mobility limitation. **Methods:** In this pragmatic, multicenter, two-arm, single-blind, parallel-group, randomized, controlled trial, we recruited older adults (aged 65 years or older and who are not in full-time employment) with reduced lower limb physical functioning (Short Physical Performance Battery [SPPB] score 4–9) from 35 primary care practices across three sites (Bristol and Bath; Birmingham; and Devon) in England. Participants were randomly assigned to receive brief advice (three healthy ageing education sessions) or a 12-month, group-based, multimodal physical activity (64 1-h exercise sessions) and behavioral maintenance (21 45-min sessions) program delivered by charity and community or leisure center staff in local communities. Randomization was stratified by site and adopted a minimization approach to balance groups by age, sex, and SPPB score, using a centralized, online, randomization algorithm. Researchers involved in data collection and analysis were masked but participants were not because of the nature of the intervention. The primary outcome was change in SPPB score at 24 months, analyzed by intention to treat. This trial is registered with ISRCTN, ISRCTN45627165. **Findings:** Between June 20, 2016, and Oct 30, 2017, 777 participants (mean age 77.6 [SD 6.8] years; 66% female; mean SPPB score 7.37 [1.56]) were randomly assigned to the intervention (n=410) and control (n=367) groups. Primary outcome data at 24 months were provided by 628 (81%) participants (294 in the control group and 334 in the intervention group). At the 24-month follow-up, the SPPB score (adjusted for baseline SPPB score, age, sex, study site, and exercise group) was significantly greater in the intervention group (mean 8.08 [SD 2.87]) than in the control group (mean 7.59 [2.61]), with an adjusted mean difference of 0.49 (95% CI 0.06–0.92; p=0.014), which is just below our predefined clinically meaningful difference of 0.50. One adverse event was related to the intervention; the most common unrelated adverse events were heart conditions, strokes, and falls. **Interpretation:** For older adults at risk of mobility limitations, the REACT intervention showed that a 12-month physical activity and behavioral maintenance programme could help prevent decline in physical function over a 24-month period.

Emerging Area: Nutrition and Sustainability

Category: Novel Foods, Healthy Diets and Climate Change.

Incorporation of Novel Foods in European Diets can Reduce Global Warming Potential, Water Use and Land Use by Over 80%

Rachel Mazac, Jelena Meinilä, Liisa Korkalo, Natasha Järviö, Mika Jalava, Hanna L. Tuomisto. *Nat Food* 3, 25 April 2022. p286–293. doi.org/10.1038/s43016-022-00489-9. [Article link](#)

Significance: An optimized linear programming model was used to compare the environmental impact of omnivore, vegan, and novel food diets. The study found replacing animal-source foods in current European diets with novel foods reduced environmental impacts by over 80% and still met nutrition and feasible consumption constraints.

Global food systems face the challenge of providing healthy and adequate nutrition through sustainable means, which is exacerbated by climate change and increasing protein demand by the world's growing population. Recent advances in novel food production technologies demonstrate potential solutions for improving the sustainability of food systems. Yet, diet-level comparisons are lacking and are needed to fully understand the environmental impacts of incorporating novel foods in diets. Here we estimate the possible reductions in global warming potential, water use and land use by replacing animal-source foods with novel or plant-based foods in European diets. Using a linear programming model, we optimized omnivore, vegan, and novel food diets for minimum environmental impacts with nutrition and feasible consumption constraints. Replacing animal-source foods in current diets with novel foods reduced all environmental impacts by over 80% and still met nutrition and feasible consumption constraints.

Engage with IAFNS

- **IAFNS and Arkansas Children’s Nutrition Center Team Up for 3-Part Webinar Series May 17, 23 and 26th.**
 - Join childhood nutrition researchers as they share their latest findings in a series of May webinars. Scholars from Arkansas Children’s Nutrition Center (ACNC) — a National Human Research Center established as a partnership between Arkansas Children’s Research Institute and USDA-ARS — will be sharing their most recent findings during a planned series of webinars slated for May 17, May 23 and May 26, 2022. The webinar series will focus first on the early life determinants of metabolic health to be followed by a second webinar on the gut and developing brain. The final webinar will address maternal and child dietary patterns and physical activity. For more information, click [here](#).
- **7th World Conference on Research Integrity
Cape Town, South Africa
May 29, 2022 – June 1, 2022**
 - The World Conferences on Research Integrity (WCRI) foster the exchange of information and discussion about responsible conduct of research. At the 7th WCRI, IAFNS will be presenting its updated Guiding Principles for Funding Food Science and Nutrition Research. Ensuring Integrity in Science: Updated Guiding Principles for Funding Food Science and Nutrition Research. For more information, click here. For more information, click [here](#).
- **GS1 Connect 2022. June 7–9, 2022. San Diego, CA.**
 - IAFNS is representing the Partnership on the USDA Global Branded Food Products Database at GS1 Connect 2022. This event brings trading partners together to learn about standards-based business processes and best practices for optimum efficiencies in managing the supply and demand sides of their value chain. IAFNS’ presentation will focus on sharing data within the USDA Branded Food Product Database. For more information, click [here](#).
- **IAFNS Annual Meeting & Science Symposium: Advancing Science for Impact.
June 21-23, 2022, At the National Press Club in Washington DC.**
 - The IAFNS Annual Meeting & Scientific Symposium is a forum for the presentation and discussion of research and ideas—focusing on science with impact. The focus will be on science that supports credible decision making by government regulators, industry professionals and academic researchers. The conference offers an exceptional learning environment and brings together a range of experts, including food and nutrition researchers, healthcare professionals, opinion leaders, industry representatives, government officials, and future leaders. The Keynote address will be delivered by Dr. Susan Mayne, Director of the Center for Food Safety and Applied Nutrition (CFSAN) at the US Food and Drug Administration. To register, click [here](#).