

# Nutrition Briefs

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## Protein

### Daily Supplementation With Whey, Soy, or Whey-Soy Blended Protein for 6 Months Maintained Lean Muscle Mass and Physical Performance in Older Adults With Low Lean Mass

Li C, Meng H, Wu S, Fang A, Liao G, Tan X, et al. *J Acad Nutr Diet*. 2021 Jun;121(6):1035-1048.e6. doi: 10.1016/j.jand.2021.01.006. [Article link](#)



**Significance:** Dietary supplementation of whey, soy or whey-soy blended protein in older adults with low lean muscle mass is equally effective in maintaining muscle mass and physical performance at the end of 6 months.

**Background:** Few studies have investigated the effect of long-term protein supplementation alone on muscle health in older adults with low lean mass. **Objective:** To determine the effect of whey, soy or whey-soy blended protein supplementation on lean muscle mass and physical performance in older adults with low lean mass. **Design:** A 4-arm randomized controlled trial. **Participants/setting:** Chinese older adults (n = 123, 65-79 years) with low lean mass (appendicular skeletal muscle index < 7.0 kg/m<sup>2</sup> in men and < 5.4 kg/m<sup>2</sup> in women) living in the urban area of Guangzhou participated between October 2015 and June 2016. **Intervention:** Participants were randomly assigned to receive approximately 16 g/d of whey, soy, or whey-soy blend protein or maintained habitual diets in control group for 6 months. **Main outcome measures:** Lean mass, handgrip strength, and physical performance (gait speed, chair stand test, and Short Physical Performance Battery) were assessed at baseline and 6 months. **Statistical analyses:** Two-way analysis of variance with the main effects of treatment and time and treatment × time interaction and analysis of covariance was used to determine differences in outcomes. **Results:** Appendicular skeletal muscle index, lean mass, percent lean mass in legs and appendicular areas, gait speed, and Short Physical Performance Battery score were maintained in the treatment groups and decreased in the control group, resulting in significant reduction in these variables from baseline in the control compared with treatment groups (all P < .01; percent differences between treatment and control groups ranged from 80% to 156%). The chair stand test time at month 6 decreased from baseline in the treatment groups and increased in the control group, resulting in a significant increase in the control compared with treatment groups (all P < .01; percent differences between treatment and control groups ranged from 132% to 155%). Handgrip strength remained unchanged. There were no significant differences in outcomes among treatment groups. **Conclusions:** Supplementation with whey, soy, or whey-soy blended protein for 6 months equally maintained lean muscle mass and physical performance in older adults with low lean mass.

## Lipids

### Infant and Toddler Consumption of Sweetened and Unsweetened Lipid Nutrient Supplements After 2-Week Home Repeated Exposures

Johnson SL, Shapiro ALB, Moding KJ, Flesher A, Davis K, Fisher JO. *J Nutr*. 2021 May 24;nxab148. doi: 10.1093/jn/nxab148. [Article link](#)

**Significance:** No difference was found in acceptance of sweetened or unsweetened versions of lipid nutrient supplement in young children, suggesting repeated experiences as an approach to increase acceptance in some cases.

**Background:** Small-quantity lipid-based nutrient supplements (SQ-LNS) are designed to address undernutrition during the complementary feeding period. SQ-LNS contains added sugars, but limited research has assessed whether infants' acceptance varies between versions with and without sugars. **Objectives:** Our objective was to examine the effects of repeated exposure on children's acceptance of sweetened and unsweetened SQ-LNS. We aimed to understand caregivers' perceptions of children's liking of the 2 SQ-LNS versions and their influences on infant acceptance of SQ-LNS. **Methods:** Caregivers

(86% non-Hispanic White) and children (7-24 mo), participated in a randomized, 2-week home-exposure study and baseline and post-home exposure assessments. Children were randomized to receive sweetened or unsweetened SQ-LNS versions, mixed with infant oatmeal. At in-person visits, caregivers fed both SQ-LNS versions to children and rated their child's liking for each. Caregivers fed the SQ-LNS version to which their child was randomized until the child refused to eat more. Acceptance was measured as total grams consumed. Mixed-effects linear models tested the change in SQ-LNS consumed between baseline and postexposure by the SQ-LNS version and number of home exposures. Covariates included the amount of SQ-LNS consumed at baseline, child BMI z-score, child age, and breastfeeding experience. **Results:** Children's acceptance of both SQ-LNS versions increased from baseline to postexposure ( $\beta$ , 0.71 g; 95% CI: 0.54-0.89 g;  $P = 0.04$ ), regardless of SQ-LNS version ( $P = 0.88$ ) or number of home exposures ( $P = 0.55$ ). Caregivers rated children's liking of unsweetened SQ-LNS higher at baseline ( $P = 0.02$ ). Children with lower liking ratings at baseline showed the greatest increases in acceptance between baseline and postexposure ( $P = 0.01$ ). **Conclusions:** Children's acceptance of SQ-LNS increased with repeated exposure, whether offered the sweetened or unsweetened version, providing preliminary support that adding sugar to SQ-LNS may not improve acceptance in young children. Children who initially like the supplement less may need repeated experience to learn to accept SQ-LNS

## Carbohydrates

### Finding the Sweet Spot: Measurement, Modification, and Application of Sweet Hedonics in Humans

Cheon E, Reister EJ, Hunter SR, Mattes RD. *Adv Nutr.* 2021 May 6;nmab055. doi: 10.1093/advances/nmab055. [Article link](#)

**Significance:** Sweet hedonics is multidimensional, influenced by innate and learned experiences. Thus, multi-prong approaches to measure, assess and modify sweet hedonics, including biological and behavioral factors such as liking, preferences and consumption intent, may offer opportunities to more effectively model approaches to reduce high sugar intakes in populations.



This work was supported by the IAFNS [Carbohydrates](#) and [Low- and No-Calorie Sweeteners Committees](#).

Sweetness is a sensation that contributes to the palatability of foods, which is the primary driver of food choice. Thus, understanding how to measure the appeal (hedonics) of sweetness and how to modify it are key to effecting dietary change for health. Sweet hedonics is multidimensional so can only be captured by multiple approaches including assessment of elements such as liking, preference, and consumption intent. There are both innate and learned components to the appeal of sweet foods and beverages. These are responsive to various behavioral and biological factors, suggesting the opportunity to modify intake. Given the high amount of added sugar intake in the United States and recommendations from many groups to reduce this, further exploration of current hypothesized approaches to moderate sugar intake (e.g., induced hedonic shift, use of low-calorie sweeteners) is warranted.

### Effect of Oat $\beta$ -Glucan on Affective and Physical Feeling States in Healthy Adults: Evidence for Reduced Headache, Fatigue, Anxiety and Limb/Joint Pains

Wolever TMS, Rahn M, Dioum EH, Jenkins AL, Ezatagha A, Campbell JE, et al. *Nutrients.* 2021 May 1;13(5):1534. doi: 10.3390/nu13051534. [Article link](#)

**Significance:** These data provide preliminary, hypothesis-generating evidence that OBG may reduce several non-GI symptoms in healthy adults.

The gastrointestinal (GI) side-effects of dietary fibers are recognized, but less is known about their effects on non-GI symptoms. We assessed non-GI symptoms in a trial of the LDL-cholesterol lowering effect of oat  $\beta$ -glucan (OBG). Participants ( $n = 207$ ) with borderline high LDL-cholesterol were randomized to an OBG (1 g OBG,  $n = 104$ ,  $n = 96$  analyzed) or Control ( $n = 103$ ,  $n = 95$  analyzed) beverage 3-times daily for 4 weeks. At screening, baseline, 2 weeks and 4 weeks participants rated the severity of 16 non-GI symptoms as none, mild, moderate or severe. The occurrence and severity (more or less severe than pre-treatment) were compared using chi-squared and Fisher's exact test, respectively. During OBG treatment, the occurrence of exhaustion and fatigue decreased versus baseline ( $p < 0.05$ ). The severity of headache (2 weeks,  $p = 0.032$ ), anxiety (2 weeks  $p = 0.059$ ) and feeling cold (4 weeks,  $p = 0.040$ ) were less on OBG than Control. The severity of fatigue and hot flashes at 4 weeks, limb/joint pain at 2 weeks and difficulty concentrating at both times decreased on OBG versus baseline. High serum c-reactive-protein and changes in c-reactive-protein, oxidized-LDL, and GI-symptom severity were associated with the occurrence and severity of several non-GI symptoms. These data provide preliminary, hypothesis-generating evidence that OBG may reduce several non-GI symptoms in healthy adults.

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## Low- and No-Calorie Sweeteners

### Use of Acceptable Daily Intake (ADI) as a Health-Based Benchmark in Nutrition Research Studies That Consider the Safety of Low-Calorie Sweeteners (LCS): A Systematic Map

Fitch SE, Payne LE, van de Ligt JLG, Doepker C, Handu D, Cohen SM, et al. *BMC Public Health*. 2021 May 20;21(1):956. doi: 10.1186/s12889-021-10934-2. [Article link](#)

**Significance:** A review of ADI use in nutrition research found that most were applied reasonably within the context of the studies but “best practices” may still be needed in interpreting ADIs as they are lifetime—not short-term—exposure values.



This work was supported by the IAFNS [Low- and No-Calorie Sweeteners Committee](#).

**Background:** It is well-recognized that consumers face many challenges in understanding and applying nutritional guidance for low-calorie sweeteners (LCS). Thus, this research aims to (1) assess how benchmarks for safe levels of consumption of LCS are utilized by researchers, and (2) understand how varying use of such benchmarks may contribute to challenges in understanding and applying nutritional guidance for LCS consumption. **Methods:** A systematic mapping exercise was employed to characterize when and how acceptable daily intake (ADI) values are used as health-based benchmarks in nutrition research studies that consider the safety of LCS. **Results:** Based on results from charting 121 studies, our findings demonstrate that comparisons of LCS intake to an ADI derived by an authoritative body have been made in a diverse set of published literature, varying widely in their objectives, approaches, and populations of interest. The majority of studies compared the ADI to intake in a population under study; these represent the type of comparison that is most consistent with the intent of the ADI. Other applications of the ADI included use as a benchmark in experimental studies, risk-benefit analyses, and metabolism studies. **Conclusion:** Although most instances of ADI use were reasonable within the context of the individual studies’ objectives, the diversity in use by original-study authors amplifies the continued need for development of “best practices” regarding the use and interpretation of the ADIs in current research. Using comparisons to the ADI can be a helpful way to provide context to research findings. However, in doing so, it is important that researchers utilize the value in a manner specific with its intent, as the ADI is a metric that represents an estimate of the amount of a substance that can be consumed daily over a lifetime without presenting an appreciable risk to health.

### The Consumption of Low-Calorie Sweetener Containing Foods during Pregnancy: Results from the ROLO Study

Conway MC, Cawley S, Geraghty AA, Walsh NM, O’Brien EC, McAuliffe FM. *Eur J Clin Nutr*. 2021 May 26. doi: 10.1038/s41430-021-00935-0. [Article link](#)

**Significance:** Pregnant women with gestational diabetes are often advised to follow a low glycemic index diet. More research is needed to determine maternal and child exposure to LCS and their impact on maternal and child health outcomes.

**Background/objectives:** Women with gestational diabetes (GDM) are advised to adapt a low glycaemic index (GI) diet, which may impact consumption of low-calorie sweeteners (LCS). LCS are increasingly popular as they add sweetness without contributing calories. This study aims to investigate the reported intakes of LCS-containing foods in women during pregnancy. **Subjects/methods:** Pregnant women recruited for the ROLO study were included in this analysis (n = 571). Women were randomised to receive either an intervention of low-GI dietary advice or usual antenatal care. Women completed a 3-day food diary in each trimester. Nine LCS-containing food groups were identified, and the quantity (g/day) consumed was calculated. **Results:** One-third of all pregnant women consumed LCS across each trimester of pregnancy. Of those in the intervention group who were LCS consumers in trimester 1, 71.6% were consumers in trimester 2, and 54.1% remained consumers in trimester 3. In the control group, less women remained consumers in trimester 2 and 3 at 58.1% and 41.9%, respectively. In trimester 2, following the dietary intervention, the proportion of LCS consumers in the intervention group was significantly higher than the proportion of consumers who were in the control group (p < 0.001). The most commonly consumed food groups were low-calorie fruit drinks, diet-cola drinks, and low-calorie yoghurts. **Conclusions:** One-third of pregnant women consumed LCS. The proportion of LCS consumers increased in the intervention group compared to the control group. Further research is needed to determine exposure levels to individual LCS, and the effect of prenatal exposure to LCS on maternal and child health outcomes.

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## Bioactives

### **Perspective: Framework for Developing Recommended Intakes of Bioactive Dietary Substances**

Yates AA, Dwyer JT, Erdman JW, King JC, Lyle BJ, Schneeman BO, et al. *Adv Nutr*. 2021 May 7:nmab044. doi: 10.1093/advances/nmab044. [Article link](#)

**Significance:** This article describes a four-step framework to develop guidance based on evidence fully vetted for efficacy and safety by qualified experts and designed to communicate the amounts of specific dietary bioactive compounds with identified health benefits.



This work was supported by the IAFNS [Bioactives Committee](#).

Dietary bioactives are food substances that promote health but are not essential to prevent typical deficiency conditions. Examples include lutein and zeaxanthin, omega-3 fatty acids, and flavonoids. When quality evidence is available, quantified intake recommendations linking dietary bioactives with specific health benefits will enable health professionals to provide evidence-based information to consumers. Without evidence-based recommendations, consumers use information from available sources that often lack standards and rigor. This article describes a framework to develop guidance based on quality evidence fully vetted for efficacy and safety by qualified experts, and designed to communicate the amounts of specific dietary bioactive compounds with identified health benefits. The 4-step Framework described here can be adapted by credible health organizations to work within their guideline development process. Standards of practice used in clinical guidelines are adapted to quantify dietary bioactive intake recommendations from foods consumed by the general public, by taking into account that side effects and trade-offs are often needed for medical treatments but are not acceptable for dietary bioactives. In quantifying dietary bioactive recommendations, this Framework establishes 4 decision-making steps: 1) characterize the bioactive, determine amounts in specific food sources, and quantify intakes; 2) evaluate safety; 3) quantify the causal relation between the specific bioactive and accepted markers of health or normal function via systematic evidence reviews; and 4) translate the evidence into a quantified bioactive intake statement. This Framework provides a working model that can be updated as new approaches are advanced.

## Sodium

### **Contribution of Reformulation, Product Renewal, and Changes in Consumer Behavior to the Reduction of Salt Intakes in the UK Population between 2008/2009 and 2016/2017**

Gressier M, Sassi F, Frost G. *Am J Clin Nutr*. 2021 May 8:nqab130. doi: 10.1093/ajcn/nqab130. [Article link](#)

**Significance:** The UK multi-prong salt reduction program launched in 2003 reported a 16% reduction in population salt intake between years 1 and 9. Success was driven mostly through product reduction through reformulation (sodium density  $-12$  mg/100 g) and, to a lesser extent, through changes in food choices ( $-1.6$  mg/100 g). Impacts were independent of socioeconomic groups.

**Background:** The UK salt reduction program started in 2003, consisting of education campaigns to raise awareness about the risks associated with a high-salt diet and of a reformulation strategy for food manufacturers. This program is often cited as an example of a successful public health program. **Objectives:** This study aimed to assess: 1) the impacts of changes in food composition and changes in consumer behavior on sodium intakes; and 2) whether changes were similar across socioeconomic groups. **Methods:** Food intakes for the UK population were derived from food diaries in the UK National Diet and Nutrition Survey for 2008/09 (year 1;  $n = 1334$ ) and 2016/17 (year 9;  $n = 995$ ). Year-specific sodium densities of foods were used to calculate the average sodium density of all food and beverage consumed. Changes in sodium density between the 2 years were explained by changes in food composition (change in sodium density of products) and/or changes in behavior (type and quantity of food consumed) using a decomposition approach. **Results:** The program was linked to a 16% (95% CI:  $-21\%$  to  $-12\%$ ) decrease in sodium intake between years 1 and 9, while the sodium density of foods consumed decreased by 17% (95% CI:  $-21\%$  to  $-12\%$ ). This decrease was largely driven by reformulation ( $-12.0$  mg/100 g). Changes in food choices reinforced the effects of the program, but had a smaller impact ( $-1.6$  mg/100 g). These effects were similar across socioeconomic groups, whether stratified by education or income, with a consistent effect of reformulation across groups and no differences between groups in behavioral responses to the program. **Conclusions:** A multi-component sodium reduction strategy deployed in the United Kingdom starting in 2003 corresponded to an important reduction in sodium intakes for the population. This reduction was mostly driven by changes in the food environment (reformulated food products to reduce the sodium density of foods) and, to a smaller extent, by changes in food choices. Impacts were consistent across socioeconomic groups.

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## Gut Microbiome

### **An Overview of Current Knowledge of the Gut Microbiota and Low-Calorie Sweeteners**

Hughes RL, Davis CD, Lobach A, Holscher HD. *Nutr Today*. 2021;56(3):105-113. doi: 10.1097/NT.000000000000481. [Article link](#)

**Significance:** The diet, gut microbiota and health status interrelationships can be further understood by incorporating published research assessing the relationship of low-/no-calorie sweeteners (LNCSs) to aspects of the gut microbiota.



This work was supported by the IAFNS [Low- and No-Calorie Sweeteners Committee](#).

This review provides an overview of the interrelationships among the diet, gut microbiota, and health status and then focuses specifically on published research assessing the relationship of low-/no-calorie sweeteners (LNCSs) to selected aspects of the gut microbiota. Microbiome research is expanding as new data on its role in health and disease vulnerability emerge. The gut microbiome affects health, digestion, and susceptibility to disease. In the last 10 years, investigations of LNCS effects on the gut microbiota have proliferated, although results are conflicting and are often confounded by differences in study design such as study diet, the form of the test article, dosage, and study population. Staying current on microbiome research and the role of dietary inputs, such as LNCSs, will allow healthcare and nutrition practitioners to provide evidence-based guidance to the individuals they serve.