



***The Journal of Nutrition* – March 2019  
Media Summaries**

The following articles are being published in the March 2019 issue of *The Journal of Nutrition*, a publication of the American Society for Nutrition. Summaries of the selected articles appear below; the full text of each article is available by clicking on the links listed. Manuscripts published in *The Journal of Nutrition* are embargoed until the article appears online either as in press (Articles in Press) or as a final version. The embargoes for the following articles have expired.

**Can obesity be reduced by choice of calories and spermidine supplementation?**

**Cardiovascular health benefits associated with high-oleic acid oils used to replace *trans*-unsaturated fatty acids in processed foods**

**Adverse impacts of energy drinks cannot be attributed to a single ingredient**

## **Can obesity be reduced by choice of calories and spermidine supplementation?**

The laws of thermodynamics state that all calories are created equal. However, there are important differences in terms of how the 3 sources of calories are metabolized. As a result, dietary energy sources can have differing effects on body weight and health status. Dietary fat has long been recognized for its detrimental health effects including obesity, atherosclerosis, and cardiovascular diseases. However, diets high in sugar have also been implicated in increased risk of a variety of chronic diseases including obesity. Diet also has a strong influence on the complex microbial ecosystem that resides in the gut. Changes in dietary intake can alter the composition of the gut microbial population and lower microbial diversity. These alterations have been implicated in increased risk of obesity and metabolic complications. Naturally occurring compounds called polyamines have been found to influence body fat accumulation and support activity-induced weight loss. Therefore, polyamines such as spermidine may have the potential to enhance these activity-induced beneficial effects. A recent study by Julia Schipke (Institute of Functional and Applied Anatomy, Hannover Medical School) and colleagues tested if spermidine supplementation and voluntary activity exert differential effects against fat- and sucrose-induced systemic and gut microbiota changes. The study results, published in the March 2019 issue of *The Journal of Nutrition*, reveal that spermidine supplementation may have beneficial effects, particularly for sucrose-induced obesity.

A factorial design was used to test the impact of diet, activity, and spermidine supplementation on sucrose- and fat-induced changes in body weight, calorie intake, circulating lipid concentrations, glucose tolerance, and gut microbiota composition. Mice were fed 1 of 3 different diets for 30 weeks: a control diet, a high-sucrose diet, and a high-fat diet, and either were left untreated, had access to running wheels for voluntary activity, were supplemented with spermidine, or a combination of activity and spermidine resulting in 12 experimental groups in total.

When compared to the control diet, the high-fat diet enhanced body weights, plasma lipids, and glucose concentrations, whereas the high-sucrose diet resulted in less-substantial increases in body weight and fasting glucose, but not increases in plasma lipids. Both the high-fat and high-sucrose diet changed the microbial taxonomic composition; however, only the high-sucrose diet increased microbial diversity compared with the control diet. Physical activity influenced microbiota composition and reduced glucose concentrations in mice fed the high-sugar diet and the high-fat diet compared with nonactive mice. The combination of activity and spermidine supplementation affected energy intake and reduced body weights of active, spermidine-supplemented mice fed the high-sugar diet compared with inactive mice fed the high-sugar diet. The results of this study suggest that dietary sucrose and fat cause diverse metabolic and microbiota changes that were differentially susceptible to physical activity. Although further studies are needed, these promising results suggest that spermidine has the potential to augment physical activity-induced beneficial effects, particularly for sucrose-induced obesity.



**Reference** Schipke J, Vital M, Schnapper-Isl A, Pieper DH, Mühlfeld C.  
[Spermidine and Voluntary Activity Exert Differential Effects on Sucrose-](#)  
[Compared with Fat-Induced Systemic Changes in Male Mice.](#)

*Journal of Nutrition.* 2019; 149:451-62.

**For More Information** To contact the corresponding author, Julia Schipke, please send an e-mail to [schipke.julia@mh-hannover.de](mailto:schipke.julia@mh-hannover.de).

## **Cardiovascular health benefits associated with high-oleic acid oils used to replace *trans* unsaturated fatty acids in processed foods**

To reduce the risk of cardiovascular disease, healthy eating guidelines, such as the Dietary Guidelines for Americans, recommend a reduction of dietary saturated fatty acids and replacement with unsaturated fatty acids. Canola oil is a commonly consumed vegetable oil that is high in monounsaturated fatty acids, moderate in polyunsaturated fatty acids, and low in saturated fatty acids, and is recommended for its cardioprotective benefits. Canola oil is also available in a novel high-oleic acid variety that is equivalent in saturated fatty acids and proportionally lower in polyunsaturated fatty acids. The development of high-oleic acid oils and subsequent incorporation into the food supply was spurred, in part, by the recognition of the adverse cardiovascular health effects of industrially produced *trans* unsaturated fatty acids from partially hydrogenated vegetable oils. Oils such as high-oleic acid canola oil are a reasonable substitute for *trans* unsaturated fatty acids given their favorable fatty acid profiles and adherence with dietary guidelines. There is widespread consumption of high-oleic acid oils, particularly in processed foods; however, there is limited knowledge of their cardiovascular impact. A study published in the March 2019 issue of *The Journal of Nutrition* conducted by Penny Kris-Etherton (Department of Nutritional Sciences, The Pennsylvania State University) and colleagues compared the effects of diets containing canola oil, high-oleic acid canola oil, and a control oil blend (formulated to emulate a Western fat profile) on cardiovascular disease risk factors, including lipids, lipoproteins, and apolipoproteins.

A total of 119 middle-aged adults with 1 or more risk factors associated with metabolic syndrome participated in this 6-week double-blind, randomized, controlled feeding trial. To be eligible for the study, subjects had an increased waist circumference plus at least 1 of the following: elevated fasting blood glucose, elevated systolic blood pressure, elevated diastolic blood pressure, and/or decreased high-density lipoprotein cholesterol. During the feeding periods, participants were provided with an isocaloric, weight-maintenance base diet with one of the following oils: canola oil, high-oleic acid canola oil, or a control oil. Fasting lipids and lipoproteins were assessed at baseline and at 6 weeks.

Compared with the control, canola and high-oleic acid canola oil diets resulted in lower total cholesterol, low-density lipoprotein cholesterol, apolipoprotein B, and non-high-density lipoprotein cholesterol, with no differences between canola diets. Total cholesterol:HDL cholesterol and apolipoprotein B:apolipoprotein A1 ratios were lower after the high-oleic acid diet in comparison to the control. There were no diet effects on triglyceride, high-density lipoprotein cholesterol, or apolipoprotein A1 concentrations. The researchers concluded that high-oleic acid canola oil, which contains high amounts of monounsaturated fatty acids relative to polyunsaturated fatty acids, provides beneficial effects on lipids and lipoproteins comparable to conventional canola oil. Study results suggest that replacing sources of saturated fatty acids with high-oleic acid and/or conventional canola oils into the diet is an effective strategy to reduce atherosclerotic cardiovascular risk.



**Reference** Bowen KJ, Kris-Etherton PM, West SG, Fleming JA, Connelly PW, Lamarche B, Couture P, Jenkins DJA, Taylor CG, Zahradka P, et al. [Diets Enriched with Conventional or High–Oleic Acid Canola Oils Lower Atherogenic Lipids and Lipoproteins Compared to a Diet with a Western Fatty Acid Profile in Adults with Central Adiposity.](#)

*Journal of Nutrition.* 2019; 149:471-8.

**For More Information** To contact the corresponding author, Penny Kris-Etherton, please send an e-mail to [pmk3@psu.edu](mailto:pmk3@psu.edu).

## **Adverse impacts of energy drinks cannot be attributed to a single ingredient**

Over the last 20 years, energy drinks have become increasingly popular and represent one of the fastest growing segments of the beverage industry. Besides caffeine, energy drinks contain additional components such as taurine, inositol, or glucuronolactone. In addition, energy drinks also typically contain other ingredients such as carbohydrates, electrolytes, vitamins, botanical extracts, food colors, and flavorings. Energy drinks are marketed as stimulants that can improve both physical and mental performance. Acute adverse effects, including fatalities, have been associated with consumption of energy drinks, especially when mixed with alcohol. Adverse symptoms can include chest tightness, rapid, irregular heart rhythms, high blood pressure, gastrointestinal discomfort, and neurological responses such as irritability, nervousness, panic attacks, hallucinations, and seizures. These physiological and pharmacological effects are largely attributed to the main components of energy drinks. However, it is unclear which of the components or combinations contributes to the reported adverse effects. Moreover, dose-dependent cardiovascular effects of single energy drink ingredients are still unknown. A study conducted by Stephan Bischoff (University of Hohenheim, Institute of Nutritional Medicine, Germany) and colleagues examined cardiovascular and metabolic effects of energy drinks and mixtures providing relevant ingredients of energy drinks compared to a control beverage without these components. The study results, published in the March 2019 issue of *The Journal of Nutrition*, show for the first time that the effects of energy drinks cannot be attributed to the single components of caffeine, taurine, or glucuronolactone.

Study products comprised a commercial energy drink, control drink, and control drinks supplemented with major energy drink ingredients at the same concentrations found in the energy drink. The study products were administered at 2 volumes, 750 or 1000 mL. Thirty-eight volunteers were randomly assigned to 2 intervention groups. One intervention group received a singular volume of 750 mL of the study products (control product supplemented with taurine and control product supplemented with caffeine) whereas the other received 1000 mL of the same study products.

Both volumes of the study products were tolerated with no dose-dependent effects on blood pressure, heart rate, ventricular interval time, and glucose metabolism. After energy drink consumption, 11% of the participants reported symptoms, in contrast to no more than 3% caused by other study products. After 1 hour of consuming an energy drink, researchers noted an increase in blood pressure and prolonged ventricular intervals. Caffeine, but not taurine or glucuronolactone, caused an increase in blood pressure, but prolongation of ventricular intervals was not detected. Blood glucose decreased in response to all study products, and increased insulin concentrations were noted. Based on the study results, the researchers concluded that a single high-volume intake of energy drinks caused adverse changes in blood pressure, ventricular activity, and insulin sensitivity in young, healthy individuals. These effects cannot be easily attributed to the single component of caffeine, taurine, or glucuronolactone. The clinical impact of the adverse changes could be of relevance to individuals at risk for cardiovascular or metabolic disease.



**Reference** Basrai M, Schweinlin A, Menzel J, Mielke H, Weikert C, Dusemund B, Putze K, Watzl B, Lampen A, Bischoff SC. [Energy Drinks Induce Acute Cardiovascular and Metabolic Changes Pointing to Potential Risks for Young Adults: A Randomized Controlled Trial](#). *Journal of Nutrition*. 2019; 149:440-51.

**For More Information** To contact the corresponding author, Stephan Bischoff, please send an e-mail to [bischoff.stephan@uni-hohenheim.de](mailto:bischoff.stephan@uni-hohenheim.de).