

## Carbohydrates

### Fructose: Metabolic, Hedonic, and Societal Parallels with Ethanol

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**Significance:** Societal efforts to reduce fructose consumption will likely be necessary to combat the obesity epidemic.

This study reviewed the metabolic, hedonic, and societal similarities between fructose and its fermentation byproduct ethanol. Elucidation of fructose metabolism in liver and fructose action in brain demonstrate three parallelisms with ethanol. First, hepatic fructose metabolism is similar to ethanol, as they both serve as substrates for de novo lipogenesis, and in the process both promote hepatic insulin resistance, dyslipidemia, and hepatic steatosis. Second, fructosylation of proteins with resultant superoxide formation can result in hepatic inflammation similar to acetaldehyde, an intermediary metabolite of ethanol. Lastly, by stimulating the “hedonic pathway” of the brain both directly and indirectly, fructose creates habituation, and possibly dependence; also paralleling ethanol. Thus, fructose induces alterations in both hepatic metabolism and central nervous system energy signaling, leading to a “vicious cycle” of excessive consumption and disease consistent with metabolic syndrome. On a societal level, the treatment of fructose as a commodity exhibits market similarities to ethanol.

### Carbohydrate Nutrition and Inflammatory Disease Mortality in Older Adults

A.E. Buyken, V. Flood, M. Empson, E. Roachchina, A.W. Barclay, J. Brand-Miller, et al.

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Link to full text: <http://www.ajcn.org/cgi/content/full/92/3/634>

**Significance:** There is a potentially important link between glycemic index and inflammatory disease mortality among older women.

This study examined whether dietary glycemic index (GI), dietary fiber, and carbohydrate-containing food groups were associated with the mortality attributable to noncardiovascular, noncancer inflammatory disease in 1490 postmenopausal women and 1245 men aged 49 y at baseline. Over a 13-y period, 84 women and 86 men died of inflammatory diseases. Women in the highest GI tertile had a 2.9-fold increased risk of inflammatory death compared with women in the lowest GI tertile [multivariate hazard ratio in energy-adjusted tertile 3 (tertile 1 as reference): 2.89; 95% CI: 1.52, 5.51; P for trend: 0.0006, adjusted for covariates]. Increasing intakes of foods high in refined sugars or refined starches (P=0.04) and decreasing intakes of bread and cereals (P=0.008) or vegetables other

than potatoes (P=0.007) also independently predicted a greater risk, with subjects' GI partly explaining these associations. In men, only an increased consumption of fruit fiber (P=0.005) and fruit (P=0.04) conferred an independent decrease in risk of inflammatory death.

## Metabolic Syndrome

### A Low-Fat, High-Complex Carbohydrate Diet Supplemented with Long-Chain (n-3) Fatty Acids Alters the Postprandial Lipoprotein Profile in Patients with Metabolic Syndrome

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**Significance:** The adverse postprandial triglyceride-raising effects of long-term low-fat high-complex carbohydrate diets may be avoided by concomitant long-chain (n-3) PUFA supplementation to weight-stable metabolic syndrome patients.

This multi-center, parallel, randomized, controlled trial addressed the hypothesis that dietary fat quantity and quality may differentially modulate postprandial lipoprotein metabolism in metabolic syndrome (MetS) patients. Subjects were randomly assigned to 1 of 4 diets: high-SFA [HSFA; 38% energy (E) from fat, 16% E as SFA], high-monounsaturated fatty acid [HMUFA; 38% E from fat, 20% E as MUFA], and 2 low-fat, high-complex carbohydrate [LFHCC; 28% E from fat] diets supplemented with 1.24 g/d of long-chain (LC) (n-3) PUFA (ratio 1.4 eicosapentaenoic acid:1 docosahexaenoic acid) or placebo (1.24 g/d of high-oleic sunflower-seed oil) for 12wk each. Postintervention, postprandial triglycerides (TG) (P=0.001) and large TG-rich lipoprotein (TRL) TRL-TG (P=0.009) clearance began earlier and was faster in the HMUFA group compared with the HSFA and LFHCC groups. The LFHCC (n=3) group had a lower postprandial TG concentration (P=0.001) than the other diet groups. Consuming the LFHCC diet increased the TG (P=0.04), large TRL-TG (P=0.01), TRL-cholesterol (P=0.001), TRL-retinyl palmitate (P=0.001), and TRL-apolipoprotein B (P=0.002) area under the curve compared with preintervention values.

## Cardiovascular Disease

### Blueberries Decrease Cardiovascular Risk Factors in Obese Men and Women with Metabolic Syndrome

A. Basu, M. Du, M.J. Leyva, K. Sanchez, N.M. Betts, M. Wu, et al.

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Link to full text: <http://jn.nutrition.org/cgi/content/full/140/9/1582>

**Significance:** Blueberries may improve selected features of metabolic syndrome and related cardiovascular risk factors at dietary achievable doses.

The effects of blueberry supplementation on features of metabolic syndrome (MetS), lipid peroxidation, and inflammation were examined in 48 obese men and women with MetS (4 males and 44 females). Subjects consumed 50g freeze-dried blueberry beverage or equivalent amounts of fluids (controls, 960 mL water) daily for 8wk in a randomized controlled trial. The decreases in systolic and diastolic blood pressures were greater in the blueberry-supplemented group (– 6 and – 4%, respectively) than in controls (– 1.5 and – 1.2%) ( $P<0.05$ ), whereas the serum glucose concentration and lipid profiles were not affected. The decreases in plasma oxidized LDL and serum malondialdehyde and hydroxynonenal concentrations were greater in the blueberry group (– 28 and – 17%, respectively) than in the control group (– 9 and – 9%) ( $P<0.01$ ).

### **Almond Consumption and Cardiovascular Risk Factors in Adults with Prediabetes**

M. Wien, D. Bleich, M. Raghuvanshi, S. Gould-Forgerite, J. Gomes, L. Monahan-Couch, et al.

*Journal of the American College of Nutrition*, Vol. 29, No. 3; pp. 189-197, 2010

Link to full text: <http://www.jacn.org/cgi/content/full/29/3/189>

**Significance:** An ADA diet consisting of 20% of calories as almonds over a 16-week period is effective in improving markers of insulin sensitivity and yields clinically significant improvements in LDL-C in adults with prediabetes.

This randomized parallel-group trial tested the hypothesis that in adults with prediabetes, an almond-enriched American Diabetes Association (ADA) diet improves measures of insulin sensitivity and other cardiovascular risk factors compared with an ADA nut-free diet. Sixty-five adults with prediabetes underwent 16-weeks of dietary modification featuring an ADA diet containing 20% of energy from almonds (approximately 2 oz/day). The almond-enriched intervention group exhibited greater reductions in insulin (–1.78  $\mu\text{U/ml}$  vs. +1.47  $\mu\text{U/ml}$ ,  $p=0.002$ ), homeostasis model analysis for insulin resistance (–0.48 vs. +0.30,  $p=0.007$ ), and homeostasis model analysis for beta-cell function (–13.2 vs. +22.3,  $p=0.001$ ) compared with the nut-free control group. Clinically significant declines in LDL-C were found in the almond-enriched intervention group (–12.4 mg/dl vs. –0.4 mg/dl) as compared with the nut-free control group.

## **Caffeine**

### **Caffeine Consumption and Incident Atrial Fibrillation in Women**

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Link to full text: <http://www.ajcn.org/cgi/content/full/92/3/509>

**Significance:** Elevated caffeine consumption does not contribute to the increasing burden of atrial fibrillation in women.

The relation between caffeine intake and incident atrial fibrillation (AF) was assessed prospectively in 33,638 initially healthy women who participated in the Women's Health Study and who were  $\geq 45$  y of age and free of cardiovascular disease and AF at baseline. Subjects were prospectively followed for incident AF from 1993 to 2009. During a median follow-up of 14.4 y (interquartile range: 13.8–14.8 y), 945 AF events occurred. Median caffeine intakes across increasing quintiles of caffeine intake were 22, 135, 285, 402, and 656 mg/d, respectively. Age-adjusted incidence rates of AF across increasing quintiles of caffeine intake were 2.15, 1.89, 2.01, 2.24, and 2.04 events, respectively, per 1000 person-years of follow-up. In Cox proportional hazards models updated in 2004 by using time-varying covariates, the corresponding multivariable-adjusted hazard ratios (95% CI) were 1.0, 0.88 (0.72, 1.06), 0.78 (0.64, 0.95), 0.96 (0.79, 1.16), and 0.89 (0.73, 1.09) (P for linear trend: 0.45).

## Flavonoids

### The Citrus Flavonoids Hesperidin and Naringin Do Not Affect Serum Cholesterol in Moderately Hypercholesterolemic Men and Women

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Link to full text: <http://jn.nutrition.org/cgi/content/full/140/9/1615>

**Significance:** Pure hesperidin and naringin consumed in capsules at mealtime do not lower serum total cholesterol and LDL-C concentrations in moderately hypercholesterolemic men and women.

This randomized, placebo-controlled, parallel trial evaluated the LDL-C-lowering efficacy of pure hesperidin and naringin in 204 moderately hypercholesterolemic individuals with a serum total cholesterol (TC) concentration of 5.0–8.0 mmol/L. Participants refrained from consuming hesperidin and naringin sources 4-wk preintervention. During the 4-wk intervention, the participants applied the same dietary restrictions and consumed 4 capsules/d providing either placebo (cellulose) or a daily dose of 800 mg hesperidin or 500 mg naringin. One hundred ninety-four participants completed the study. Participants (n=194) maintained their prestudy body weights (mean changes  $< 0.2$  kg in all groups). The mean consumption of scheduled capsules was  $> 99\%$ . Hesperidin and naringin did not affect TC or LDL-C, with endpoint LDL-C concentrations (adjusted for baseline) of  $4.00 \pm 0.04$ ,  $3.99 \pm 0.04$ , and  $3.99 \pm 0.04$  mmol/L for control, hesperidin, and naringin groups, respectively. These citrus flavonoids also did not affect HDL-C and triglyceride concentrations.

## Lipids

### Supplemental Barley Protein and Casein Similarly Affect Serum Lipids in Hypercholesterolemic Women and Men

D.J.A. Jenkins, K. Srirachikul, J.M.W. Wong, C.W.C. Kendall, B. Bashyam, E. Vidgen, et al.

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Link to full text: <http://jn.nutrition.org/cgi/content/full/140/9/1633>

**Significance:** Barley protein remains an additional option for raising the protein content of the diet.

The effect on serum lipids of raising protein intake by 5% using barley protein was assessed in 23 hypercholesterolemic men and postmenopausal women. This randomized crossover study compared a bread enriched with either barley protein or calcium caseinate [30 g protein, 8374 kJ (2000 kcal)] taken separately as two 1-mo treatment phases with a minimum 2-wk washout. Palatability, satiety, and compliance were similar for both the barley protein- and casein-enriched breads, with no differences between the treatments in effects on serum LDL-C or C-reactive protein, measures of oxidative stress, or blood pressure.

## Type 2 diabetes

### Improvement of Dietary Quality with the Aid of a Low Glycemic Index Diet in Asian Patients with Type 2 Diabetes Mellitus

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Link to full text: <http://www.jacn.org/cgi/content/full/29/3/161>

**Significance:** Low glycemic index dietary advice has the ability to improve the dietary quality of Asian patients with type 2 diabetes.

This randomized controlled study was conducted to determine the effect of low glycemic index (GI) dietary advice on eating patterns and dietary quality in 104 Asian patients with type 2 diabetes. Subjects received either low GI or conventional carbohydrate exchange (CCE) dietary advice for 12-weeks. At week 12, both groups achieved the recommendations for carbohydrate (52±4% and 54±4% of energy) and fat (30±4% and 28±5% of energy) intake. With the low GI diet, crude fiber and dietary calcium intake increased, while the dietary GI reduced. Subjects in the lowest dietary GI/glycemic load (GI/GL) quartile consumed more parboiled/basmati rice, pasta, milk/dairy products, fruits, and dough, which are foods from the low GI category. There was a significant reduction in hemoglobin A<sub>1c</sub> at week 12 for patients in the lowest GI/GL quartile ( $\Delta = -0.7 \pm 0.1\%$ ) compared with those in the highest GI/GL quartile ( $\Delta = -0.1 \pm 0.2\%$ ).

## Special Report

### Intake of Artificially Sweetened Soft Drinks and Risk of Preterm Delivery: a Prospective Cohort Study in 59,334 Danish Pregnant Women

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**Significance:** Daily intake of artificially sweetened soft drinks may increase the risk of preterm delivery.

The association between intakes of sugar-sweetened and artificially sweetened soft drinks and preterm delivery was examined in this prospective cohort analysis of 59,334 women from the Danish National Birth Cohort (1996–2002). There was an association between intake of artificially sweetened carbonated and noncarbonated soft drinks and an increased risk of preterm delivery (P for trend:  $\leq 0.001$ , both variables). In comparison with women with no intake of artificially sweetened carbonated soft drinks, the adjusted odds ratio (OR) for women who consumed  $\leq 1$  serving of artificially sweetened carbonated soft drinks/d was 1.38 (95% CI: 1.15, 1.65). The corresponding OR for women who consumed  $\geq 4$  servings of artificially sweetened carbonated soft drinks/d was 1.78 (95% CI: 1.19, 2.66). The association was observed for normal-weight and overweight women. A stronger increase in risk was observed for early preterm and moderately preterm delivery than with late-preterm delivery.