

Type 2 Diabetes

Combined effect of alcohol consumption and lifestyle behaviors on risk of type 2 diabetes

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Significance: Moderate alcohol consumption was associated with an ~40% lower risk compared with abstention in subjects already at lower risk of type 2 diabetes.

This prospective study examined whether moderate alcohol consumption is associated with a lower risk of type 2 diabetes in 35,625 adults with combined low-risk lifestyle behaviors who were free of diabetes, cardiovascular disease, and cancer at baseline. In addition to moderate alcohol consumption (women: 5.0–14.9 g/d; men: 5.0–29.9 g/d), low-risk categories of 4 lifestyle behaviors were defined as: optimal weight [BMI <25 kg/m²], physically active (≥30 min of physical activity/d), current nonsmoker, and a healthy diet [upper 2 quintiles of the DASH diet]. During a median of 10.3 y, 796 incident cases of type 2 diabetes were identified. Compared with teetotalers, hazard ratios of moderate alcohol consumers for risk of type 2 diabetes in low-risk lifestyle strata were 0.35 (95% CI: 0.17, 0.72) when of a normal weight, 0.65 (95% CI: 0.46, 0.91) when physically active, 0.54 (95% CI: 0.41, 0.71) when nonsmoking, and 0.57 (95% CI: 0.39, 0.84) when consuming a healthy diet. When ≥3 low-risk lifestyle behaviors were combined, the hazard ratio for incidence of type 2 diabetes in moderate alcohol consumers was 0.56 (95% CI: 0.32, 1.00).

A high-protein low-fat diet is more effective in improving blood pressure and triglycerides in calorie-restricted obese individuals with newly diagnosed type 2 diabetes

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Significance: A protein fat ratio of 1.5 in diets significantly improves blood pressure and triglyceride concentrations in obese individuals with type 2 diabetes.

This random, blind, crossover design study compared the effects of two diets differing in protein to fat ratios on cardiovascular disease risk factors in 17 obese (BMI 31–45 kg/m²) volunteers with type 2 diabetes who consumed two diets, each for 4 weeks, with a 3 week washout period. The diets were: (1) a high-protein low-fat diet (HP-LF, with 30% protein, 50% carbohydrates and 20% fat) and (2) a low-protein high-fat diet (LP-HF, with 15% protein, 50% carbohydrates and 35% fat). Both diets were equally effective in promoting weight loss and fat loss and in improving fasting glycemic control, and total- and LDL-cholesterol, but the HP-LF diet decreased to a greater

extent triglyceride levels ($P=0.04$) when compared with the LP–HF diet. The HP–LF diet improved significantly both systolic and diastolic blood pressure when compared with the LP–HF diet ($P<0.001$ and $P<0.001$, respectively).

Association between adiposity in midlife and older age and risk of diabetes in older adults

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Journal of the American Medical Association, Vol. 303, No. 24; pp. 2504-2512, 2010

Significance: Among older adults, overall and central adiposity, and weight gain during middle age and after the age of 65 years are associated with risk of diabetes.

The relationship between adiposity, changes in adiposity, and risk of incident type 2 diabetes (DM) was examined in this prospective cohort study of 4193 adults aged ≥ 65 y. Over median follow-up of 12.4y (range, 0.9-17.8y), 339 cases of incident diabetes (i.e., use of antidiabetic medication or a fasting glucose level ≥ 126 mg/dL) were ascertained. The adjusted hazard ratio (HR) of DM for participants in the highest quintile of baseline measures compared with those in the lowest was 4.3 (95%CI, 2.9-6.5) for BMI, 3.0 (95%CI, 2.0-4.3) for BMI at age 50, 4.2 (95%CI, 2.8-6.4) for weight, 4.0 (95%CI, 2.6-6.0) for fat mass, 4.2 (95%CI, 2.8-6.2) for waist circumference, 2.4 (95%CI, 1.6-3.5) for waist-hip ratio, and 3.8 (95%CI, 2.6-5.5) for waist-height ratio. When stratified by age, participants aged ≥ 75 y had HRs approximately half as large as those aged 65-74y. Compared with weight-stable participants (± 2 kg), those who gained the most weight from age 50 to baseline (≥ 9 kg), and from baseline to the third follow-up visit (≥ 6 kg), had HRs for DM of 2.8 (95%CI, 1.9-4.3) and 2.0 (95%CI, 1.1-3.7), respectively. Participants with >10 -cm increase in waist size from baseline to the third follow-up visit had a HR of DM of 1.7 (95%CI, 1.1-2.8) compared with those who gained or lost ≤ 2 -cm.

Dietary milled flaxseed and flaxseed oil improve n-3 fatty acid status and do not affect glycemic control in individuals with well-controlled type 2 diabetes

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Significance: Milled flaxseed and flaxseed oil intake does not affect glycemic control in adults with well-controlled type 2 diabetes.

The effects of dietary consumption of milled flaxseed or flaxseed oil on glycemic control, n-3 fatty acid status, anthropometrics, and adipokines were examined in this randomized, parallel, controlled trial in 34 adults with type 2 diabetes, age 52.4 ± 1.5 y, BMI 32.4 ± 1.0 kg/m². Subjects consumed a selection of bakery products containing no flax (control group [CTL], n=9), milled flaxseed (FXS, n=13; 32g/d), or flaxseed oil (FXO, n=12; 13g/d) daily for 12 weeks. The FXS and FXO groups received equivalent amounts of alpha-linolenic acid (ALA; 7.4g/day). The FXS and FXO groups had increases in plasma phospholipid n-3 fatty acids (ALA, eicosapentaenoic acid [EPA], or decosapentaenoic acid [DPA], but not docosahexaenoic acid), and the FXO group had more EPA and DPA in plasma phospholipids compared to the FXS group. All groups had similar caloric intakes; however, the CTL group

experienced a 4% weight gain compared to baseline ($p < 0.05$), while both flax groups had constant body weights during the study period.

Cardiovascular Disease

Relationship between alcohol intake, health and social status and cardiovascular risk factors in the urban Paris-Ile-De-France Cohort: is the cardioprotective action of alcohol a myth?

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Significance: Moderate alcohol drinkers display a more favorable clinical and biological profile, consistent with lower cardiovascular risk as compared with nondrinkers and heavy drinkers.

This study evaluated potential confounders, which may contribute to putative cardioprotection by alcohol. Clinical and biological characteristics, including cardiovascular (CV) risk factors and health status, of 149,773 subjects undergoing examination at the Center for Cardiovascular Disease Prevention were evaluated. The subjects were divided into four groups according to alcohol consumption: never, low (≤ 10 g/day), moderate (10–30 g/day) and high (> 30 g/day); former drinkers were analyzed as a separate group. After adjustment for age, moderate male drinkers were more likely to display clinical and biological characteristics associated with lower CV risk, including low BMI, heart rate, pulse pressure, fasting triglycerides, fasting glucose, stress and depression scores together with superior subjective health status, respiratory function, social status and physical activity. Moderate female drinkers equally displayed low waist circumference, blood pressure and fasting triglycerides and LDL-cholesterol. Alcohol intake was strongly associated with plasma HDL-cholesterol in both sexes. Multivariate analysis confirmed that moderate and low drinkers displayed better health status than did never drinkers.

Association between the frequency of fruit and vegetable consumption and cardiovascular disease in male smokers and non-smokers

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Significance: A high fruit and vegetable intake is associated with a lower risk of CVD in male smokers.

The relationship between the frequency of fruit and vegetable (F&V) intake and cardiovascular disease (CVD) risk in 8060 males, aged 50–59y, current, former and never smokers was compared in this prospective study. The outcome criteria were incident cases of acute coronary syndrome (ACS) and total CVD (coronary heart disease and stroke) over a 10-year period. A total of 367 ACS and 612 CVD events occurred during the follow-up period. A multivariate analysis revealed a statistically significant interaction between smoking status and F&V intake for ACS

and for CVD (both P 's<0.05). In current smokers, the relative risks for ACS were 0.78 (0.54–1.13) and 0.49 (0.30–0.81) in the second and third tertiles of F&V intake, respectively (P for trend<0.001); for CVD, the values were 0.80 (0.59–1.08) and 0.64 (0.44–0.93) respectively (P for trend<0.001). In contrast, no statistically significant associations were observed for never and former smokers. Similar statistical interactions for ACS were observed for fruit intake ($P=0.07$) and vegetable intake ($P<0.05$) taken separately.

Coronary Heart Disease

Zinc decreases C-reactive protein, lipid peroxidation, and inflammatory cytokines in elderly subjects: a potential implication of zinc as an atheroprotective agent

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American Journal of Clinical Nutrition, Vol. 91, No. 6; pp. 1634-1641, 2010

Significance: Zinc may have a protective effect in atherosclerosis because of its anti-inflammatory and antioxidant functions.

A randomized, double-blind, placebo trial of zinc supplementation was conducted in 40 healthy elderly subjects aged 56–83y. Subjects were randomized to an oral dose of 45 mg zinc/d as a gluconate for 6 mo or placebo. After 6 mo, the intake of zinc, compared with intake of placebo, increased the concentrations of plasma zinc and decreased the concentrations of plasma high-sensitivity C-reactive protein (hsCRP), interleukin (IL)-6, macrophage chemoattractant protein 1 (MCP-1), vascular cell adhesion molecule 1 (VCAM-1), secretory phospholipase A2, and malondialdehyde and hydroxyalkenals (MDA+HAE). Regression analysis showed that changes in concentrations of plasma zinc were inversely associated with changes in concentrations of plasma hsCRP, MCP-1, VCAM-1, and MDA+HAE after 6 mo. In cell culture studies, zinc decreased the generation of TNF- α , IL-1 β , VCAM-1, and MDA+HAE and the activation of nuclear transcription factor κ B and increased antiinflammatory proteins A20 and peroxisome proliferator-activated receptor- α in human monocytic leukemia THP-1 cells and human aortic endothelial cells compared with zinc-deficient cells.

Flavonoids

Anthocyanins are bioavailable in humans following an acute dose of cranberry juice

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Journal of Nutrition, Vol. 140, No. 6; pp. 1099-1104, 2010

Significance: Cranberry anthocyanins are poorly absorbed and rapidly removed from plasma.

A study was undertaken in 15 subjects aged 62 \pm 8y with coronary artery disease to determine the pharmacokinetics of cranberry anthocyanins. Blood and urine samples were collected between baseline (0 h) and 4 h after consumption of 480mL cranberry juice (54% juice; 835 mg total polyphenols; 94.47mg anthocyanins). Marked inter-individual

differences in plasma anthocyanin pharmacokinetics were observed with maximum anthocyanin concentrations detected between 1 and 3 h. Cranberry anthocyanins were bioavailable but with notable differences in the maximum concentration and area under the curve_{0-4h} between individual participants. The pattern of anthocyanin glucosides observed in plasma and urine generally reflected the relative concentration determined in the juice. Plasma concentrations of the individual anthocyanins ranged between 0.56-4.64 nmol/L. Total recovery of urinary anthocyanin was 0.79±0.90% of the dose delivered. Observed concentrations of plasma anthocyanins appear insufficient to alter radical load or redox potential but may be adequate to affect signal transduction and/or gene expression.

Effects of resveratrol on cerebral blood flow variables and cognitive performance in humans: a double-blind, placebo-controlled, crossover investigation

D.O. Kennedy, E.L. Wightman, J.L. Reay, G. Lietz, E.J. Okello, A. Wilde, et al.
American Journal of Clinical Nutrition, Vol. 91, No. 6; pp. 1590-1597, 2010

Significance: Single doses of orally administered resveratrol can modulate cerebral blood flow variables.

This randomized, double-blind, placebo-controlled, crossover study assessed the effects of oral resveratrol on cognitive performance and localized cerebral blood flow variables in 22 healthy adults. Subjects received a placebo and 2 doses (250 and 500 mg) of *trans*-resveratrol in counterbalanced order on separate days. After a 45-min resting absorption period, the participants performed a selection of cognitive tasks that activate the frontal cortex for an additional 36 min. The presence of resveratrol and its conjugates in plasma was confirmed by HPLC after the same doses in a separate cohort ($n=9$). Resveratrol administration resulted in dose-dependent increases in cerebral blood flow during task performance. There was also an increase in deoxyhemoglobin after both doses of resveratrol, which suggested enhanced oxygen extraction, that became apparent toward the end of the 45-min absorption phase and was sustained throughout task performance. Cognitive function was not affected. Resveratrol metabolites were present in plasma throughout the cognitive task period.

Metabolic Syndrome

Berry meals and risk factors associated with metabolic syndrome

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European Journal of Clinical Nutrition, Vol. 64, No. 6; pp. 614–621, 2010

Significance: A decrease in alanine aminotransferase in the berry group may contribute positively to the low-grade systemic inflammation in the body and decrease the risk of cardiovascular diseases.

The effects of lifestyle intervention with and without industrial berry products, on risk factors associated with metabolic syndrome on 61 slightly overweight women (average age 42.9 years) were compared. Subjects were randomized for a 20-week dietary intervention trial with two parallel treatment groups, one lifestyle intervention

group with berry products equaling an average daily dose of 163 g of northern berries (berry group, diet 1, $N=31$, of which 28 completed the study) and the other group with lifestyle intervention only (control group, diet 2, $N=30$, of which 22 completed the study). Increased berry consumption as part of the normal daily diet was the only lifestyle difference between the two intervention groups. The major effects achieved by diet 1 were changes in the levels of alanine aminotransferase (ALAT) and adiponectin (at P -values <0.001 and 0.002 , respectively). A statistically significant difference between the two intervention groups was the higher decrease in the ALAT value in the berry group ($P=0.003$).

Green tea supplementation affects body weight, lipids, and lipid peroxidation in obese subjects with metabolic syndrome

A. Basu, K. Sanchez, M.J. Leyva, M. Wu, N.M. Betts, C.E. Aston, et al.

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Significance: Green tea flavonoids may improve features of metabolic syndrome in obese patients.

This randomized, controlled prospective trial compared the effects of supplementation of green tea beverage (GTB) or green tea extracts (GTE) with controls on body weight, glucose and lipid profile, biomarkers of oxidative stress, and safety parameters in 35 obese subjects with metabolic syndrome. Age- and gender-matched trios were randomly assigned to the control (4 cups water/d), GTB (4 cups/d), or GTE (2 capsules and 4 cups water/d) group for 8 weeks. The tea and extract groups had similar dosing of epigallocatechin-3-gallate (EGCG). Pairwise comparisons showed GTB and GTE caused a significant decrease in body weight and BMI versus controls at 8 weeks (-2.5 ± 0.7 kg, $p<0.01$, and -1.9 ± 0.6 , $p<0.05$, respectively). GTB showed a decreasing trend in LDL-cholesterol and LDL/HDL versus controls ($p<0.1$). GTB also significantly decreased malondialdehyde and hydroxynonenals (-0.39 ± 0.06 μM , $p<0.0001$) versus controls. Plasma free catechins were detectable in both beverage and extract groups versus controls at screen and at 8 weeks, indicating compliance and bioavailability of green tea catechins.

Probiotics

Regulation of abdominal adiposity by probiotics (*Lactobacillus gasseri* SBT2055) in adults with obese tendencies in a randomized controlled trial

Y. Kadooka, M. Sato, K. Imaizumi, A. Ogawa, K. Ikuyama, Y. Akai, et al.

European Journal of Clinical Nutrition, Vol. 64, No. 6; pp. 636-643, 2010

Significance: The probiotic *Lactobacillus gasseri* SBT2055 showed lowering effects on abdominal adiposity body weight and other measures, suggesting its beneficial influence on metabolic disorders.

The effects of the probiotic *Lactobacillus gasseri* SBT2055 (LG2055) on abdominal adiposity, body weight and other body measures were evaluated in 87 adults with high BMI ($24.2\text{--}30.7$ kg/m^2) and abdominal visceral fat area ($81.2\text{--}178.5$ cm^2) in a multicenter, double-blind, randomized, placebo-controlled intervention trial. Subjects were

randomly assigned to receive either fermented milk (FM) containing LG2055 (active FM; $n=43$) or FM without LG2055 (control FM; $n=44$), and were asked to consume 200 g/day of FM for 12 weeks. In the active FM group, abdominal visceral and subcutaneous fat areas significantly ($P<0.01$) decreased from baseline by an average of 4.6% (mean: -5.8 cm^2) and 3.3% (-7.4 cm^2), respectively. Body weight and other measures also decreased significantly ($P<0.001$) as follows: body weight, 1.4% (-1.1 kg); BMI, 1.5% (-0.4 kg/m^2); waist, 1.8% (-1.7 cm); hip, 1.5% (-1.5 cm). In the control group, none of these parameters decreased significantly. High-molecular weight adiponectin in serum increased significantly ($P<0.01$) in the active and control groups by 12.7% ($0.17 \text{ }\mu\text{g/ml}$) and 13.6% ($0.23 \text{ }\mu\text{g/ml}$), respectively.

Carbohydrates

Intake of carbohydrates compared with intake of saturated fatty acids and risk of myocardial infarction: importance of the glycemic index

M.U. Jakobsen, C. Dethlefsen, A.M. Joensen, J. Stegger, A. Tjønneland, E.B. Schmidt, et al.
American Journal of Clinical Nutrition, Vol. 91, No. 6; pp. 1764-1768, 2010

Significance: Replacing SFAs with carbohydrates with low-GI values is associated with a lower risk of MI, whereas replacing SFAs with carbohydrates with high-GI values is associated with a higher risk of MI.

This prospective cohort study aimed to investigate the risk of myocardial infarction (MI) associated with a higher energy intake from carbohydrates and a concomitant lower energy intake from saturated fatty acids (SFAs) in 53,644 women and men free of MI at baseline. Carbohydrates with different glycemic index (GI) values were also investigated. During a median of 12-y of follow-up, 1943 incident MI cases occurred. There was a nonsignificant inverse association between substitution of carbohydrates with low-GI values for SFAs and risk of MI [hazard ratio (HR) for MI per 5% increment of energy intake from carbohydrates: 0.88; 95% CI: 0.72, 1.07]. In contrast, there was a statistically significant positive association between substitution of carbohydrates with high-GI values for SFAs and risk of MI (HR: 1.33; 95% CI: 1.08, 1.64). No effect modification by sex was observed.

Advanced Glycation End Products

Advanced glycation end products in foods and a practical guide to their reduction in the diet

J. Uribarri, S. Woodruff, S. Goodman, W. Cai, X. Chen, R. Pyzik, et al.
Journal of the American Dietetic Association, Vol. 110, No. 6; pp. 911-916, 2010

Significance: The new dietary advanced glycation end products (dAGE) database provides a valuable instrument for estimating dAGE intake and for guiding food choices to reduce dAGE intake.

Dietary advanced glycation end products (dAGEs) are known to contribute to increased oxidant stress and inflammation. This report significantly expands the available dAGE database, validates the dAGE testing

methodology, compares cooking procedures and inhibitory agents on new dAGE formation, and introduces practical approaches for reducing dAGE consumption in daily life. Based on the findings, dry heat promotes new dAGE formation by >10- to 100-fold above the uncooked state across food categories. Animal-derived foods that are high in fat and protein are generally AGE-rich and prone to new AGE formation during cooking. In contrast, carbohydrate-rich foods such as vegetables, fruits, whole grains, and milk contain relatively few AGEs, even after cooking. The formation of new dAGEs during cooking was prevented by the AGE inhibitory compound aminoguanidine and significantly reduced by cooking with moist heat, using shorter cooking times, cooking at lower temperatures, and by use of acidic ingredients such as lemon juice or vinegar.

Caffeine

Maternal caffeine intake from coffee and tea, fetal growth, and the risks of adverse birth outcomes: the Generation R Study

R. Bakker, E.A.P. Steegers, A. Obradov, H. Raat, A. Hofman, V.W.V. Jaddoe
American Journal of Clinical Nutrition, Vol. 91, No. 6; pp. 1691-1698, 2010

Significance: Caffeine intake of ≥ 6 units/d during pregnancy is associated with impaired fetal length growth and caffeine exposure might be preferentially adversely affect fetal skeletal growth.

The associations of maternal caffeine intake, on the basis of coffee and tea consumption, with fetal growth characteristics measured in each trimester of pregnancy and the risks of adverse birth outcomes were evaluated in a population-based prospective cohort study. Associations were studied in 7346 pregnant women from early pregnancy onward. Caffeine intake in the first, second, and third trimesters was on the basis of coffee and tea consumption and was assessed by questionnaires. No consistent associations of caffeine intake with fetal head circumference or estimated fetal weight in any trimester were observed. Higher caffeine intake was associated with smaller first-trimester crown-rump length, second- and third-trimester femur length, and birth length (P for trend < 0.05). Offspring of mothers who consumed ≥ 6 caffeine units/d tended to have increased risks of small-for-gestational-age infants at birth.

Sleep and Food Intake

Acute partial sleep deprivation increases food intake in healthy men

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American Journal of Clinical Nutrition, Vol. 91, No. 6; pp. 1550-1559, 2010

Significance: Sleep restriction could be a factor that promotes obesity.

This randomized crossover study observed modifications in energy intake and physical activity after acute partial sleep deprivation in 12 healthy men aged 22 ± 3 y, BMI 22.30 ± 1.83 kg/m². During the first night of each 48-h session,

subjects had either 8-h or 4-h of sleep. All foods consumed subsequently were eaten ad libitum. Feelings of hunger, perceived pleasantness of the foods, desire to eat some foods, and sensation of sleepiness were also evaluated. In comparison with the 8-h sleep session, subjects consumed 559 ± 617 kcal (ie, 22%) more energy on the day after sleep restriction ($P < 0.01$), and preprandial hunger was higher before breakfast ($P < 0.001$) and dinner ($P < 0.05$). No change in the perceived pleasantness of the foods or in the desire to eat the foods was observed. Physical activity from 1215 to 2015 was higher after sleep restriction than after 8-h of sleep ($P < 0.01$), even though the sensation of sleepiness was more marked ($P < 0.01$).