Effect of the glycemic index of the diet on weight loss, modulation of satiety, inflammation, and other metabolic risk factors: a randomized controlled trial.


BACKGROUND: Low-glycemic index (GI) diets have been proven to have beneficial effects in such chronic conditions as type 2 diabetes, ischemic heart disease, and some types of cancer, but the effect of low-GI diets on weight loss, satiety, and inflammation is still controversial.

OBJECTIVE: We assessed the efficacy of two moderate-carbohydrate diets and a low-fat diet with different GIs on weight loss and the modulation of satiety, inflammation, and other metabolic risk markers.

DESIGN: The GLYNDIET study is a 6-mo randomized, parallel, controlled clinical trial conducted in 122 overweight and obese adults. Participants were randomly assigned to one of the following 3 isocaloric energy-restricted diets for 6 mo: 1) a moderate-carbohydrate and high-GI diet (HGI), 2) a moderate-carbohydrate and low-GI diet (LGI), and 3) a low-fat and high-GI diet (LF).

RESULTS: At weeks 16 and 20 and the end of the intervention, changes in body mass index (BMI; in kg/m²) differed significantly between intervention groups. Reductions in BMI were greater in the LGI group than in the LF group, whereas in the HGI group, reductions in BMI did not differ significantly from those in the other 2 groups (LGI: -2.45 ± 0.27; HGI: -2.30 ± 0.27; LF: -1.43 ± 0.27; F = 4.616, P = 0.012; pairwise comparisons: LGI compared with HGI, P = 1.000; LGI compared with LF, P = 0.016; HGI compared with LF, P = 0.061). The decrease in fasting insulin, homeostatic model assessment of insulin resistance, and homeostatic model assessment of β cell function was also significantly greater in the LGI group than in the LF group (P < 0.05). Despite this tendency for a greater improvement with a low-GI diet, the 3 intervention groups were not observed to have different effects on hunger, satiety, lipid profiles, or other inflammatory and metabolic risk markers.

CONCLUSION: A low-GI and energy-restricted diet containing moderate amounts of carbohydrates may be more effective than a high-GI and low-fat diet at reducing body weight and controlling glucose and insulin metabolism.

Acute ingestion of resistant starch reduces food intake in healthy adults.

Bodinham CL, Frost GS, Robertson MD

Resistant starch (RS), a non-viscous dietary fibre, may have postprandial effects on appetite regulation and metabolism, although the exact effects and mechanisms are unknown. An acute randomised, single-blind crossover study, aimed to determine the effects of consumption of 48 g RS on appetite compared to energy and available carbohydrate-matched placebo. Twenty young healthy adult males consumed either 48 g RS or the placebo divided equally between two mixed meals on two separate occasions. Effects on appetite were assessed, using an ad libitum test meal and 24-h diet diaries for energy intake, and using visual analogue scales for subjective measures. Changes to postprandial glucose, insulin and C-peptide were also assessed. There was a significantly lower energy intake following the RS supplement compared to the placebo supplement at both the ad libitum test meal (5241 (sem 313) v. 5606 (sem 345) kJ, P = 0.033) and over the 24 h (12 603 (sem 519) v. 13 949 (sem 755) kJ, P = 0.044). However, there was no associated effect on subjective appetite measures. Postprandial plasma glucose concentrations were not significantly different between supplements, but there was a significantly lower postprandial insulin response following the RS
supplement (P = 0.029). The corresponding C-peptide concentrations were not significantly different, although the ratio of C-peptide to insulin was higher following the RS supplement compared to placebo (P = 0.059). These results suggest that consumption of 48 g RS, over a 24-h period, may be useful in the management of the metabolic syndrome and appetite. Further studies are required to determine the exact mechanisms.


Resistant starch from high-amylose maize increases insulin sensitivity in overweight and obese men.

Maki KC1, Pelkman CL, Finocchiaro ET, Kelley KM, Lawless AL, Schild AL, Rains TM.

This study evaluated the effects of 2 levels of intake of high-amylose maize type 2 resistant starch (HAM-RS2) on insulin sensitivity S(I) in participants with waist circumference ≥89 (women) or ≥102 cm (men). Participants received 0 (control starch), 15, or 30 g/d (double-blind) of HAM-RS2 in random order for 4-wk periods separated by 3-wk washouts. Minimal model S(I) was assessed at the end of each period using the insulin-modified i.v. glucose tolerance test. The efficacy evaluable sample included 11 men and 22 women (mean ± SEM) age 49.5 ± 1.6 y, with a BMI of 30.6 ± 0.5 kg/m2 and waist circumference 105.3 ± 1.3 cm. A treatment main effect (P = 0.018) and a treatment × sex interaction (P = 0.033) were present. In men, least squares geometric mean analysis for S(I) did not differ after intake of 15 g/d HAM-RS2 (6.90 × 10⁻⁵ pmol⁻¹·L⁻¹·min⁻¹) and 30 g/d HAM-RS2 (7.13 × 10⁻⁵ pmol⁻¹·L⁻¹·min⁻¹), but both were higher than after the control treatment (4.66 × 10⁻⁵ pmol⁻¹·L⁻¹·min⁻¹) (P < 0.05). In women, there was no difference among the treatments (overall least squares ln-transformed mean ± pooled SEM = 1.80 ± 0.08; geometric mean = 6.05 × 10⁻⁵ pmol⁻¹·L⁻¹·min⁻¹). These results suggest that consumption of 15-30 g/d of HAM-RS2 improves S(I) in men. Additional research is needed to understand the mechanisms that might account for the treatment × sex interaction observed.


Resistant starch improves insulin sensitivity in metabolic syndrome.

Johnston KL1, Thomas EL, Bell JD, Frost GS, Robertson MD.

AIMS: Diets rich in non-viscous fibre are linked to a reduced risk of both diabetes and cardiovascular disease; however, the mechanism of action remains unclear. This study was undertaken to assess whether chronic consumption of this type of fibre in individuals with the metabolic syndrome would improve insulin sensitivity via changes in ectopic fat storage.

METHODS: The study was a single-blind, randomized, parallel nutritional intervention where 20 insulin resistant subjects consumed either the fibre supplement (resistant starch) (40 g/day) or placebo supplement (0 g/day) for 12 weeks. Insulin sensitivity was measured by euglycaemic-hyperinsulinaemic clamp and ectopic fat storage measured by whole-body magnetic resonance spectroscopy.

RESULTS: Resistant starch consumption did not significantly affect body weight, fat storage in muscle, liver or visceral depots. There was also no change with resistant starch feeding on vascular function or markers of inflammation. However, in subjects randomized to consume the resistant starch, insulin sensitivity improved compared with the placebo group (P = 0.023). Insulin sensitivity correlated significantly with changes in waist circumference and fat storage in tibialis muscle and to a lesser extent to visceral-to-subcutaneous abdominal adipose tissue ratio.

CONCLUSION: Consumption of resistant starch improves insulin sensitivity in subjects with the metabolic syndrome. Unlike in animal models, diabetes prevention does not appear to be directly related to changes in body adiposity, blood lipids or inflammatory markers. Further research to elucidate the mechanisms behind this change in insulin sensitivity in human subjects is required.
Baseline insulin sensitivity affects response to high-amylose maize resistant starch in women: a randomized, controlled trial
Barbara A. Gower, Richard Bergman, Darko Stefanovski, Betty Darnell, Fernando Ovalle, Gordon Fisher, S. Katherine Sweatt, Holly S. Resuehr and Christine Pelkman

BACKGROUND: Resistant starch (RS) is a type of dietary fiber that can improve glucose metabolism, but its effects may be modulated by sex or baseline insulin sensitivity. This study was designed to examine the effect of high-amylose maize resistant starch (HAM-RS2) on insulin sensitivity (SI) in women, and to determine if SI status affects the response to RS.

METHODS: This was a randomized, placebo-controlled, double-blind, cross-over study. Participants were 40 healthy, non-diabetic women aged 22–67 years in the normal-weight to obese BMI range (20.6–47.4 kg/m2). Two doses of HAM-RS2 were tested, 15 and 30 g per day, administered in the form of cookies. Participants were randomized to the order in which they received the experimental and placebo product. Each arm was 4 weeks, with a 4-week wash-out period in between. SI was assessed at the end of each 4-week arm of product consumption by frequently-sampled, insulin-modified, intravenous glucose tolerance test and minimal modeling. Participants were categorized as being insulin resistant (IR; SI < 7.8) or insulin sensitive (IS; SI ≥ 7.8) based on Gaussian analysis. The effect of treatment arm on SI was examined by mixed-model analysis within IR and IS sub-groups, using all available data. In addition, SI was examined by ANOVA among just those women who completed all three arms of the study with valid SI results.

RESULTS: Among IR participants, SI was on average ~16% higher after the 30 g arm when compared to the control arm by mixed-model analysis (n = 40, P < 0.05), and tended to be 23% higher by ANOVA among women who completed all arms (n = 23, P = 0.06). HAM-RS2 did not affect SI in IS women.

CONCLUSIONS: Consumption of HAM-RS2 at 30 g/day in the form of a snack food item was associated with improved insulin sensitivity in women with insulin resistance.

Clinical trials registry number: NCT01521806.

Resistant Starch Bagels Reduce Fasting and Postprandial Insulin in Adults at Risk of Type 2 Diabetes.
Dainty SA, Klingel SL, Pilkey SE, McDonald E, McKeown B, Emes MJ, Duncan AM.

BACKGROUND: Type 2 diabetes (T2D) incidence continues to rise. Although increasing dietary fiber intake is an established strategy for improved glycemic control, most adults consume insufficient amounts. Fiber-enhanced functional foods can increase fiber intake, and there is particular interest in resistant starch (RS) as a high-fiber ingredient. Studies show that high-amylose maize resistant starch, type 2 (HAM-RS2) improves acute and chronic glycemic responses, but more studies are needed in individuals at high risk of T2D with RS delivered in commonly consumed foods.

OBJECTIVE: The objective of this study was to examine the chronic effects of consuming bagels high in HAM-RS2 on fasting and postprandial glycemic markers in adults at increased risk of T2D.

METHODS: With the use of a randomized, double-blind crossover design, 24 men and women with a mean ± SE age of 55.3 ± 1.59 y and body mass index (in kg/m2) of 30.2 ± 0.57 consumed 1 bagel containing 25 g HAM-RS2/d or 1 control wheat bagel/d for 56 d each, separated by a 4-wk washout. Fasting and postprandial oral-glucose-tolerance test (OGTT) glucose and insulin were measured on study days 1 and 57 of each bagel treatment.

RESULTS: The RS bagel treatment resulted in significantly lower fasting (22.1%, P = 0.04), 2-h (23.3%, P < 0.008), and 3-h (18.9%, P = 0.05) insulin incremental areas under the curve and fasting insulin resistance (homeostasis model assessment of insulin resistance; 23.1%, P = 0.04) than did the control bagel treatment. Fasting and postprandial OGTT glucose concentrations did not differ between the RS and control bagel treatments on study days 1 or 57.

CONCLUSIONS: These data suggest that consumption of a high-HAM-RS2 bagel improves glycemic efficiency by reducing the amount of insulin required to manage postprandial glucose while improving fasting insulin sensitivity in adults at increased risk of T2D. This research provides support for a feasible dietary strategy for T2D risk reduction. This trial was registered at clinicaltrials.gov as NCT02129946.
The impact of green tea and coffee consumption on the reduced risk of stroke incidence in Japanese population: the Japan public health center-based study cohort.

Kokubo Y, Iso H, Saito I, Yamagishi K, Yatsuya H, Ishihara J, Inoue M, Tsugane S

BACKGROUND AND PURPOSE: Few prospective studies have examined the impact of both green tea and coffee consumption on strokes. We investigated the association of the combination of those consumption with stroke incidence in a general population.

METHODS: We studied 82 369 Japanese (aged 45-74 years; without cardiovascular disease [CVD] or cancer in 1995 and 1998 for Cohort I and II, respectively) who received 13 years of mean follow-up through the end of 2007. Green tea and coffee consumption was assessed by self-administered food frequency questionnaire at baseline.

RESULTS: In the 1 066 718 person-years of follow-up, we documented the incidence of strokes (n=3425) and coronary heart disease (n=910). Compared with seldom drinking green tea, the multivariable-adjusted hazard ratios (95% confidence intervals) of all strokes were 0.86 (0.78-0.95) and 0.80 (0.73-0.89) in green tea 2 to 3 and ≥ 4 cups/d, respectively. Higher green tea consumption was associated with inverse risks of CVD and strokes subtypes. Compared with seldom drinking coffee, the multivariable-adjusted hazard ratios (95% confidence intervals) of all strokes were 0.89 (0.80-0.99), 0.80 (0.72-0.90), and 0.81 (0.72-0.91) for coffee 3 to 6 times/week and 1 and ≥ 2 times/day, respectively. Coffee consumption was associated with an inverse risk of CVD and cerebral infarction. Higher green tea or coffee consumption reduced the risks of CVD and stroke subtypes (especially in intracerebral hemorrhage, P for interaction between green tea and coffee=0.04). None of the significant association was observed in coronary heart disease.

CONCLUSIONS: Higher green tea and coffee consumption were inversely associated with risk of CVD and stroke in general population.
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CONCLUSIONS: Higher green tea and coffee consumption were inversely associated with risk of CVD and stroke in general population.


Preventive role of green tea catechins from obesity and related disorders especially hypercholesterolemia and hyperglycemia

Ahmad RS, Butt MS, Sultan MT, Mushtaq Z, Ahmad S, Dewanjee S, De Feo V, Zia-Ul-Haq M.

BACKGROUND: During the last few years, scientific investigations have proposed diet based regimens to prevent several health ailments including obesity, hypercholesterolemia and diabetes. In this regard, a promising tool is the use of functional foods/nutraceuticals. Present research project was an attempt to explore nutraceutical worth of locally grown green tea variety (Qi-Men) against lifestyle related disorders.

METHODS: Functional drinks (T2 and T3) were prepared by adding catechins and epigallocatechin gallate (EGCG) @ 550 mg/500 mL and compared with control (T1). These functional drinks were tested in experimental rats modeling (Sprague Dawley). Based on diets, four studies were conducted i.e. trial-I (normal diet), trial-II (high cholesterol diet), trial-III (high sucrose diet), trial-IV (high cholesterol+high sucrose diet). Rats were monitored daily for their feed and drink intake while body weight was measured on weekly basis. After period of 56 days rats were sacrificed and evaluated their serum lipid (cholesterol, LDL and HDL), glucose and insulin levels.

RESULTS: Results for feed consumption by rats revealed that highest feed intake was recorded in group provided control drink than other groups. However, non significant differences were noted among all groups for drink consumption. Functional drinks resulted in significant reduction in body weight with maximum lowering noted in trial-II and III i.e. 10.73 to 8.49% and 10.12 to 10.49%, respectively. Likewise, cholesterol and LDL were substantially reduced with 14.42% decrease observed in trial-IV and 30.43% in trial-II, respectively. Furthermore, serum glucose and insulin levels were also lowered significantly in the trial-III and IV while in trial-I and II differences were non-significant. In contrast to lipid profile, experimental drink containing EGCG reduced the trait better than catechins based functional drink.

CONCLUSIONS: The drinks supplemented with catechins and EGCG are effective against obesity, hypercholesterolemia and hyperglycemia.


The anti-obesity effects of green tea in human intervention and basic molecular studies.


Many researchers have reported that obesity is a major risk factor for diabetes, cardiovascular diseases, several forms of cancer (such as breast, colon and prostate), pulmonary, osteoarticular and metabolic diseases in the past decades. Recently, the hypolipidemic and anti-obesity effects of green tea in animals and humans have slowly become a hot topic in nutritional and food science research. This review will up-date the information of the anti-obesity effects of green tea in human intervention and animal studies. During recent years, an increasing number of clinical trials have confirmed the beneficial effects of green tea on obesity. However, the optimal dose has not yet been established owing to the very different results from studies with a similar design, which may be caused by differences in the extent of obesity, dietary intake, physical activity intensity, the strength of subjects' compliance to test instruction, the genetic background of populations, body composition and dietary habits. Therefore, further investigations on a larger scale and with longer periods of observation and tighter controls are needed to define optimal doses in subjects with varying degrees of
metabolic risk factors and to determine differences in beneficial effects among diverse populations. Moreover, data from laboratory studies have shown that green tea has important roles in fat metabolism by reducing food intake, interrupting lipid emulsification and absorption, suppressing adipogenesis and lipid synthesis and increasing energy expenditure via thermogenesis, fat oxidation and fecal lipid excretion. However, the exact molecular mechanisms remain elusive.


The use of green coffee extract as a weight loss supplement: a systematic review and meta-analysis of randomised clinical trials.
Onakpoya I, Terry R, Ernst E.

The purpose of this paper is to assess the efficacy of green coffee extract (GCE) as a weight loss supplement, using data from human clinical trials. Electronic and non electronic searches were conducted to identify relevant articles, with no restrictions in time or language. Two independent reviewers extracted the data and assessed the methodological quality of included studies. Five eligible trials were identified, and three of these were included. All studies were associated with a high risk of bias. The meta-analytic result reveals a significant difference in body weight in GCE compared with placebo (mean difference: -2.47 kg; 95%CI: -4.23, -0.72). The magnitude of the effect is moderate, and there is significant heterogeneity amongst the studies. It is concluded that the results from these trials are promising, but the studies are all of poor methodological quality. More rigorous trials are needed to assess the usefulness of GCE as a weight loss tool.


Roles of chlorogenic Acid on regulating glucose and lipids metabolism: a review.
Meng S, Cao J, Feng Q, Peng J, Hu Y.

Intracellular glucose and lipid metabolic homeostasis is vital for maintaining basic life activities of a cell or an organism. Glucose and lipid metabolic disorders are closely related with the occurrence and progression of diabetes, obesity, hepatic steatosis, cardiovascular disease, and cancer. Chlorogenic acid (CGA), one of the most abundant polyphenol compounds in the human diet, is a group of phenolic secondary metabolites produced by certain plant species and is an important component of coffee. Accumulating evidence has demonstrated that CGA exerts many biological properties, including antibacterial, antioxidant, and anticarcinogenic activities. Recently, the roles and applications of CGA, particularly in relation to glucose and lipid metabolism, have been highlighted. This review addresses current studies investigating the roles of CGA in glucose and lipid metabolism.