The Effects and Benefits of Flavonoids on Coronary Heart Disease

Introduction

The mysterious effects of flavonoids in foods such as wines, teas, and dark chocolate has had food scientists and researchers curious of what health benefits they have in moderate intakes overtime. Flavonoids have been said to have strong anti-inflammatory, antioxidant, antithrombotic and endothelial properties. In the study Intake of Specific Flavonoid Classes and Coronary Heart Disease a Case Control Study in Greece, 329 coronary infraction patients and 570 control patients’ flavonoid intakes were measured by a food frequency questionnaire as well as their odds ratio of flavonoid intake and risk of coronary heart disease. This study had a statistically significant result in that flavan-3-ols decreased coronary heart disease risk by 24% yet other classes of flavonoids had no statistical significance. In the second study Grape Polyphenols Do Not Affect Vascular Function in Healthy Men the randomized double blind study consisted of 35 men ages 18 to 45 years who consumed 800 mg of polyphenols. The effects of the polyphenol capsules on flow mediated dilation was measured after the consumption of a low-fat breakfast and high-fat lunch. The measurements concluded that FMD was not significantly affected by the polyphenols, showing that polyphenol flavonoids have no significant effect on blood flow to the heart and coronary heart disease prevention. In comparison to both of these studies we found
that the effect of consuming foods high in flavonoids and polyphenols has no significant effect on the prevention of coronary heart disease.

Discussion

In the study *Intake of Specific Flavonoid Classes and Coronary Heart Disease- a Case-Control Study in Greece* the objective was to see how different flavonoids, for example flavan-3-ols and flavanones, have an effect on the risk of coronary heart disease being reduced. The study was a hospital based case control study where food frequency questionnaires were handed out to 329 patients with a coronary infraction and 570 control patients between January 1990 and April 1991 in Athens, Greece. The food frequency questionnaire included 110 foods and each patient had to record how often they consumed each food on the list. The foods were measured based on their flavonoid content so that the researches could measure how much on average each patient consumed foods containing flavonoids. Another questionnaire was also given out with dietary and non-dietary cardiovascular disease risks including gender, place of residence, education, BMI, blood pressure, exercise, smoking status, alcohol intake, coffee intake, and total energy and saturated fat intake. Based on the data obtained from the questionnaires, flavonol content was measured in cross tabulations and put into six categories of flavonal intake then an odds ratio was measured by taking coronary heart disease incidences per increment of each evaluated category of flavonoids intake. The results from the odds ratios showed that the effect of the flavonoid flavan-3-ol had a significant effect (p=0.03) against the risk of coronary heart disease.
This study was very specific on how each patient averaged out their flavonoid intake from the questionnaire and how each different flavonoid had either an effect on coronary heart disease or it did not. The odds ratio per an increment of flavonoid intake to coronary heart disease risk was a good indication on how much flavonoid intake had an effect on each patients' risk. Also taking into consideration dietary and non-dietary risk factors of coronary heart disease was a great way of showing that despite bad health habits, flavonoids can help prevent heart problems.

This study definitely had its limitations. A food frequency questionnaire can be very inaccurate due to the fact that patients are not always precise when answering questions and recalling what they typically eat. Patients' answers for the food frequency questions can yield unclear data. In addition, the record does not take into consideration the fact that some of the patients may develop coronary heart disease in the future despite a high flavonoid intake.

Based on how this study was presented and the methods used, I do not support the evidence that flavonoids help to prevent coronary heart disease because a food frequency questionnaire is an inaccurate method of measuring average total intake. Food frequency questionnaires are more of an estimate of usual consumption instead of an accurate depiction of each of the subject’s diets, making the results inaccurate. Also, the data showed that only one flavonoid out of seven had a significant effect on decreasing the risk of coronary heart disease. If flavanols had a positive correlation on lowering the risk of heart disease there would be more significant results in each of the seven categories of flavanols.
On the opposing side of the association between polyphenols and a lowered risk of coronary heart disease is the study *Grape Polyphenols Do Not Affect Vascular Function in Healthy Men*, in which there were no significant differences in those who took a polyphenol supplement compared with the placebo-control group. This study discusses the “French paradox” link between a diet rich in saturated fat and low mortality rates associated with coronary heart disease. Red wine is a great source of polyphenols which increased the production of nitric oxide, leading to vasodilation, according to in-vitro studies.

FMD (noninvasive flow-mediated dilation) is a method used to assess endothelial function. Endothelial function is a determinant of future cardiovascular occurrences. An ultrasound is used to measure brachial artery diameter before inflation of a BP cuff on the forearm to induce ischemia. The artery diameter is measured again once the cuff is released to give a percent increase in the size of the brachial artery diameter. The inflation is directly caused by nitric oxide, so the FMD value is that of the amount of nitric oxide available in the body.

There is limited research in randomized, controlled studies that show a positive correlation between consumption of polyphenols and a lowered risk of coronary heart disease and most previous studies used participants with elevated CVD risk rather than healthy heart patients. This study focuses on healthy male patients with no coronary problems and assesses the possible change in endothelial function as well as other cardiovascular health markers throughout one month of polyphenol supplementation. The study was a double blind and randomized full crossover design. A baseline assessment was done after an initial three day run-in period. Measurements were also
taken after three two-week interventions. The group of participants consisted of 35 men aged 18-45 with a BMI between 18-32. They had to have no current or previous metabolic diseases, CVD, or gastrointestinal disorders. Participants also couldn’t have blood pressure, blood markers, plasma liver enzymes, fasting serum lipids, glucose markers, or urinary protein levels outside of the reference range, as well as lifestyle habits that may affect the outcome of the study.

Participants were randomly divided into three groups: each took supplements of polyphenols either from a wine-grape mix (Provinols) or grape seed (Leucoselect), or in the case of the control group, a placebo (micro-crystalline cellulose). The grape seed and wine-grape mix had previously shown an effect on vascular function in animal studies. The supplement was taken daily for six weeks and effects were studied after a low-fat breakfast (~751kJ, 25% fat) and three hours after a high-fat lunch (3136kJ, 78% fat) because previous studies have found that red wine “might counteract endothelial dysfunction caused by a vascular function stressor, such as cigarette smoking or a high-fat meal” (Mierlo, 2010 (14, 19, 27-29)). The men were required to refrain from taking any other vitamin supplementation from the screening day until the completion of the study and were given standardized meals in the last few days before the study began. All participants had to fast for ten hours from foods and eight hours from drinks except water for the beginning of the study and then on the day the study began they were served foods low in flavonoids, antioxidants, glucose, caffeine, and fat. The supplement came in the form of six capsules that amounted to 800 mg of polyphenols (other than the placebos). An HPLC analysis showed that the polyphenols contained different amounts of catechins, anthocyanins, phenolic acids, flavonols, and stilbenes, but the
majority of the polyphenols were unidentified oligomers and polymers. For the first two week treatment, participants took three capsules a day with breakfast and three with dinner but during the test day after each treatment period the second set of capsules was taken with a high-fat lunch. Measurements were taken after breakfast and three hours after lunch. Weight was measured without heavy clothing and shoes, height was measured using a wall-mounted stadiometer, and the two were used together to compute BMI.

FMD levels after both a low-fat breakfast and a high-fat lunch had no significant effect on vascular function. The wine grape solid treatment yielded a result of -0.4% (95% Cl= -1.8 to 0.9; P= 0.77) and the grape seed solids yielded a result of 0.2% (95% Cl= -1.2 to 1.5; P= 0.94), both of which were not significant differences in terms of FMD. After the high fat period, the wine grape solid results were 0.7% (95% CI= -0.6 to 2.0; P= 0.49) and -0.2% (95% CI= -1.5 to 1.1; P= 0.94) for the grape seed solids. Blood pressure was not affected, nor was heart rate, pulse wave transit time, or arterial elasticity in the large and small arteries. Platelet function and serum lipids did not change with the supplementation. Serum total cholesterol showed to be lower after breakfast and lunch but otherwise the measured features of this study had no significant deviation from the status before the addition of polyphenols. Serum LDL and HDL cholesterol concentrations did not change.

This was a strong study for several reasons. Only men were used so as to eliminate the hormone fluctuating in women and all the exclusion factors helped to keep a good sample for the study. The study design allowed for no bias so that strengthened the study and its results as well. Limitations included the length of the study. Six weeks
isn’t sufficient time to get thorough results. The results for lipid profiles and platelet function weren’t consistent and may need blood sampling to confirm findings.

Conclusion

Overall, based on the two articles regarding polyphenols and their effects on vascular function, the studies showed that they do not have a significant effect on vascular function and coronary heart disease. The results weren’t in favor of polyphenols having a positive significance for the body. In future studies perhaps individuals with heart problems will be studied and perhaps other supplements could be tested. For now, polyphenols in red wine and grapes do not affect one’s prevention of coronary heart disease.