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File: ■ Garlic (*Allium sativum*)
■ Serum Lipids
■ Cholesterol

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RE: Meta-analysis of the Effect of Garlic on Serum Lipid Levels

Ried K, Toben C, Fakler P. Effect of garlic on serum lipids: an updated meta-analysis. *Nutr Rev*. May 2013;71(5):282-299.

Having high cholesterol or other lipid concentrations is a risk factor for cardiovascular disease (CVD). Statins are a common pharmaceutical intervention to decrease cholesterol or triglyceride concentrations; however, adverse side effects such as muscle or cognitive problems, or increased diabetes risk, have been reported with statin use. Thus, alternative therapies are important. Garlic (*Allium sativum*) has been shown to decrease cholesterol in previous studies and is used to mitigate various CVD risk factors.[1] This meta-analysis focused on impacts of garlic on total cholesterol (TC), low-density lipoprotein cholesterol (LDL), high-density lipoprotein cholesterol (HDL), and triglyceride concentrations.

Databases searched included Medline, Cochrane, and Google Scholar. Included studies were published in English or German, randomized, placebo-controlled clinical trials, addressing garlic's effects on cholesterol from 1955 to December 2011. Search terms were "garlic," "allium sativum," "allicin," "cholesterol," "hyperlipidemia," and "lipid." Inclusion criteria also consisted of treatment equal to or greater than 2 weeks, use of a placebo, enrollment of adult participants, and use of garlic alone. Exclusion criteria were missing data, studies that included pregnant participants or those who were taking drugs for the lowering of cholesterol, used a combination treatment, did not have a placebo, included children or patients with kidney transplant, reported low compliance or elevated loss to follow-up, or included subjects from another study. Study quality was also measured with emphasis on randomization, blinding, follow-up loss, funding, and compliance. Studies were scored on these criteria to yield a total potential score of 5. Studies with ≤ 2 or greater than 20% attrition were excluded from the analysis.

From the search, of the 63 trials found, 39 were included in this study with data on TC, LDL, HDL, or triglyceride concentrations. From the included trials, 2,298 subjects had an average age of 49.5 years. A parallel design was used in 32 trials, and a crossover design was used in 5. The trials used garlic powder (600-5,600 mg/day), garlic oil (9-18 mg/day), aged garlic extract (1,000-7,200 mg/day), or raw garlic (4-10 g/day). It is stated

that the various dosages and preparations are of limited comparability due to compound variation. Quality assessment of trials showed that most included descriptions of randomization, blinding, and placebo. Only 2 trials had more than 20% follow-up loss; compliance was high (n=15). Financial support from industry was reported for 13 trials.

From the analysis of trials that reported data for TC concentrations, garlic significantly lowered TC as compared to placebo (mean difference = -15.25 mg/dl, 95% confidence intervals [CIs], -20.72, -9.78 mg/dl, P<0.0001). The most common preparation was garlic powder (n=24), followed by aged garlic extract (n=5), and raw garlic (n=2). Significant effects with garlic preparations were seen with garlic powder (P<0.0001), aged garlic extract (P<0.001), and raw garlic (P<0.0001). A significant effect was also observed with enteric-coated garlic powder tablets (P<0.0003).

Of the total, 26 trials included data for LDL concentrations. A significant decrease of LDL was seen in those taking garlic as compared to the placebo group (mean difference = -6.41 mg/dl, 95% CI, -11.77, -1.05 mg/dl, P=0.02). This was seen more strongly in trials with a longer treatment period (P=0.01), elevated mean TC concentrations at baseline (P=0.0004), and trials without industry support (P=0.04). A significant effect of garlic preparation was seen with trials using garlic powder (P=0.04, n=19). The use of enteric-coated garlic powder tablets, different trial arms, low quality of the study, or the use of subjects taking other medication had no effect on the results.

Thirty trials assessed HDL concentrations and reported a significant effect (mean difference = 1.49 mg/dl, 95% CI, 0.19, 2.69 mg/dl, P=0.02). Of the preparation types, garlic oil provided the most significant impact (P=0.007, n=6). There were no significant effects of garlic on triglyceride concentrations (n=32). Of those in treatment groups, 7% reported instances of adverse side effects, but the number of these patients was not different when compared to the placebo groups. Gastrointestinal problems such as bloating and belching were observed, but not correlated to garlic preparation. Also, no publication bias was found.

In conclusion, garlic supplementation was effective in decreasing TC and LDL, and significantly elevated HDL, while being well tolerated. In particular, the decrease in TC is considered clinically relevant in those with elevated cholesterol at baseline; however, the bioavailability of garlic compounds is variable with preparation and form. Limitations mentioned of this meta-analysis include heterogeneity with treatment duration or varying levels of certain parameters at baseline. Also, the active compounds in the garlic preparations were unknown. It is surmised that standardization of garlic or preparations, as well as dosage based on active compounds, should be included in future clinical trials.

—Amy C. Keller, PhD

Reference

[1]Blumenthal M, Goldberg A, Brinckmann J, eds. *Herbal Medicine: Expanded Commission E Monographs*. Austin, TX: American Botanical Council; Newton, MA: Integrative Medicine Communications; 2000.

The American Botanical Council has chosen not to include the original article.