

Garlic & Health by Ann Gerhardt, MD

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Bottom Line at the Top: Crushed garlic and garlic extracts block clotting by inhibiting platelet aggregation and this effect may prevent clogged arteries and heart disease. Claims that garlic lowers cholesterol, acts as an anti-oxidant, cures diabetes or prevents cancer lack definitive proof. Allicin is probably not the active component.

I thought garlic would be a simple, herb-with-some-data-a-lot-of-hype-some hope-subject for an article. Fat chance. It seems a basic premise was remiss. Until recently most people were convinced that allicin, a sulfur-containing constituent of crushed garlic, was responsible for garlic's health effects. Manufacturers standardize their garlic supplements according to the percent allicin. Scientists verify that their garlic tablets should work by documenting the allicin content. If for no other reason, it smells the worst, so it must be the healthiest part of the bulb.

It turns out that a lot or a little allicin in garlic supplements make no difference to health effects. Supplements with equivalent allicin content produce different study results. Allicin is not even absorbed intact into the body. Since supplements used in studies have been standardized to allicin content, it makes interpretation of their results problematic.

Medicinal Uses: Garlic (*Allium sativum*) is one of the most commonly used cooking spices and medicinal herbs. Its aroma has attracted and repulsed for years, inspiring such common manes as stinking rose, nectar of the gods and camphor of the poor.

Over the years, people have used it to treat leprosy, clotting disorders, deafness, TB (inhaling garlic dust), dropsy, smallpox, earaches, flatulence, Candida infections, diabetes, toothache, sore throat, worms, asthma and scurvy. More recently, it is used to prevent or reverse heart disease, improve the immune system, prevent cancer, normalize cholesterol and blood pressure, and cure cataracts and disturbances of the gastrointestinal tract, like colic, flatulence and dyspepsia.

Garlic kills a variety of bacteria and fungi when applied directly to them (as on skin). The powder is more active than garlic-in-oil. Russian army physicians treated infected wounds with garlic when antibiotics were scarce in WWII. Allicin was patented as an antifungal, however it never advanced to a commercial product.

Ingesting 1200 mg garlic daily repels ticks slightly better than placebo, but the dose, equivalent to ~ 3 cloves garlic/day, would be guaranteed to repel most humans, too.

Published by

HEALTHY CHOICES FOR MIND AND BODY

Written by Ann Gerhardt, MD

Long ago it was the remedy of choice for serpent or vampire bites.

Cholesterol: Some have hypothesized that the lower-than-normal incidence of heart disease in some Mediterranean countries may in part be due to the routine consumption of garlic. Lowering cholesterol is one way that garlic might prevent heart disease. In liver cell cultures, water extracts of garlic block cholesterol synthesis by 30-87%. Other types of extracts, fresh garlic and aged garlic extract (AGE) are not as potent. Pure alliin or allicin are totally ineffective at lowering cholesterol. **A number of sulfur-containing compounds found in garlic, including ajoene and S-allyl cysteine (SAC), each decrease cholesterol production in cell cultures by 40-50%, but whole garlic extract works better.**

Scientists disagree about which step of the cholesterol production pathway garlic blocks. Some suggest that it blocks the same enzyme as do the statin drugs Lipitor and Crestor, while others find inhibition of a different enzyme (4- α -methyl oxidase) or multiple enzymes. But does this test tube effect translate into real cholesterol improvement in people who take it by mouth?

Over 100 animal studies generally (but not always) confirm garlic's cholesterol-lowering effect, but require a huge amount of garlic (up to 2% of their total food weight). A comparable dose for humans would be 4-5 cloves of garlic daily: You might have a better cholesterol level, but at the expense of no close (literally and figuratively) friends.

On average cholesterol-lowering trials in people yield a 10% cholesterol reduction using fresh garlic, garlic powder, garlic oil or AGE. Effects on triglycerides and HDL-cholesterol are less convincing. Dosages range from ½ to 5 cloves (or the equivalent powder or extract) per day. Conclusions about dose are difficult, because the same dose that lowered cholesterol in one trial might be ineffective in another.

A very well-designed study published this year seemingly buries any notion that garlic lowers cholesterol in humans. The Stanford investigators compared 1 clove per day of fresh garlic to 4 Garlicin tablets (garlic powder) or 6 Kyolic (AGE) capsules, standardized to their allicin content. After 26 weeks people with initially high LDL-cholesterol had absolutely no

improvement of their cholesterol levels. It is hard to reconcile these results with the many others that showed cholesterol reduction, but many of the others had methodological short-comings.

Coronary heart disease: Though garlic inconsistently affects animals' and human's cholesterol levels, repeated animal studies show that high garlic doses keep their arteries clean, without the plaque build-up that causes heart attacks and stroke. Kyolic reduces the fat and cholesterol accumulation in rat aortas and blocks thickening of the artery walls.

Garlic may also protect against vascular disease by means other than cholesterol. **More than one of garlic's sulfur compounds inhibit blood clotting by impairing platelet aggregation and speeding up fibrinolysis (the breakdown of clot).** It also may open up arteries, leading to lower blood pressure, as it does in rats. Inconclusive evidence suggests that garlic acts as an anti-oxidant, and decreases calcium build-up in coronary arteries. Cardiac patients taking garlic oil were able to walk farther, with a lower heart rate. Garlic tablets did not help patients with bad leg circulation.

Diabetes: Some tout garlic as a treatment for diabetes, but in well-designed studies it does not significantly lower glucose. If garlic is good for diabetics, it is probably due to its beneficial vascular effects, since clogged arteries cause most lethal diabetic complications.

Cancer: Those who eat diets high in garlic and onion have 60% less stomach cancer. Claims for a protective effect of garlic against breast and prostate cancers have not yet been proven. Test tube experiments hint that garlic's sulfur compounds inactivate ingested carcinogens and down-shift the liver's conversion of charred meat's pre-carcinogens into carcinogens. Whether this occurs in humans after consuming garlic is unknown.

Allicin dilemma: Allicin is not present in raw garlic, though garlic is full of natural sulfur-containing chemicals responsible for its sharp taste and strong smell. Raw garlic contains alliin, with little smell and no apparent biologic function. Crushing garlic liberates alliin from one compartment, and the enzyme allinase, which is released from another compartment, converts it to allicin. Allicin confers the really sharp aspect to crushed garlic's odor.

Allicin blood levels are undetectable in the body after even excessive (10 cloves) garlic consumption. This is probably because allicin is unstable and degrades to another sulfur substance (allyl-methyl-sulfide) in the stomach. That compound and others pass through the gut into the liver where they are further modified, then carried by the bloodstream to the lungs and skin. For hours to days later, they escape as garlic breath and body odor, reminding your friends about your recent garlic meal.

Allicin's chemical instability makes it unlikely that it has any health benefits. Independent laboratory analysis of supplements often show little or no allicin in tablets and oil capsules on the market. Some manufacturers have attempted to maximize allicin's bioavailability (absorption into the body in a usable form) with an enteric coating to protect it from stomach acid, without much success.

Must it smell to be good? Those who believe that the smelly substances in garlic confer its medicinal qualities dispute the therapeutic value of deodorized garlic. But allicin, which contributes significantly to garlic's smell has not been proven to be responsible for garlic's health benefits. Most studies demonstrating garlic's health benefits used cooked garlic, pickled garlic, aged garlic, and AGE. All of them have little typical garlic odor, refuting the idea that garlic must reek to be good.

Composition: Garlic contains dozens of sulfur-containing compounds. Though individual compounds, such as SAC, seem to be biologically active and are absorbed by the body, it is likely that multiple compounds act in synergy for medicinal effects. Other members of the Allium plant genus, like leeks, onions, chives and shallots, contain lesser amounts of these same sulfur compounds. Garlic contains vitamin B6, vitamin C, flavonoids, germanium, selenium and manganese. Their quantities in garlic are probably too small to confer health benefits.

Significant variability: Garlic's chemical make-up varies depending on where it was grown and even from bulb to bulb. How garlic is processed to form pills and capsules further affects its composition. Whole garlic cloves, garlic crushed in oil, steam-distilled garlic oil and garlic powders all have different amounts of each sulfur-containing compound. Depending on the preparation, there might be zero to 100% of the amount found in crushed garlic.

Composition also changes over time during storage and is affected by heat. Allicin decomposes slowly over time and rapidly with heating, which is why garlic's odor mellows with cooking. Crushed garlic's ability to inactivate platelets lasts 10 months if stored at less than 45°F and is gone after 10 minutes of boiling or 400°F heat. Uncrushed garlic loses its ability to block platelet aggregation after 6 minutes of boiling or high heat. Microwaving inactivates the least. The most active garlic is freshly crushed and uncooked.

Side effects: Garlic's ability to inhibit clotting by inactivating platelets might lead to bleeding, so garlic supplements should not be taken with warfarin (coumadin) or anti-platelet drugs such as aspirin or Plavix. **It should be stopped one week prior to surgery.** Fresh garlic extract may elicit burning of mouth, esophagus and stomach, non-bacterial halitosis, nausea, sweating and lightheadedness. Garlic dust induces asthma. Garlic-in-oil preparations have

caused botulism. Strong oils and pastes applied directly to the skin have caused burns, particularly on children. Some babies who are breast fed by mothers who eat garlic are slow to feed and later smell like garlic-breath.