

Garlic and Cancer Prevention: Questions and Answers

Key Points

- Preliminary studies suggest that garlic consumption may reduce the risk of developing several types of cancer, especially cancers of the gastrointestinal tract (see Questions 3 and 4). Most of the studies evaluated different types of garlic preparations and used them in varying amounts (see Question 5).
- If garlic consumption does reduce the risk of developing cancer, the amount needed to lower risk remains unknown (see Question 7).
- Although usual garlic consumption rarely causes problems, higher intakes can cause side effects, including gastrointestinal distress (see Question 8).

The information included in this fact sheet is not to be used as the basis for a health claim.

1. What is garlic?

Garlic is a vegetable (*Allium sativum*) that belongs to the Allium class of bulb-shaped plants, which also includes onions, chives, leeks, and scallions. Garlic is used for flavoring in cooking and is unique because of its high sulfur content. In addition to sulfur, garlic also contains arginine, oligosaccharides, flavonoids, and selenium, all of which may be beneficial to health (1).

The characteristic odor and flavor of garlic comes from sulfur compounds formed from allicin, the major precursor of garlic's bioactive compounds, which are formed when garlic bulbs are chopped, crushed, or damaged (2). Bioactive compounds are defined as substances in foods or dietary supplements, other than those needed to meet basic nutritional needs, that are responsible for changes in health status.

2. What are the types of garlic preparations?

Garlic supplements can be classified into four groups: Garlic essential oil, garlic oil macerate, garlic powder, and garlic extract.

- *Garlic essential oil* is obtained by passing steam through garlic. Commercially available garlic oil capsules generally contain vegetable oil, but only have a small amount of garlic essential oil because of its strong odor.
- *Garlic oil macerate* products are made from encapsulated mixtures of whole garlic cloves ground into vegetable oil.
- *Garlic powder* is produced by slicing or crushing garlic cloves, then drying and grinding them into powder. Garlic powder is used as a flavoring agent for condiments and food and is thought to retain the same ingredients as raw garlic.
- *Garlic extract* is made from whole or sliced garlic cloves that are soaked in an alcohol solution (an extracting solution) for varying amounts of time. Powdered forms of the extract also are available (3, 4).



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3. Do findings from *population studies* offer evidence that garlic may prevent cancer?

Several population studies show an association between increased intake of garlic and reduced risk of certain cancers, including cancers of the stomach, colon, esophagus, pancreas, and breast. Population studies are multidisciplinary studies of population groups that investigate the cause, incidence, or spread of a disease or examine the effect of health-related interventions, dietary and nutritional intakes, or environmental exposures. An analysis of data from seven population studies showed that the higher the amount of raw and cooked garlic consumed, the lower the risk of stomach and colorectal cancer (5).

The European Prospective Investigation into Cancer and Nutrition (EPIC) is an ongoing multinational study involving men and women from 10 different countries. This study is investigating the effects of nutrition on cancer. In the study, higher intakes of onion and garlic were associated with a reduced risk of intestinal cancer (6).

The Iowa Women's Study is a large prospective study investigating whether diet, distribution of body fat, and other risk factors are related to cancer incidence in older women. Findings from the study showed a strong association between garlic consumption and colon cancer risk. Women who consumed the highest amounts of garlic had a 50 percent lower risk of cancer of the distal colon compared with women who had the lowest level of garlic consumption (7).

Several population studies conducted in China centered on garlic consumption and cancer risk. In one study, investigators found that frequent consumption of garlic and various types of onions and chives was associated with reduced risk of esophageal and stomach cancers, with greater risk reductions seen for higher levels of consumption (8). Similarly, in another study, the consumption of allium vegetables, especially garlic and onions, was linked to a reduced risk of stomach cancer (9). In a third study, greater intake of allium vegetables (more than 10 g per day vs. less than 2.2 g per day), particularly garlic and scallions, was associated with an approximately 50 percent reduction in prostate cancer risk (10).

Evidence also suggests that increased garlic consumption may reduce pancreatic cancer risk. A study conducted in the San Francisco Bay area found that pancreatic cancer risk was 54 percent lower in people who ate larger amounts of garlic compared with those who ate lower amounts (11).

In addition, a study in France found that increased garlic consumption was associated with a statistically significant reduction in breast cancer risk. After considering total calorie intake and other established risk factors, breast cancer risk was reduced in those consuming greater amounts of fiber, garlic, and onions (12).

4. Do findings from *clinical trials* offer evidence that garlic may prevent cancer?

Few clinical trials (research studies with people) have been done to examine the potential anticancer effects of garlic.

Three randomized clinical trials have evaluated the effect of garlic intake on gastric cancer risk. In one study, which involved over 5,000 Chinese men and women at high risk for stomach cancer, researchers compared the effects of taking a combination of 200 mg synthetic allitridum (an extract of garlic used as a medicine in China for over 3,000 years) daily and 100 micrograms selenium every other day with taking a placebo (an inactive substance or treatment that looks the same as, and is given the same way as, an active drug or treatment being tested) for 5 years. In the group that received allitridum and selenium, the risk for all tumors combined was reduced by 33 percent and the risk for stomach cancer was reduced by 52 percent in comparison with the group that received only the placebo (13).

In contrast, findings from another randomized trial involving individuals with precancerous stomach lesions found that garlic supplementation (800 mg garlic extract plus 4 mg steam-distilled garlic oil daily) did not improve the prevalence (number of existing cases) of precancerous gastric lesions or reduce the incidence (number of new cases) of gastric cancer (14).

A third randomized study in Japan compared the effects of daily high-dose (2.4 mL) and low-dose (0.16 mL) intake of aged-garlic extract after 6 and 12 months of use on individuals with colorectal adenomas (noncancerous tumors). At the end of 12 months, 67 percent of the low-intake group developed new adenomas compared with 47 percent in the high-intake group (15).

The results of a small, nonrandomized study indicate that the application of garlic extracts to some skin tumors may be beneficial. In the study, which involved 21 persons with basal cell carcinoma, the application of ajoene (a sulfurous chemical found in garlic) to the skin for 1 month markedly decreased the size of 17 tumors, increased tumor size in 3 patients, and resulted in no change in 1 other patient (16). Changes in tumor size ranged from an 88 percent reduction to a 69 percent increase, with an overall median reduction of 47 percent.

5. What are the current issues and controversies surrounding the use of garlic in cancer prevention?

Study limitations, including the accuracy of reporting the amounts and frequency of garlic consumed, and the inability to compare data from studies that used different garlic products and amounts make an overall conclusion about garlic and cancer prevention extremely difficult. Since many of the studies looking at garlic use and cancer prevention have used multi-ingredient products, it is unclear whether garlic alone or in combination with other nutritional components may have the greatest effect.

Well-designed dietary studies in humans using predetermined amounts of garlic (intervention studies) are needed to determine potentially effective intakes. Studies directly comparing various garlic preparations are also needed.

6. How might garlic act to prevent cancer?

Protective effects from garlic may arise from its antibacterial properties (17) or from its ability to block the formation of cancer-causing substances (18), halt the activation of cancer-causing substances (19), enhance DNA repair (20), reduce cell proliferation, or induce cell death (10).

7. How much garlic may be useful for cancer prevention?

The National Cancer Institute, part of the National Institutes of Health, does not recommend any dietary supplement for the prevention of cancer, but recognizes garlic as one of several vegetables with potential anticancer properties. Because all garlic preparations are not the same, it is difficult to determine the exact amount of garlic that may be needed to reduce cancer risk. Furthermore, the active compounds present in garlic may lose their effectiveness with time, handling, and processing. The World Health Organization's (WHO) guidelines for general health promotion for adults is a daily dose of 2 to 5 g of fresh garlic (approximately one clove), 0.4 to 1.2 g of dried garlic powder, 2 to 5 mg of garlic oil, 300 to 1,000 mg of garlic extract, or other formulations that are equal to 2 to 5 mg of allicin.

8. What are the safety considerations?

Although garlic has been used safely in cooking, excessive consumption can cause some side effects, in addition to strong breath and body odors (4, 21). Garlic occasionally causes allergies that can range from mild irritation to potentially life-threatening problems. Ingestion of fresh garlic bulbs, extracts, or oil on an empty stomach may occasionally cause heartburn, nausea, vomiting, and diarrhea. Some animal and human studies suggest that garlic can lower blood sugar levels and increase insulin.

Garlic has been shown to interfere with several prescription drugs, especially the HIV medication saquinavir (brand names Invirase® and Fortovase®). Garlic can lower the serum levels of saquinavir by as much as 50 percent (22). Garlic also acts as a natural blood thinner and, thus, should be avoided by pregnant women, people about to undergo surgery, and people taking blood thinners, such as warfarin (brand name Coumadin®).

Garlic bulbs are sometimes contaminated with the bacterium *Clostridium botulinum*. *C. botulinum* can grow and produce botulinum toxin in garlic-in-oil products that are not refrigerated and do not contain antibacterial agents.

In addition, chemical burns, contact dermatitis, and bronchial asthma can occur when garlic is applied to the skin. Garlic should also be avoided by people who are prone to stomach conditions, such as ulcers, as it can exacerbate the condition or cause new ones (4).

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Related NCI materials and Web pages:

- National Cancer Institute Fact Sheet 6.7, *Cancer: Questions and Answers* (<http://www.cancer.gov/cancertopics/factsheet/Sites-Types/general>)
- NCI's Complementary and Alternative Medicine Home Page (<http://www.cancer.gov/cancertopics/treatment/cam>)
- *What You Need To Know About™ Cancer* (<http://www.cancer.gov/cancertopics/wyntk/overview>)

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