

Significance of Garlic and Its Constituents in Cancer and Cardiovascular Disease

Is Garlic Alternative Medicine?¹⁻³

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ABSTRACT Garlic has been used medicinally since antiquity. In virtually every early civilization known, such as ancient India, Egypt, Rome, China, and Japan, garlic was part of the therapeutic regimen for a variety of maladies. Therefore, the ancient medicinal tradition of garlic use would qualify it as a folk medicine or as an alternative or complementary medicine. But is garlic an alternative to established methods of disease prevention or treatment? Scientists from around the world have identified a number of bioactive substances in garlic that are water soluble (e.g., S-allyl methylcysteine), and fat soluble (e.g., diallyldisulfide). Mechanisms of action are being elucidated by modern technology. The validity of ancient medicine is now being evaluated critically in cell-free systems, animal models, and human populations. Preventive and therapeutic trials of garlic are still in early stages. There are many promising lines of research suggesting the potential effects of garlic. The current state of knowledge does not recognize garlic as a true alternative, but it will likely find a place for garlic as a complement to established methods of disease prevention and treatment. Our goal should be to examine garlic together with other agents to evaluate its possible efficacy and toxicity under conditions of actual use in humans. *J. Nutr.* 136: 713S-715S, 2006.

KEY WORDS: • garlic • alternative medicine • cancer prevention • antioxidant • anticoagulant • complementary medicine

The use of garlic dates to antiquity. Biblical references note that when the Jews left Egypt, they missed their garlic. Virtually

¹ Published in a supplement to *The Journal of Nutrition*. Presented at the symposium "Significance of Garlic and Its Constituents in Cancer and Cardiovascular Disease" held April 9-11, 2005 at Georgetown University, Washington, DC. The symposium was sponsored by Strang Cancer Prevention Center, affiliated with Weill Medical College of Cornell University, and Harbor-UCLA Medical Center, and co-sponsored by American Botanical Council, American Institute for Cancer Research, American Society for Nutrition, Life Extension Foundation, General Nutrition Centers, National Nutritional Foods Association, Society of Atherosclerosis Imaging, Susan Samueli Center for Integrative Medicine at the University of California, Irvine. The symposium was supported by Alan James Group, LLC, Agencias Motta, S.A., Antistress AG, Armal, Birger Ledin AB, Ecolandia International, Essential Sterolin Products (PTY) Ltd., Grand Quality LLC, IC Vietnam, Intervac Ltd., Jenn Health, Kernpharm BV, Laboratori Mizar SAS, Magna Trade, Manavita B.V.B.A., MaxiPharm A/S, Nature's Farm, Naturkost S. Rui a.s., Nichea Company Limited, Nutra-Life Health & Fitness Ltd., Oy Valioravinto Ab, Panax, PT. Nutriprima Jayasakti, Purity Life Health Products Limited, Quest Vitamins, Ltd., Sabinco S.A., The AIM Companies, Valosun Ltd., Wakunaga of America Co. Ltd., and Wakunaga Pharmaceutical Co., Ltd. Guest editors for the supplement publication were Richard Rivlin, Matthew Budoff, and Harunobu Amagase. *Guest Editor Disclosure:* R. Rivlin has been awarded research grants from Wakunaga of America, Ltd. and received an honorarium for serving as co-chair of the conference; M. Budoff has been awarded research grants from Wakunaga of America, Ltd. and received an honorarium for serving as co-chair of the conference; and Harunobu Amagase is employed by Wakunaga of America, Ltd.

² Author disclosure: R. Rivlin has been awarded research grants from Wakunaga of America, Ltd. and received an honorarium for serving as co-chair of the conference.

³ This work was supported by grants from the National Institutes of Health, grant CA29502 (Clinical Nutrition Research Unit), the American Institute for Cancer Research, the Sunny and Abe Rosenberg Foundation, the Ronald and Susan Lynch Foundation, and Wakunaga of America Co., Ltd.

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⁵ Abbreviation used: CAM, complementary or alternative medicine.

every early civilization known has used garlic for a variety of maladies and to preserve good health (1). Documents dating from the beginning of recorded history show that garlic was found in Egyptian pyramids and ancient Greek temples. Medical texts from China, India, Egypt, Greece, and Rome mention medical applications of garlic. Cultures that developed independently came to the same general conclusions, namely, that garlic was administered to provide strength and to increase work capacity (1).

Ancient Greece is of particular interest, because Hippocrates, considered the father of medicine, used garlic as an essential component of his therapeutic armamentarium (Fig. 1). There is evidence that garlic was ingested at the original Olympic games (2). Indeed, garlic is likely to have been one of the first "performance-enhancing agents" approved for competitive athletes at the Olympics.

As a result of its ancient origins and widespread use in folk medicine, garlic has been considered by some to be a component of alternative medicine. But is the use of garlic truly alternative medicine? It is unlikely that garlic will become an alternative to established methods of patient care, but it has significant potential as a complement to accepted prevention and treatment strategies.

Complementary versus alternative. The use of complementary and alternative medicine is widespread in contemporary society. As Figure 2 indicates, close to 4 out of 5 patients with cancer use some form of complementary or alternative medicine (3). The practices may vary from massage to risky invasive procedures, such as coffee enemas, which are not approved for use as accepted standards of care. The patients

- Garlic found in the palace of Knossos in Crete
 - Soldiers were fed garlic to give them courage, and garlic was associated with war.
 - During the first Olympic games, garlic was taken by athletes before they competed.
 - Used to protect the skin against poisons or toxins
 - Hippocrates, the Father of Medicine, used garlic.
- Adapted from Rivlin (1)*

FIGURE 1 Utilization of garlic in Ancient Greece.

- Alternative
- 1) Promoted for use in place of established methods for serious disease
 - 2) Often biologically invasive
 - 3) Usually costly and may be potentially harmful
- Adapted from Cassileth (3)*

FIGURE 4 Alternative vs. complementary therapies (alternative).

- 80% of cancer patients
 - Better educated
 - Higher socioeconomic status
 - Female
 - Younger
 - Health conscious
- Adapted from Cassileth (3)*

FIGURE 2 Participants in complementary and alternative medicine (CAM).

- Complementary
- 1) Used together with established therapies for serious diseases
 - 2) Generally not invasive
 - 3) Inexpensive and generally safe; support measures
 - 4) Based upon evidence
- Adapted from Cassileth (3)*

FIGURE 5 Alternative vs. complementary therapies cont'd (complementary).

who seek these treatments are not the most ignorant in our population, but tend to be among the better educated, have a higher socioeconomic status, and are among those who are most aware of the need to maintain good health through diet and lifestyle (3).

One may well ask why anyone would use complementary or alternative medicine (CAM)⁵ at all when scientific medicine has made so many striking advances. Perhaps the answer lies, to a large degree, in the limitations and failures of scientific medicine. Patients can be frustrated with the delays, expenses, and the slow pace of scientific medicine, which are among the reasons shown in **Figure 3** why people choose to use CAM. Some CAM treatments are believed to reduce side effects, such as anxiety, nausea, fatigue, and depression. Patients may seek a better quality of life and one that is "more natural." Complementary therapies often tend to be relatively safe, noninvasive, nontoxic, and relatively inexpensive (4).

Furthermore, many patients are drawn to alternative medicine because of a sense of partnership with the practitioner over their care and a feeling of control over their own bodies. Those of us who follow evidence-based medicine in making recommendations to patients would do well to learn some valuable lessons from the alternative practitioners. Too often we try to tell patients what to do and dictate to them what the best course of action is, according to the data. Perhaps we don't involve the patient in the decision-making process to the extent that we should.

We must keep in mind the clear distinction between a treatment that is a true alternative to established methods of patient care and one that is in addition to, or complementary

- Frustration
 - Lack of control of self
 - Cultural influences
 - Chronic illness not improving, continuing to suffer
 - Control of symptoms
 - When mainstream medicine has little to offer
- Adapted from Frazier (4)*

FIGURE 3 Why use CAM?

Agents from plant sources that are biologically active and may be utilized for both preventive and therapeutic purposes. Phytochemicals have effects upon oxidation potential, cellular differentiation, inflammation, lipid and drug metabolism and other metabolic processes. These agents are at the frontier of research on cancer prevention.

FIGURE 6 Definition of phytochemicals.

to, the standard treatment. Alternative therapies are promoted as replacements for established care, particularly when the latter is painful, uncomfortable, or invasive (**Fig. 4**). However, there is a significant risk to many alternative therapies. Those that are no longer permitted in the United States are easily accessed by patients willing to go abroad to Europe, Mexico, or the Caribbean (6). The cost of such treatments is not trivial.

Finally, patients may seek alternative care because they feel that they have run out of therapeutic options. Nothing is working, and their doctors have given them a discouraging prognosis. Such patients are vulnerable to illusory promises of a cure.

Complementary therapies, on the other hand, do not replace proven therapies but are used in conjunction with scientifically established methods (**Fig. 5**). Such therapies are generally noninvasive, help to alleviate symptoms, are generally inexpensive, and thought to be safe. In most instances, complementary treatments are based upon a body of scientific data, whereas alternative medical therapies are generally unpublished, unregulated, not subject to peer review, and have no proven validity (5).

Phytochemicals. Countless studies have demonstrated the value of vegetables and fruits in the prevention of cancer and heart disease. In many instances, the precise identity of all the active components is incompletely understood. The whole often appears to be greater than the sum of the parts.

As research advances, it is apparent that many vegetables and fruits have antioxidant capabilities and, as mentioned, the effects are often synergistic rather than additive. We must remember that the benefits of phytochemicals extend far beyond their antioxidant capabilities (**Fig. 6**). Such agents influence inflammation, differentiation, and many other basic

- Combinations of carotenoids are more potent than the sum of activity of individual carotenoids, e.g., lycopene and lutein
- It is likely that synergy occurs with garlic and other agents

FIGURE 7 Synergy of compounds with antioxidant potential.

and fundamental processes (6,7). The anticancer effects of phytochemicals are increasingly recognized as complex and multifactorial.

New challenges. As medicine advances, increasing attention is being paid to combinations of therapeutic agents. The effects may be additive or synergistic. This point is particularly relevant for the antioxidants. In general, combinations of antioxidants are more potent than the sum of individual antioxidants administered separately. Such synergistic effects have been clearly demonstrable for lycopene and lutein (**Fig. 7**); it is likely that they also extend to garlic. More research is needed to explore the role of active derivatives of garlic in combination with other drugs, foods and herbs.

An example of the potential interactions of garlic with other agents known to affect blood coagulation is shown in **Figure 8**. There is a potential for abuse if individuals consume large amounts of agents like Valerian, Dong Quai, and Ginseng (8,9). It has been the experience of the author that while garlic may pose a theoretical risk when consumed with these other agents, clinically significant untoward events are, in fact, hardly ever observed. Nevertheless, the safety margins of combinations of agents need to be defined more quantitatively.

Garlic as complementary medicine. Scientific investigations of garlic are advancing rapidly in many directions. Further research is needed to learn more precisely the mechanisms of action at the molecular level of garlic's many components. Furthermore, more information is needed with regard to the nature and significance of garlic's interactions with various foods, phytochemicals, herbs, and drugs.

We cannot reasonably conclude from available evidence that garlic can serve as an alternative to existing and validated methods of disease prevention and treatment. Rather, the rapid

- Vitamin E
- Garlic
- Asian ginseng
- St. John's wort
- Dong Quai
- Valerian

Note: coenzyme Q10 is a pro-coagulant; inhibits Warfarin activity

Adapted from Cassileth (3)

FIGURE 8 Some common agents with anticoagulant effects.

pace of advances in garlic research provides increasing evidence that garlic has significant potential as a complement to established therapies. Thus, the answer to the question, Is garlic alternative medicine? is probably negative, but we can look forward with increasing confidence to a potential role for garlic as a complement to other strategies of disease prevention and treatment. Much work lies ahead of us to collaborate in order to find the answers to the big questions.

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