

## Garlic (*Allium Sativum*)

- I. Family and Common Names<sup>1-2</sup>
  - a. Family: Amaryllidaceae or Liliaceae<sup>1</sup>
  - b. Common Names: Aged Garlic Extract, Ajo, Alli Sativi Bulbus, Allium, Camphor of the Poor, Clove Garlic, Nectar of the Gods, Poor Man's Treacle, Rust Treacle, Stinking Rose<sup>1-2</sup>
- II. Description of Active Ingredients
  - a. Clove/whole garlic contains the inactive ingredient alliin. Once the clove cells are broken or crushed, then the enzyme allinase is released. Allinase converts alliin into allicin, which is both highly active and unstable. The activity of the product is based on allicin content, but allicin itself triggers production of active principles (S-allyl cysteine, DAS, DADS, ajoene, etc).<sup>1-2</sup>
- III. Indications and Efficacy
  - a. Hyperlipidemia: Some studies have shown no benefit, but most studies show a modest decrease in LDL and TG (4-12%) at 25 weeks with garlic extract (600-900 mg/d) and aged extract preparations (1-7.2gm/d).<sup>3-4</sup>
  - b. Hypertension: Studies have shown minced bulbs (1-2 cloves up to TID) and garlic powder (600-900 mg/d) to decrease BP by 2-7% after 4 weeks of use.<sup>1,3-4</sup>
  - c. Antimicrobial
    - i. Antibiotic: Studies have demonstrated antibiotic activity against *E coli*, MRSA, and *Salmonella* with oil, water, and ethanol extracts.<sup>1,2</sup>
    - ii. Antifungal: Studies have shown activity against *Tinea pedis* and *Candida* infections with topical and oil, water, and ethanol extracts.<sup>1,2</sup>
  - d. Cancer Prevention
    - i. Stomach and Colon Cancer: Increased dietary garlic is correlated with a decreased risk of developing stomach and colon cancer. No change in risk with garlic supplements.<sup>5</sup>
    - ii. Prostate: Preliminary studies have demonstrated that increased dietary garlic may decrease prostate cancer risk.<sup>6</sup>
  - e. Anticoagulant: Studies have shown most formulations of garlic to alter plasma fibrinogen levels, coagulation time, and fibrinolytic activity. Garlic also inhibits platelet aggregation.<sup>1,2</sup>
  - f. Diabetes Mellitus: Controversial, but minority of studies demonstrates a decrease in blood glucose levels.<sup>1</sup>
- IV. Mechanisms of Action
  - a. Hyperlipidemia: Preparations proposed to act as a HMG CoA Reductase inhibitor.<sup>1-3</sup>
  - b. Hypertension: Preparations activate EDRF and nitric oxide to relax smooth muscle and vasodilate blood vessels. Garlic also changes the membrane potential of vascular smooth muscle cells by opening potassium channels, causing hyperpolarization and vasodilation by keeping calcium channel closed for a longer period of time.<sup>1-3</sup>
  - c. Antimicrobial: Garlic acts as a broad range antimicrobial agent, its mechanism is unknown<sup>1,2,4</sup>
  - d. Cancer Prevention: Exact mechanism unknown<sup>5-6</sup>
  - e. Anticoagulant: Inhibits the arachadonic acid cascade, inhibiting platelet aggregation<sup>1,2</sup>
  - f. Diabetes Mellitus: Decrease blood glucose levels by enhancing insulin production and protecting against insulin inactivation.<sup>1</sup>
- V. Dosage Forms and Doses<sup>1</sup>

- a. Extract: 600-1200 mg divided TID has the most data supporting its use
- b. Aged extract: 600 mg -7.2 gm divided TID also has some supporting data
- c. Fresh garlic: 1-2 cloves up to TID is also used
- d. Ajoene (constituent of allicin): 0.4% cream, 0.6-1% gel applied topically for 7-14 days for *Tinea pedis* infections
- e. Odorless products do not contain active compounds
- VI. Contraindications (usually safe when consider the amount that is consumed in food preparations)<sup>1,2</sup>
  - a. Allergy to garlic
  - b. Increased risk of post-operative bleeding
- VII. Herb Interactions<sup>1,2</sup>
  - a. Herbs: Herbs with anticoagulant effects (gingko, ginger, ginseng, etc)
- VIII. Drug Interactions<sup>1,2</sup>
  - a. Anticoagulants (aspirin, clopidigrel, enoxaparin, etc)
  - b. NNRTIs: Garlic may be an inducer of CYP3A4, thus decreasing NNRTI levels
  - c. Oral contraceptives: Garlic may decrease the effectiveness
  - d. Hypoglycemic medications (sulfonyureas, insulin, etc): Garlic may promote hypoglycemia
  - e. Cyclosporin: Garlic may induce the metabolism of cyclosporin, thus decreasing the level of immunosuppression
- IX. Side Effects: Most are dose-related and minor<sup>1,2</sup>
  - a. Body/breath odor
  - b. Mouth/GI irritation
  - c. Heartburn
  - d. Flatulence
  - e. Nausea/vomiting
  - f. Diarrhea
  - g. Topical reactions
- X. References
  1. <http://www.naturaldatabase.com/>
  2. <http://www.who.int/medicines/library/trm/medicinalplants/monographs.shtml/>
  3. Ackermann RT, Mulrow CD, Ramirez G, et al. Garlic shows promise for improving some cardiovascular risk factors. Arch Intern Med 2001;161:813-24.
  4. Silagy CA, Neil HA. A meta-analysis of the effect of garlic on blood pressure. J Hypertension 1994;12(4):463-8.
  5. Fleischauer AT, Poole C, Arab L. Garlic consumption and cancer prevention: meta-analyses of colorectal and stomach cancers. Am J Clin Nutr 2000;72:1047-52.
  6. Key TJ, Silcocks PB, Davey GK, et al. A case-control study of diet and prostate cancer. Br J Cancer 1997;76:678-87.