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## ALL ABOUT SUPPLEMENTS

### Garlic

#### Medical Science Discovers New Uses for an Ancient Herb

By Stephen Laifer

Herbalists routinely claim that garlic (*Allium sativum*) is the world's longest-used medicinal food. The therapeutic use of garlic predates written history by several millennia, with the earliest mention dating back more than 5,000 years ago to Sanskrit records in India.<sup>1</sup> Garlic was already a long-favored remedy in ancient medicine 1,000 years before the birth of Christ. Ancient Egyptians worshipped the spice as a god, valuing it so much that 15 pounds of garlic would purchase a healthy male slave.



A close relative of the onion, garlic's origins in the Kirgiz desert region of Siberia have endowed it with the ability to thrive in harsh climates and poor soil. The bulb's adaptability played a significant role in its becoming a staple crop in almost every civilization around the globe. Even 1,000 years ago, garlic was grown in virtually all the known world and nearly universally recognized as a medicinal plant.

Twentieth-century science relegated garlic to a state of relative neglect medicinally, if not in the kitchen. In recent years, however, garlic has moved to the forefront of an explosion of interest in natural remedies. According to the UCLA Center for Human Nutrition in Los Angeles, diets rich in plant foods are associated with a reduced risk of heart disease and cancer. These plant foods contain phytochemicals that have anti-cancer and anti-inflammatory properties. Garlic and other white-green foods in the onion family contain allyl sulphides, which may inhibit the growth of cancer cells.<sup>2</sup>

Today, garlic is the subject of considerable research for its medicinal properties, and new clinical trials are yielding proof of its role as a powerful antioxidant. Garlic also shows promise in protecting against heart disease, hypertension, and cancer.

### SCAVENGING FREE RADICALS

Implicated in many serious illnesses, free radicals are harmful byproducts of cellular metabolism. Antioxidants scavenge free radicals.

Sulfur-containing compounds, found in all body cells, are indispensable to living organisms. Unlike humans, plants can use inorganic sulfur to synthesize sulfur-containing amino acids. Many strong antioxidant compounds are rich in sulfur, including N-acetylcysteine, taurine, lipoic acid, and glutathione. Plants are an important source of sulfur for humans, and garlic is a major source of organosulfur compounds.<sup>3</sup>

Recent studies in India have demonstrated garlic's effectiveness in reducing oxidative stress in animals with high blood lipid levels. Supplementation with garlic significantly countered the lipid-related depletion of intracellular antioxidants in the liver and red blood cells.<sup>4,5</sup> Two separate studies focused on S-allylcysteine, a garlic-derived compound and well-characterized scavenger of free radicals. S-allylcysteine scavenges free radicals and reduces oxidative stress.<sup>6,7</sup> In experimental animal models, S-allylcysteine helped protect the nervous system from neurotoxins and the kidneys against damage from reactive oxygen species.<sup>6,7</sup>

### PROTECTING THE HEART

In horror movies, garlic is often used to ward off vampires. Garlic does indeed protect the blood (and its major engine, the heart) from attack—not from vampires, but from a subtler enemy. In recent years, atherosclerosis has emerged as one of the leading causes of death in nations whose diets are disproportionately high in saturated fats and cholesterol. A Czech study investigated garlic's inhibitory effect on the biosynthesis of cholesterol and fatty acids. Positive results manifested in reduced

arterial plaque and markedly decreased accumulation of cholesterol in the vascular walls.<sup>8</sup>

A Turkish team exploring garlic extract's effects on coronary plaque formation saw similar results. In test animals, seven months of garlic supplementation significantly decreased the plaque surface area in the animals' aortas.<sup>9</sup> Another study implicated several sulfur-containing compounds isolated from garlic as highly active anti-thrombotic agents. This study established that garlic could be a significant inhibitor of platelet aggregation.<sup>10</sup>



Eleven patients with atherosclerosis were the focus of a six-month study on possible beneficial effects of garlic extract at a daily dose of 1 milliliter per kilogram of body weight. Garlic supplementation notably lowered levels of the oxidative marker malondialdehyde in plasma and red blood cells; ingesting garlic extract also prevented oxidation reactions by eliminating oxidant stress.<sup>11</sup> The study authors concluded, "it is possible that reduced peroxidation processes may play a part in some of the beneficial effects of garlic in atherosclerotic diseases."<sup>11</sup>

Aged garlic extract has been shown to reduce multiple cardiovascular risk factors, including blood pressure, cholesterol, and platelet aggregation and adhesion, while stimulating the generation of nitric oxide in endothelial cells.<sup>12</sup> A recent, double-blind, placebo-controlled study evaluated aged garlic extract's ability to inhibit vascular calcification, a marker of plaque formation in human coronary arteries, in 23 patients with atherosclerosis.<sup>12</sup> The results suggested that aged garlic extract may inhibit the progression of coronary calcification, suggesting a therapeutic role for garlic in patients at high risk for future cardiovascular events.<sup>12</sup>

### TAKING THE PRESSURE OFF

Hypertension, or high blood pressure, is a silent but potentially deadly disease. Research suggests that garlic supplementation may provide important benefits for hypertensive patients.

Researchers at the University of Mississippi investigated hypertension treatment using natural, commonly available dietary supplements and stress-reducing lifestyle modifications.<sup>13</sup> Garlic showed the potential to reduce systolic blood pressure by at least 9 mmHg and diastolic blood pressure by at least 5 mmHg.<sup>13</sup>

A subsequent Turkish clinical trial took this evidence further, finding that garlic extract supplementation over four months markedly lowered systolic and diastolic blood pressure values in hypertensive volunteer subjects with high blood cholesterol.<sup>14</sup> In those with normal blood pressure, garlic did not affect blood pressure levels.<sup>14</sup>

### ALLY IN THE CANCER WAR



For thousands of years, traditional medical practitioners have used garlic and other members of the *Allium* genus to treat cardiovascular disease.<sup>15</sup> Garlic's use as a remedy for tumors extends back to the Codex Ebers of 1550 BC, an Egyptian medical papyrus.<sup>16</sup> Recent extensive research has focused on the anticarcinogenic potential of allium vegetables and their constituents, allylsulfides (organosulfur compounds) and flavonoids.

Modern epidemiological studies, well correlated with laboratory investigations, corroborate the evidence that higher intake of allium products is associated with reduced risk of several cancers.<sup>15</sup> The mechanisms proposed to explain the cancer-preventive effects of garlic include inhibition of tumor mutagenesis, modulation of enzyme activities, and effects on cell proliferation and tumor growth.<sup>15</sup>

Several garlic compounds, including allicin, induce apoptosis (programmed cell death) in various malignant human cells. These include breast, colorectal, hepatic, prostate, and lymphoma cells.<sup>16</sup> A growing number of clinical studies are examining the properties of ajoene, the major sulfur-containing compound purified from garlic. Ajoene has the advantage of being more chemically stable than allicin, and researchers are investigating its possible role in the prevention and treatment of cancer.<sup>17,18</sup>

Cancer researchers have noted that inhibition of the proteasome—an intracellular device by which damaged or unneeded proteins are broken down—plays a key role in apoptosis and cell cycle blockade in tumor cells. In a recent French study of ajoene's effects on the proteasome's activities, researchers found that ajoene affected proteasome function and activity both in vitro and in the living cell, and that these effects may account for ajoene's potential anti-tumor action.<sup>19</sup>

Topical application of ajoene has produced significant clinical response in patients with skin basal cell carcinoma.<sup>16</sup> Ajoene inhibited proliferation and induced apoptosis of human leukemia CD34-negative cells, inducing 30% apoptosis in myeloblasts from a chronic myeloid leukemia patient in blast crisis.<sup>16</sup> Even more significantly, ajoene profoundly enhanced the apoptotic effect of two chemo-therapeutic drugs, cytarabine (Cytosar®) and fludarabine (Fludara®).<sup>16</sup>

The list of cancers responding to garlic treatment or supplementation continues to grow. Separate Chinese studies reported that the garlic component allyl sulfide demonstrated activity against human bladder cancer<sup>20</sup> and liver cancer<sup>21</sup> cells in vitro. Another study reported on the protective effects of garlic components in a rat model of colon carcinogenesis, noting that garlic inhibited cell proliferation, induced apoptosis, and suppressed the activity of the cyclooxygenase-2 (COX-2) enzyme.<sup>22</sup>

## GETTING THE BENEFITS

Garlic has demonstrated few toxic side effects. While eating garlic cloves is a proven way to obtain the benefits of their organosulfides, unwelcome side effects include bad breath and perspiration. Fortunately, garlic supplements provide all the benefits of eating raw garlic without these undesirable effects.

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