Allicin SAP

*Science-based immune and cardiovascular health support**

Garlic (*Allium sativum*) is traditionally used in herbal medicine as an antibiotic, antithrombotic, and antineoplastic agent.* Garlic is enriched with a plethora of volatile, water-soluble and oil-soluble organosulfur bioactive compounds. Allicin is considered one of the most potent broad-spectrum antimicrobial compounds in freshly cut or crushed garlic that possesses a variety of biological properties.* Allicin exerts antibacterial, antifungal, antiparasitic, and antiviral activities, and offers protection against upper respiratory tract infections and catarrhal conditions.* It may serve as a potential agent for the management of small intestinal bacterial overgrowth (SIBO).*

Substantial evidence supports the efficacy of garlic extracts containing allicin in regulating blood lipid levels, reducing hypertension, preventing hyperglycemia, and fostering cardiovascular health.* Garlic-derived compounds possess strong immunomodulatory properties and can help promote healthy immune responses, reduce gastric pathologies, alleviate alcohol liver disease, and improve skin damage caused by UV irradiation.* **Allicin SAP** delivers garlic extract containing allicin stabilized through microencapsulation for optimal efficacy and health benefits.*

SUPPLEMENT FACTS

Serving Size: 1 Capsule

	Amount Per Serving	% Daily Value
Garlic (*Allium sativum*) bulb extract, 1% allicin	200 mg	**

**Daily Value not established

Other ingredients: Vegetable magnesium stearate and silicon dioxide in a non-GMO vegetable capsule composed of vegetable hypromellose and purified water.

This product is non-GMO and vegan friendly.

Contains no: Gluten, soy, wheat, eggs, dairy, yeast, citrus, preservatives, artificial colors and flavors, or sugar.

Allicin SAP contains 90 capsules per bottle.

DIRECTIONS FOR USE

Adults: Take 1 capsule three times daily or as directed by your healthcare practitioner.

INDICATIONS

Allicin SAP can help:

- Manage upper respiratory tract infections and catarrhal conditions.*
- Manage small intestinal bacterial overgrowth (SIBO).*
- Promote cardiovascular health by improving blood lipid levels, reducing hypertension, and enhancing antioxidant status.*
- Regulate blood glucose and enhance healthy immune responses.*
- Improve alcohol liver disease.*
- Protect against UV-irradiation–induced skin damage.*

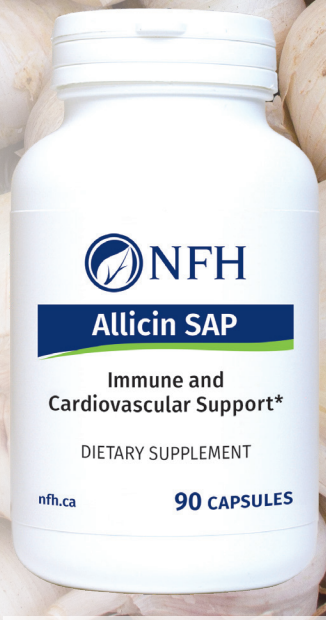
CAUTIONS AND WARNINGS

Consult a healthcare practitioner prior to use if you are pregnant; if you have diabetes; if you are taking blood thinners or protease inhibitors. *For relief of upper respiratory tract infections and catarrhal conditions:* Consult a healthcare practitioner if symptoms persist or worsen.

Hypersensitivity (e.g. allergy) has been known to occur; in which case, discontinue use.

PURITY, CLEANLINESS AND STABILITY

All ingredients listed for each **Allicin SAP** lot number have been tested by an ISO 17025–accredited third-party laboratory for identity, potency, and purity.



Scientific Advisory Panel (SAP): adding nutraceutical research to achieve optimum health

*** These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease.**

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351 Joseph-Carrier, Vaudreuil-Dorion, Quebec, J7V 5V5
T 1 866 510 3123 • F 1 866 510 3130 • nfh.ca

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INTRODUCTION

Garlic (*Allium sativum*) is a popular culinary and medicinal herb used for its prophylactic and therapeutic actions on various ailments that dates back to antiquity.[1][2] Garlic has been documented for its application as an antibiotic, antithrombotic, and antineoplastic agent.[1] In traditional medicine, garlic has been used to treat chronic bronchitis, recurrent upper respiratory tract infections, influenza, diarrhea, constipation, parasitic infection, hypertension, food poisoning, and tumours, as well as as a mild anticoagulant.[1][2] The widespread use of garlic as a topical and systemic antimicrobial agent resulted in its nickname "Russian penicillin."[1][3] More than 2000 biologically active volatile, water-soluble and oil-soluble organosulfur compounds such as alliin, scordinin A and B, diallyl sulfide, diallyl di- and trisulfphides (DAS, DADS, DATS), along with essential oils, dietary fibre, inulin, flavonoids, and pectin are present in garlic.[3] Allicin is produced from garlic cell-wall compartments resulting from the interaction between its precursor alliin and the enzyme alliinase when the bulb is crushed, minced, or otherwise processed.[1][3] Allicin is considered one of the most potent antimicrobial compounds in garlic, responsible for the typical smell and taste of freshly cut or crushed garlic, and possesses a variety of biological properties. Allicin has a short half-life and transforms into a number of other compounds including DAS, DADS, dithiins, and ajoene.[2][3]

ANTIMICROBIAL EFFECTS

Antibacterial Effects

The antibacterial activity of garlic is mainly due to the broad-spectrum antimicrobial compound allicin.[4][5] Allicin is thought to exert its antimicrobial effect by inhibiting certain thiol-containing enzymes in the microorganisms, and facilitated by the rapid reaction of thiosulfinates with thiol groups.[5] In addition, allicin also specifically inhibits other bacterial enzymes such as the acetyl-CoA–forming system, consisting of acetate kinase and phosphotransacetyl-CoA synthetase.[5] In a clinical study, a reduction in *Helicobacter pylori* infection, as evidenced by a significant reduction in urease breath test, was observed in patients after administration of medium-sized cloves of garlic (3 g) with a meal, twice a day.[6] Garlic extracts have been reported to prevent the formation of *Staphylococcus* enterotoxins A, B, and C_1, and also thermonuclease. Noteworthy, a number of antibiotic-resistant bacterial strains including methicillin-resistant *S. aureus*, other multidrug-resistant enterotoxicogenic strains of *Escherichia coli*, *Enterococcus*, *Shigella dysenteriae*, *S. flexneri*, and *S. sonnei* cells were all found to be sensitive to allicin. Allicin also had an in vivo antibacterial activity against *S. flexneri* Y when tested in the rabbit model of experimental shigellosis.[7] These suggest that allicin could be potentially used in the treatment protocol for managing small intestinal bacterial overgrowth (SIBO).

Antifungal Activity

Evidence from in vitro studies support the antifungal efficacy of allicin against species of *Candida*, *Cryptococcus*, *Trichophyton*, *Epidermophyton*, and *Microsporum* even at low concentrations, and inhibit the formation of mycotoxins like the aflatoxin of *Aspergillus parasiticus*.[8][9]

Antiparasitic and Antiviral Properties

Garlic has been traditionally used for its antiparasitic effects. *Entamoeba histolytica*, the human intestinal protozoan parasite, is very sensitive to allicin, as only 30 µg/mL of allicin totally inhibits its growth.[10] Allicin also effectively inhibits other parasites including *Giardia lamblia*, *Leishmania major*, *Leptomonas colosoma*, and *Crithidia fasciculate*.[10] Fresh garlic extracts exert antiviral activities against a number of viruses such as the human cytomegalovirus, influenza B, herpes simplex virus type 1, herpes simplex virus type 2, parainfluenza virus type 3, vaccinia virus, vesicular stomatitis virus, and human rhinovirus type 2.[5]

CARDIOVASCULAR HEALTH

Allicin exerts a number of potential cardiovascular health benefits through various modes of action.

Antihypertensive Effects

Ex vivo and in vivo studies have established the vasodilation effects of allicin via both nitric oxide–dependent and independent pathways, although the precise mechanism of action remains unelucidated.[11][12] Garlic extracts have been known for their antihypertensive effects. A recent meta-analysis strongly supports the use of garlic extract as an effective and safe treatment option for hypertension.[13]

Prevention of Hyperlipidemia

A number of controlled clinical studies demonstrate the lipid-lowering potential of garlic extracts. In one study, administration of garlic tablets standardized for allicin at 1.3% in diabetic type 2 human patients reduced total blood cholesterol and low-density lipoprotein levels, while high-density lipoprotein levels increased.[14][15][16][17]

Prevention of Cardiac Hypertrophy, Angiogenesis, and Oxidative Damage

In vitro and in vivo studies have shown that allicin attenuates the pathological modifications of the heart, inhibits expression of cardiac hypertrophy markers, and prevents enlargement of myocardial cells.[12][18] Other cardiovascular beneficial effects of allicin include inhibition of angiogenesis, suppression of platelet aggregation, and antioxidant effects.[11]

Hypoglycemic Effects

Substantial evidence supports the hypoglycemic effects of garlic. In a controlled study, garlic consumption (3 cloves/day) for 30 days in type 2 diabetic patients reduced blood glucose and lipids levels.[15] In other controlled studies, diabetic patients taking 100 mg/d and 300 mg twice daily of garlic for 5 months and 24 weeks, respectively, experienced profound reductions in blood glucose and lipid levels compared to the placebo.[16][17]

IMMUNE ENHANCEMENT

Garlic contains immunomodulatory proteins, such as lectins or agglutinins, that influence inflammation by altering immune-cell signalling by inhibiting the migration of neutrophilic granulocytes into epithelia and reduce TNF-α, C-reactive protein, and other proinflammatory cytokines.[3][4][13] These immunomodulatory effects of allicin could enhance defence against pathogens, and suppress immune processes to prevent allergies and infections.[3]

UPPER RESPIRATORY TRACT INFECTIONS

Clinical trials have shown the beneficial effects of garlic in the prevention, duration, and severity of upper respiratory infections.[13] A randomized, double-blind, placebo-controlled trial in 146 participants evaluating the effect of 180 mg/d garlic powder over 3 months observed a 37% reduction in the number of colds, and a 30% reduction in the duration of illness compared to the placebo.[18]

CANCER PREVENTION

Garlic can be used as a protective agent against stomach, colon, and other types of cancers due to allyl sulfur and other garlic compounds, which have been known to slow or prevent growth of tumour cells. In a clinical study, administration of an aqueous extract of garlic (1 ml/kg_{bw}) for a month was reported to cause significant improvement in prostate cancer patients.[20] In another randomized crossover study, garlic consumption (5 g raw, crushed garlic) was found to modulate the expression of immunity- and cancer-related genes in the whole blood of 17 human volunteers.[21]

DIGESTIVE HEALTH

Garlic extract has been known to ameliorate chemical-induced gastric ulcers in animal models due to its antioxidant and anti-inflammatory effects.[22] Garlic oil supplementation significantly decreased ulcer index and lipid peroxidation caused by ethanol in rats. Garlic could be potentially used for the treatment of inflammatory bowel disease owing to its immunomodulatory effects. Overall, garlic can be considered an excellent therapeutic option to reduce gastric pathologies.

ALCOHOLIC LIVER DISEASE

In a clinical study, administration of 2.4 g of raw garlic for 45 days significantly lowered liver marker enzymes, decreased lipid peroxidation levels, and improved the antioxidant status in patients diagnosed with alcohol liver disease.[23]

SKIN HEALTH

Ultraviolet (UV) exposure, a major factor in skin photoaging, results in elevated oxidative stress, increases matrix metalloproteinases (MMPs), and degrades dermal collagen and elastic fibres. Garlic supplementation has been reported to protect against UV-induced coarse-wrinkle formation and hyperkeratosis, enhance the skin antioxidative status, and suppress MMP-1 and MMP-2 protein levels and gene expression in a mice model. The research outcomes indicate that garlic consumption may help protect against UV-irradiation–induced skin photoaging.[24]

STABILIZATION OF ALLICIN USING MICROENCAPSULATION

Microencapulsation of allicin has been shown to profoundly improve the stability of allicin against heat, pH, light, and oxygen, thereby preserving the desired broad-spectrum antimicrobial activity.[25]

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INDICATION SPECIFIC DOSAGE SUMMARY BASED ON HUMAN CLINICAL RESEARCH#

#Please note these suggestions are guidelines based on the clinical studies. Evidence for efficacy and safety have been qualitatively (study quality in terms of study design, sample size, appropriate methods of analysis, use of appropriate placebo/control, bias) assessed and have been rated using a 5 star ★ rating classification.

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Indication	Suggested Dosage	Supporting evidence and study outcomes	Study design	Outcomes measures/ selection criteria for studies	Safety	Evidence quality rating
Cardiovascular Health						
Hypercholesterolemic effect[1,2]	2 capsules/day	Decrease in serum cholesterol levels*	1 Randomized double blinded and 1 comparative study, n=56, avg dose = 32 mg allicin/day for 8-12 weeks	Serum cholesterol levels, low-density lipoprotein cholesterol (LDL-C), triglycerides, high-density lipoprotein cholesterol (HDL-C), LDLC/HDLC ratio	No adverse events were reported	★★★
Artherosclerosis[3]	1 capsule/day	No variations in carotid intima-media thickness (CIMT)*	Randomized placebo-controlled trial, n=56, dose = 1.2 mg allicin twice per day for 12 weeks	CIMT, plasma total cholesterol, LDL-C, HDL-C, triglycerides, apolipoprotein A1 and apolipoprotein B	No adverse events were reported	★★
Anti-Microbial						
H. pylori infection[4,5]	3 capsules/ day (based on the study that achieved 90% eradication rate in 90% of participants)	Effective in reducing *H. pylori* infection and increased remission rate of peptic ulcers*	Meta analysis of randomized controlled trials, n=867, dose = most studies evaluated 120 mg allicin per day for 2 weeks but in one study 4.2 mg per day achieved 90% eradication of H. *pylori* infection in combination with standard regimen	The grading of recommendations assessment, development and evaluation (GRADE)	No adverse events were reported	★★★
Metabolic Syndrome						
Type 2 Diabetes[6]	3 capsules/ day with antidiabetic medication as recommended	Combination of allicin supplementation with metformin improved glycemic control with favourable effects on hyperlipidemic activity*	Single blinded randomized placebo-controlled study, n=60, dose = 300 mg garlic extract providing approximately 1.8 mg of allicin thrice per day for 24 weeks along with metformin 500 mg twice per day	Total cholesterol, HDL-C, and LDL-C, triglycerides, fasting blood glucose	No adverse events were reported	★★

Oxidative stress and pregnancy outcomes						
Biomarkers of oxidative stress[7]	1 capsule/day	Decreased hs-CRP, and increased GSH*	Randomized double blinded placebo-controlled trial, n=44, dose = 1 garlic tablet (equal to 400 mg garlic and 1 mg allicin) for 9 weeks	Serum high sensitivity C-reactive protein (hs-CRP), increased plasma glutathione, reducing fasting plasma glucose, increasing quantitative insulin sensitivity check	No adverse events were reported	★★
NAFLD						
Hepatic steatosis in NAFLD[8]	2 capsules/day	Twenty-four (51.1%) patients in the garlic group achieved improvement in the hepatic steatosis compared to eight (15.7%) patients in the placebo group.* Significant reductions in weight and serum alanine transaminase (ALT), aspartate transaminase, (AST), fasting blood sugar (FBS), Hb A1C, total cholesterol, LDL-C, and TG*	Randomized double blinded placebo-controlled parallel-group trial, n=98, dose = 2 garlic tablets (equal to 800 mg garlic and 3 mg allicin per day) for 15 weeks	Improvement in hepatic steatosis assessed by ultrasound. Improvement was defined as a reduction in the grade of the hepatic steatosis from the 1st to the 15th week of the intervention. Body weight and serum ALT, AST, LDL-C, HDL-C, total cholesterol TG, FBS and HbA1c	No adverse events were reported	★★★

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