

APPLICATIONS

- Immune Support
- Antioxidant Support
- Cardiovascular Support
- Vitamin Support



INTRODUCTION

Vitamin C (ascorbic acid) is a water-soluble vitamin that may help with immune support, antioxidant support, and cardiovascular support.^{*1} The word *ascorbic* comes from the Greek prefix *a*, meaning not, and the Latin *scorbutus*, or scurvy. Scurvy was relatively common, particularly in sailors, until the mid 1700s when James Lind discovered that citrus fruits were effective in treating the disease. Scurvy continued to be a problem until prevention with vitamin C-rich citrus fruits became a widely-accepted practice.²

Fortunately, vitamin C deficiency is extremely rare in the United States. Unlike many other mammals, humans are unable to synthesize vitamin C and must obtain it from dietary or supplemental sources. Significant dietary sources of vitamin C include fruits such as grapefruit, oranges, kiwifruit and strawberries, as well as vegetables such as bell peppers, broccoli, and brussels sprouts.³

The chemical structure of vitamin C was discovered in the 1930s by Hungarian researcher Albert Szent-Györgyi. While observing how cells used nutrients, he isolated a hydrogen carrier with the properties of both sugar and acid that would later become known as ascorbic acid. His discovery of the antioxidant properties of vitamin C became the foundation for future research, and Szent-Györgyi would eventually earn a Nobel prize for his work.⁴

Linus Pauling also played a significant role in the study and use of vitamin C. In the 1960s, Pauling became fascinated with nutritional chemistry and pioneered the field of orthomolecular medicine. He correctly postulated, amidst disagreement and even ridicule from peers, that factors such as environmental stress, biochemical individuality, and disease might increase the need for certain micronutrients such as vitamin C.^{*5} While not all of his theories were correct, studies show that there is a role for vitamin C in the support of immune and cardiovascular health.^{*6,7}

Vitamin C plays a vital role in many biological processes.* It helps to maintain

cytochrome P450 electron transport already within the normal range.^{*8} Vitamin C is a cofactor for dopamine-beta-hydroxylase which converts dopamine to epinephrine, and for alpha-amidating monooxygenase enzymes which help to form neuropeptides. It is needed for collagen synthesis, myelin synthesis, and the function of neurons, glial cells, and neurotransmitter receptors.¹ Additionally, it helps to support healthy iron absorption.^{*9} Vitamin C's role in collagen synthesis supports the integumentary and musculoskeletal systems, and its role in antioxidant support may help to maintain both immune and cardiovascular health.^{*6,7}

NutraMedix rigorously follows current good manufacturing practices (cGMP), as do our suppliers. Our Vitamin C is free of gluten, sugar, soy, and dairy. It is also free of GMOs, mold, and yeast.

IMMUNE SUPPORT

Vitamin C participates in several mechanisms of immune support.^{*10} At the most basic level, it helps to maintain epithelial barriers by supporting collagen synthesis, which contributes to healthy skin and mucous membranes.^{*1} Vitamin C may support innate immunity by accumulating within neutrophils, where it may enhance chemotaxis and phagocytosis, in addition to generating reactive oxygen species (ROS) for microbial support.^{*11} It may support adaptive immunity by promoting the differentiation and proliferation of cellular T and humoral B cells.^{*11}

Vitamin C may support upper respiratory health in various age groups, particularly during the winter season.^{*7,12,13,14} Normal vitamin C levels support healthy immunity and may be helpful for both pre-illness and intra-illness support.^{*12,14} As adaptive immunity slows with age, it is reasonable to consider vitamin C support for the elder demographic, particularly in cases of known deficiency.^{15,16,17}

ANTIOXIDANT SUPPORT

Vitamin C may support antioxidant function, due to its role as an electron donor, and has the ability to scavenge both reactive oxygen species (ROS) and reactive nitrogen species (RNS).^{*18} Unopposed oxidative stress in the cardiovascular system may result in endothelial cell apoptosis, inflammation and cell adhesion; decreased availability of nitric oxide (NO); and oxidative LDL modification.^{*18} Vitamin C may act as a free radical scavenger to help mitigate oxidative stress, support normal NO synthesis, and protect neutrophils from ROS during phagocytosis.^{18,19}

OTHER USES

Cardiovascular Support

Plasma vitamin C concentration may help to support cardiovascular health and may contribute cardiovascular-specific antioxidant support.^{*3,6} Vitamin C may help to maintain healthy endothelial function, which is attributed to its antioxidant support.^{*20} A meta-analysis of 29 randomized, controlled trials found that vitamin C may help to maintain healthy systolic and diastolic blood pressure already within the normal range.^{*21} A meta-analysis of 13 randomized, controlled trials found that it may help maintain LDL cholesterol and triglycerides already within the normal range.^{*22} A meta-analysis of 15 randomized, controlled trials found that vitamin C may help to maintain a normal heart rhythm.^{*23}

Vitamin Support

As vitamin C cannot be synthesized by humans, dietary and/or supplemental intake is essential. The dietary reference intake (DRI) to prevent overt deficiency is 75 mg/day in women and 90 mg/day in men.¹ Higher amounts may be needed for optimal support, and doses of 2,000 mg/day have been used safely in multiple trials.^{*24} This product contains 1,000 mg vitamin C (ascorbic acid) per capsule, and a serving of two capsules contains 2,222% of the daily value.

SAFETY AND CAUTIONS

Vitamin C is generally well-tolerated. At doses over 2,000 mg/day, heartburn, abdominal cramps, osmotic diarrhea, or gastrointestinal upset can occur.¹ Severe side effects are rare, and often limited to specific populations. In postmenopausal women with diabetes, vitamin C in amounts greater than 300 mg/day may increase cardiovascular risk, though not in women without diabetes, nor in equivalent

amounts found in food.²⁵ Vitamin C in amounts greater than 500 mg/day may increase the risk of carotid thickening in men, though not in equivalent amounts found in foods.²⁶ In those with a history of kidney stones, vitamin C may increase the risk of stone formation.²⁷ It may also increase aluminum absorption in those with renal failure,²⁸ and may increase the absorption of levothyroxine.²⁹ Vitamin C may theoretically decrease the effectiveness of alkylating agents, antitumor antibiotics, indinavir and warfarin,³² though information about the warfarin interaction is conflicting.³⁰ High doses of vitamin C may also cause dose-dependent side effects such as headache, fatigue, somnolence, or insomnia.³⁰

Safety not documented in breastfeeding or pregnant women, or in children under 3 years of age due to insufficient safety research.

*** This statement has not been evaluated by the Food and Drug Administration. This product is not intended to treat, cure, or prevent any diseases.**



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