

Vitamin C



Applications

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

Introduction

NutraMedix 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 citrus fruits were found 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. Humans, unlike other mammals, 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, lemons, limes, 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 hypothesized, amidst disagreement and even ridicule from peers, that environmental stress, biochemical individuality, or 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 are roles 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 maintain cytochrome P-450 electron transport already within the normal range.⁸ It is a cofactor for dopamine-beta-hydroxylase which converts dopamine to epinephrine, and for alpha-amidating monooxygenase enzymes which help form neuropeptides. Vitamin C is needed for collagen synthesis, myelin synthesis, and the function of neurons, glial cells, and neurotransmitter receptors.¹ Additionally, it helps support healthy iron absorption, transport, and storage.⁹ Vitamin C's role in collagen synthesis supports the integumentary and musculoskeletal systems, and its role as an antioxidant may support both immune and cardiovascular health.^{6,7}

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

suppliers, including stringent ID testing, microbial testing, and heavy metal testing. This testing is conducted on both the raw material and after encapsulation.

Immune Support

Vitamin C participates in several mechanisms of immune support.¹⁰ At a basic level, it helps 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.^{7,12-14} Normal vitamin C levels support healthy immunity and may be helpful for both pre-illness and intra-illness support.^{12,14} As adaptive immunity is altered by age, it is reasonable to consider vitamin C support for the elder demographic, particularly in cases of known deficiency.¹⁵⁻¹⁷

Antioxidant Support

Vitamin C may support antioxidant function, because of its role as an electron donor, and has the ability to scavenge both reactive oxygen species (ROS) and reactive nitrogen species (RNS).^{1,18} 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 Support

Cardiovascular Support

Vitamin C may help with cardiovascular health. Plasma vitamin C concentration may help support cardiovascular health and may contribute

cardiovascular-specific antioxidant support.^{3,6} Vitamin C may help support healthy endothelial function, which is attributed to antioxidant activity.²⁰ A meta-analysis of 29 randomized, controlled trials found that vitamin C may help 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 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 2000 mg/day have been used safely in multiple trials.²⁴ This product contains 1000 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 2000 mg/day, heartburn, abdominal cramps, osmotic diarrhea, or gastrointestinal upset can occur.¹ High doses of vitamin C may also cause dose-dependent side effects such as headache, fatigue, somnolence, or insomnia.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.²⁵ In those with a history of kidney stones, vitamin C may increase the risk of stone formation.²⁵ It may also increase aluminum absorption in those with renal failure,²⁵ and may increase the absorption of levothyroxine.²⁵ Vitamin C may theoretically decrease the effectiveness of alkylating agents, antitumor antibiotics, indinavir, and warfarin, though information about the warfarin interaction is conflicting.²⁵

Safety is not documented in breastfeeding or pregnant women, or in children under age 3, 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.

References

- ¹Institute of Medicine. (2000). Dietary Reference Intakes for Vitamin C, Vitamin E, Selenium, and Carotenoids. Washington, DC: National Academy Press. Available at: <http://www.nap.edu/books/0309069351/html/>.
- ²Carpenter K.J. (2012). *Annals of Nutrition & Metabolism*, 61(3), 259-264.
- ³ODS. (2021). Office of Dietary Supplements - Vitamin C. Retrieved 26 August 2021, from <https://ods.od.nih.gov/factsheets/VitaminC-HealthProfessional/#h3>
- ⁴ACS. (2021). Albert Szent-Gyorgyi Vitamin C - Landmark - American Chemical Society. Retrieved 27 August 2021, from <https://www.acs.org/content/acs/en/education/whatischemistry/landmarks/szentgyorgyi.html>
- ⁵Linus Pauling Institute. (2021). Linus Pauling Biography. Retrieved 27 August 2021, from <https://lpi.oregonstate.edu/about/linus-pauling-biography>
- ⁶Van Guilder, G.P., Hoetzer, G.L., et al. (2008). *The Journal of Physiology*, 586(14), 3525-3535.
- ⁷Johnston, C.S., Barkyoumb, G.M., et al. (2014). *Nutrients*, 6(7), 2572-2583.
- ⁸van Heeswijk, R.P., Cooper, C.L., et al. (2005). *Pharmacotherapy*, 25(12), 1725-1728.
- ⁹Lynch, S.R., & Cook, J.D. (1980). *Annals of the New York Academy of Sciences*, 355, 32-44.
- ¹⁰Jacob, R.A., & Sotoudeh, G. (2002). *Nutrition in Clinical Care*, 5(2), 66-74.
- ¹¹Carr, A.C., & Maggini, S. (2017). *Nutrients*, 9(11), 1211.
- ¹²Ran, L., et al. (2018). *BioMed Research International*, 2018, 1837634.
- ¹³Sasazuki, S., Sasaki, S., et al. (2006). *European Journal of Clinical Nutrition*, 60(1), 9-17.
- ¹⁴Anderson, T.W., Reid, D.B., et al. (1972). *Canadian Medical Association Journal*, 107(6), 503-508.
- ¹⁵Delafuente, J.C., Prendergast, J.M., et al. (1986). *International Journal of Immunopharmacology*, 8(2), 205-211.
- ¹⁶Kennes, B., Dumont, I., et al. (1983). *Gerontology*, 29(5), 305-310.
- ¹⁷Starke, J., Schneider, H., et al. (2011). *Clinical Nutrition*, 30(2), 194-201.
- ¹⁸Li, Y., & Schellhorn, H.E. (2007). *The Journal of Nutrition*, 137(10), 2171-2184.
- ¹⁹Wintergerst, E.S., Maggini, S., et al. (2006). *Annals of Nutrition & Metabolism*, 50(2), 85-94.
- ²⁰Hornig, B., Arakawa, N., et al. (1998). *Circulation*, 97(4), 363-368.
- ²¹Juraschek, S.P., Guallar, E., et al. (2012). *The American Journal of Clinical Nutrition*, 95(5), 1079-1088.
- ²²McRae M.P. (2008). *Journal of Chiropractic Medicine*, 7(2), 48-58.
- ²³Hemilä, H., & Suonsyrjä, T. (2017). *BMC Cardiovascular Disorders*, 17(1), 49.
- ²⁴Hathcock, J.N., Azzi, A., et al. (2005). *The American Journal of Clinical Nutrition*, 81(4), 736-745.
- ²⁵Natural Medicines. (2021). Vitamin C [monograph]. <http://naturalmedicines.therapeuticresearch.com>

NutraMedix

KEEP OUT OF REACH OF CHILDREN STORAGE:
Keep tightly closed in a dry place at room temperature. (59-86°F or 15-30°C)

SUGGESTED USE: Take one to two capsules daily after a meal or as directed by your physician. Do not use if pregnant or nursing. Stop use if adverse reactions develop.

†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.

VITAMIN C

1000 mg

Non-GMO

IMMUNE AND ANTIOXIDANT SUPPORT†

Supplement Facts

Serving Size 2 Capsules
Servings Per Container 60

Name	Amount Per Serving	% DV
Ascorbic acid	2,000mg	2,222%

Other ingredients: vegetable capsule, magnesium stearate from vegetable source.

GLUTEN, SOY & DAIRY FREE

7 28650 09335 6

Dietary Supplement
120 Vegetable Capsules

NutraMedix

Jupiter, Florida 33458 USA
www.nutramedix.com
561-745-2917