



ND FORMULAS

# Buffered Vitamin C

- *Boosts Immune System Function and Antioxidant Reserve*
- *Maintains Normal Inflammatory Balance*
- *Promotes Collagen Formation to Maintain Healthy Ligaments, Tendons and Joints*

Vitamin C is a water-soluble vitamin most widely known for its role in supporting immune health. It provides potent antioxidant protection, as it helps combat cellular damage from free radicals caused by oxidative stress, thus protecting health overall. Vitamin C also boosts the function of immune cells and is a key nutrient in the synthesis of collagen. The capsules in this product are balanced with calcium, magnesium and potassium to gently deliver high-concentration vitamin C to reduce the potential of gastrointestinal upset.

## Overview

Vitamin C's role in immune enhancement has been strongly evidenced in supplementation research to increase natural killer cell activity, lymphocyte proliferation and immune balance.<sup>1</sup> Vitamin C is also a potent antioxidant, acting to neutralize free radical damage to cells, including DNA, lipids and proteins. As a free radical neutralizing agent, vitamin C readily donates electrons to unstable molecules and breaks the chain of free radical damage to cells and tissues.<sup>2</sup> Vitamin C is also involved in the synthesis of collagen, carnitine and neurotransmitters.<sup>2-4</sup> The vitamin is considered essential to humans, and while most mammals are able to synthesize vitamin C, humans cannot. As a result, exposure to smoke, pollution, radiation, heavy metal exposure and high-stress lifestyles all increase the body's requirement for vitamin C.

## Deficiency†

Severe vitamin C deficiency has been known for many centuries as scurvy.<sup>2</sup> While scurvy is rare in the majority of today's population, current lifestyle factors raise the requirement for vitamin C. Adequate intake and retention is necessary to maintain healthy vitamin C status in the body.

## Cardiovascular Health†

Research has shown vitamin C to have a strong relationship with cardiovascular health. In 2004, a pooled analysis of nine prospective cohort studies found that supplemental vitamin C intake (>400 mg/day for a mean of 10 years) supported cardiovascular health.<sup>5</sup> A meta-analysis of 13 randomized controlled trials (RCTs) assessed the effect of vitamin C supplementation on blood fats<sup>6</sup> among 549 subjects, aged 48-82 years of age. Subjects received vitamin C supplements or placebo at doses ranging from 500 to 2,000 mg/day for 4 to 24 weeks. Overall, vitamin C supplementation had a significant impact on maintaining healthy blood fats. In addition, cross-sectional studies have indicated that plasma vitamin C concentration helps maintain healthy blood pressure levels in both men and women.<sup>7-9</sup>

## Immune Function & Antioxidant Support†

Vitamin C supplementation has been studied for more than six decades for its role in supporting the body during immune challenges. It has been shown to stimulate both the production<sup>10,11</sup> and function<sup>12,13</sup> of white blood cells, especially neutrophils, lymphocytes and phagocytes. These immune guardians have been shown to accumulate high concentrations of vitamin C, which can protect these cell types from oxidative damage.<sup>14,15</sup> Through its potent antioxidant functions, vitamin C has been shown to protect white blood cells from self-inflicted oxidative damage.<sup>16</sup>

## Connective Tissue Health<sup>†</sup>

Vitamin C's role in collagen formation makes it vital to maintaining skin, capillary, gum, joint and skeletal health.<sup>[17]</sup> The antioxidant properties of vitamin C and its role in collagen synthesis make vitamin C vital to skin health. Keratinocytes have a high capacity for vitamin C transport, to compensate for limited blood flow to the epidermis.<sup>18,19</sup> Vitamin C's role in normal tissue repair and recovery may include promoting keratinocyte differentiation,<sup>20,21</sup> stimulating the formation of the epidermal barrier and re-establishing the stratum corneum, the outermost layer of the epidermis.<sup>22</sup> Higher intakes of dietary vitamin C have been correlated with a decreased risk of dry skin.<sup>23</sup>

## Directions

2 or more capsules per day or as recommended by your health care professional.

## Does Not Contain

Gluten, yeast, artificial colors and flavors.

## Cautions

If you are pregnant or nursing, consult your physician before taking this product.

<b>Supplement Facts</b> <sup>v2</sup>		
Serving Size 2 Capsules		
Servings Per Container 45 & 90		
<b>2 capsules contain</b>	<b>Amount Per Serving</b>	<b>% Daily Value</b>
Vitamin C (as Ascorbic Acid USP)	700 mg	778%
Calcium (as Calcium Carbonate USP)	100 mg	8%
Magnesium (as Magnesium Carbonate USP)	100 mg	24%
Potassium (as Potassium Gluconate USP)	20 mg	<1%

## References

1. Wintergerst ES, Maggini S, Hornig DH. Immune-enhancing role of vitamin C and zinc and effect on clinical conditions. *Ann Nutr Metab.* 2006;50(2):85-94. Epub 2005 Dec 21.
2. From: <http://lpi.oregonstate.edu/infocenter/vitamins/vitaminC/>. Accessed 1-28-14.
3. NIH Office of Dietary Supplements. Dietary Supplement Fact Sheet: Vitamin C. <http://ods.od.nih.gov/factsheets/VitaminC-HealthProfessional/>. Accessed September 3, 2012.
4. Schlueter AK, Johnston CS. Vitamin C: overview and update. *JEBCAM.* 2011; 16(1) 49-57. <http://chp.sagepub.com/content/16/1/49.full.pdf+html>. Accessed August 23, 2012.
5. Knekt P, Ritz J, Pereira MA, et al. Antioxidant vitamins and coronary heart disease risk: a pooled analysis of 9 cohorts. *Am J Clin Nutr.* 2004;80(6):1508-1520.
6. McRae MP. Vitamin C supplementation lowers serum low-density lipoprotein cholesterol and triglycerides: a meta-analysis of 13 randomized controlled trials. *J Chiropr Med.* 2008;7(2):48-58.
7. Moran JP, Cohen L, Greene JM, et al. Plasma ascorbic acid concentrations relate inversely to blood pressure in human subjects. *Am J Clin Nutr.* 1993;57(2):213-217.
8. Block G, Jensen CD, Norkus EP, Hudes M, Crawford PB. Vitamin C in plasma is inversely related to blood pressure and change in blood pressure during the previous year in young Black and White women. *Nutr J.* 2008;7:35.
9. Myint PK, Luben RN, Wareham NJ, Khaw KT. Association between plasma vitamin C concentrations and blood pressure in the European prospective investigation into cancer-Norfolk population-based study. *Hypertension.* 2011;58(3):372-379.
10. Prinz W, Bortz R, Bregin B, Hersch M. The effect of ascorbic acid supplementation on some parameters of the human immunological defence system. *Int J Vitam Nutr Res.* 1977;47(3):248-257.
11. Jariwalla RJ, Harakeh S. Antiviral and immunomodulatory activities of ascorbic acid. In: Harris JR (ed). *Subcellular Biochemistry.* Vol. 25. Ascorbic Acid: Biochemistry and Biomedical Cell Biology. New York: Plenum Press; 1996:215-231.
12. Levy R, Shriker O, Porath A, Riesenberk K, Schlaeffer F. Vitamin C for the treatment of recurrent furunculosis in patients with impaired neutrophil functions. *J Infect Dis.* 1996;173(6):1502-1505.
13. Anderson R, Oosthuizen R, Maritz R, Theron A, Van Rensburg AJ. The effects of increasing weekly doses of ascorbate on certain cellular and humoral immune functions in normal volunteers. *Am J Clin Nutr.* 1980;33(1):71-76.
14. Bergsten P, Amitai G, Kehrl J, Dhariwal KR, Klein HG, Levine M. Millimolar concentrations of ascorbic acid in purified human mononuclear leukocytes. Depletion and reaccumulation. *J Biol Chem.* 1990;265(5):2584-2587.
15. Evans RM, Currie L, Campbell A. The distribution of ascorbic acid between various cellular components of blood, in normal individuals, and its relation to the plasma concentration. *Br J Nutr.* 1982;47(3):473-482.
16. Jariwalla RJ, Harakeh S. Mechanisms underlying the action of vitamin C in viral and immunodeficiency disease. In: Packer L, Fuchs J, eds. *Vitamin C in Health and Disease.* New York: Marcel Dekker, Inc.; 1997:309-322.
17. MacKay D, Miller AL. Nutritional support for wound healing. *Altern Med Rev.* 2003 Nov;8(4):359-77. [PMID: 14653765]
18. Steiling H, Longet K, Moodycliffe A, et al. Sodium-dependent vitamin C transporter isoforms in skin: Distribution, kinetics, and effect of UVB-induced oxidative stress. *Free Radic Biol Med* 2007;43:752-762.
19. Kang JS, Kim HN, Jung da J, et al. Regulation of UVB-induced IL-8 and MCP-1 production in skin keratinocytes by increasing vitamin C uptake via the redistribution of SVCT-1 from the cytosol to the membrane. *J Invest Dermatol* 2007;127:698-706.
20. Duarte TL, Cooke MS, Jones GD. Gene expression profiling reveals new protective roles for vitamin C in human skin cells. *Free Radic Biol Med* 2009;46:78-87.
21. Savini I, Catani MV, Rossi A, Duranti G, Melino G, Avigliano L. Characterization of keratinocyte differentiation induced by ascorbic acid: protein kinase C involvement and vitamin C homeostasis. *J Invest Dermatol* 2002;118:372-379.
22. Ponc M, Weerheim A, Kempenaar J, et al. The formation of competent barrier lipids in reconstructed human epidermis requires the presence of vitamin C. *J Invest Dermatol* 1997;109:348-355.
23. Cosgrove MC, Franco OH, Granger SP, Murray PG, Mayes AE. Dietary nutrient intakes and skin-aging appearance among middle-aged American women. *Am J Clin Nutr* 2007;86:1225-1231.