Vitamin C with Q®-C

INGREDIENTS

Vitamin C (known as L-ascorbic acid or ascorbate) is a water-soluble micronutrient required for multiple vital biological functions. Humans, unlike most animals, are unable to synthesize vitamin C endogenously making it an essential dietary component. It is necessary for normal growth and development and is an essential enzyme cofactor for several enzymes in the post-translational hydroxylation of collagen, biosynthesis of carnitine, conversion of the neurotransmitter dopamine to norepinephrine, peptide amidation, and in tyrosine metabolism.

Vitamin C is also known as a natural antioxidant that supports the immune system and helps with iron absorption. As a powerful antioxidant, vitamin C acts as an election donor that helps fight oxidative stress, a chemical reaction that produces free radicals. The build-up of free radicals over time may contribute to the aging process and impact our overall health and well-being with negative outcomes on immune and cardiovascular systems, cognitive and ocular conditions, joint and bone health, and connective tissues.*[1-4]

Vitamin C is acquired primarily through the consumption of fruit, vegetables, supplements, fortified food and beverages. Nevertheless, because the vitamin C content of food may be reduced by prolonged storage and cooking (ascorbic acid is water soluble and is destroyed by heat), supplementing our diet with dietary supplement vitamin C may be the best way to assure the proper quantity of vitamin C daily intake.[1] Doctor's Best Vitamin C contains Q®- C which is manufactured in Scotland and prized for its quality and reliability.[5]

BENEFITS

Doctor's Best Vitamin C with Q®- C:

- helps support a healthy immune system*
- helps supports the cardiovascular system*
- helps support the body's antioxidant potential*
- provides quality vitamin C, an essential cofactor for important enzyme systems*
- provides quality vitamin C, a nutrient essential for joints and other connective tissues*
- Non-GMO/gluten Free/Soy Free/Vegan

Vitamin C 500mg, 120VC

Supplement Facts

Serving Size 1 Veggie Capsule
Servings Per Container 120

Amount Per Serving		%Daily Value
Vitamin C (as Q®-C ascorbic acid)	500 mg	555%

Other ingredients: Modified cellulose (vegetarian capsule).

Suggested Adult Use: Take 1 capsule twice daily preferably without food, or as recommended by a nutritionally-informed physician.

Non-GMO / Gluten Free / Soy Free / Vegan
Store in a cool dry place.

Premium vitamins by DSM – www.qualityforlife.com.
Q® is a trademark of DSM.

Vitamin C 1000mg, 120VC & 360VC

Supplement Facts

Serving Size 1 Veggie Capsule
Servings Per Container 120 & 360

Amount Per Serving		% Daily Value
Vitamin C (as Q®-C ascorbic acid)	1000 mg	1110%

Other Ingredients: Modified cellulose (vegetarian capsule).

Suggested Adult Use: Take 1 capsule daily preferably without food, or as recommended by a nutritionally-informed physician.

Non-GMO / Gluten Free / Soy Free / Vegan
Store in a cool dry place.

Premium vitamins by DSM – www.qualityforlife.com.
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* 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.

EXTENDED BENEFITS

Helps support a healthy immune system*

The role of vitamin C in the human immune defense has been a widely researched field for the last decades. Although vitamin C is a potent antioxidant protecting the body against oxidative challenges, it is likely that its action as a cofactor for numerous biosynthetic and gene regulatory enzymes plays a key role in its immune-modulating effects. Vitamin C stimulates neutrophil migration to the site of infection, enhances phagocytosis and oxidant generation, and microbial killing.[6,7] Thus, it is apparent that vitamin C is necessary for the immune system to mount and sustain an adequate response against pathogens, while avoiding excessive damage to the body.[8-13]

Supports the cardiovascular system*

Several studies have shown that vitamin C may favorably affect blood pressure and endothelial function.* While these are only single elements of the complex cardiovascular system, they do grant support to the hypothesis that vitamin C may play a positive role in cardiovascular health.*[14-17] Numerous mechanisms have been proposed to explain the vitamin C-induced BP reduction and include the action of vitamin C on nitric oxide (NO) and on the angiotensin receptor type 1 (AT_1 receptors). Nitric oxide is produced by endothelial cells (lining blood vessel walls) helps to maintain cardiovascular homeostasis and to safeguard blood vessels. Ascorbic acid helps to protect the normal NO biosynthesis pathway, which is easily disrupted by reactive oxygen species (ROS). Angiotensin II (Ang II) is an important hormonal regulator of blood pressure. Some studies demonstrated that vitamin C could decrease the binding affinity of the angiotensin II type 1 (AT1) receptor for angiotensin II by disrupting the AT1 receptor disulfide bridges offering a mechanistic explanation for the reported blood pressure lowering effect of ascorbic acid.*[18]

Helps support the body's antioxidant potential*

Free radicals, reactive oxygen species, and oxidants play a dual role as both toxic and beneficial compounds, in metabolic processes and in response to exogenous stimulations. They are produced either from normal metabolic activities or from environmental factors (pollution, cigarette smoke, radiation, etc.). When an overload of free radicals and/or ROS cannot be scavenged, their accumulation in the body generates oxidative stress, a chemical reaction that produces free radicals, leading to chain reactions that may damage cells.[19] With time, this process may lead to the development of poor health impacting negatively various vital systems such as cardiovascular and immune systems, but also joint and eye health.*

The antioxidant effect of vitamin C has been well documented.[20] Vitamin C is a powerful antioxidant that can neutralize ROS and reduce the oxidative stress making it a potent reducing agent and scavenger of free radicals in biological systems. It is involved in the first line of antioxidant defense, protecting lipid membranes, and proteins from oxidative damage. More, as a water-soluble molecule, vitamin C can work both inside and outside the cells and can neutralize free radicals and fight free radical damage.

Provides quality Vitamin C, an essential cofactor for important enzyme systems*

Vitamin C plays important roles in many different biological processes. Several critical enzymes require vitamin C as a cofactor to function properly. In the collagen processing enzymes, the lysyl hydroxylases and the prolyl hydroxylases need vitamin C to catalyze the hydroxylation of proline and lysine, two amino acids essential in the making of structurally stable collagen. Vitamin C is also necessary for bone remodeling due to the presence of collagen in the organic matrix of bones. In the catecholamine processing enzymes, dopamine βhydroxylase uses vitamin C to catalyze the hydroxylation of the dopamine side chain to form norepinephrine. Vitamin C is also an essential cofactor for the synthesis of carnitine, an amino acid that is necessary for the transport of fatty acids into mitochondria. This transfer of fatty acids is an important factor in the production of ATP (a central metabolite that plays fundamental roles as an energy transfer molecule at the cellular level).[21] Dietary ascorbate is also involved in non-heme iron absorption in the small intestine.[22-24]

Doctor's BEST®
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Vitamin C Powder

Supplement Facts

Serving Size 1 scoop (~ 1 gram)
Servings Per Container Approximately 250

	Amount per serving	% Daily Value
Vitamin C (as Q®-C ascorbic acid)	1 g	1110%

Other Ingredients: None

Suggested Adult Use: Mix 1 level scoop in 8 ounces fruit juice or beverage of your choice daily, preferably without food, or as recommended by a nutritionally-informed physician.

Non-GMO / Gluten Free / Soy Free / Vegan
Store in a cool dry place.

Premium vitamins by DSM – www.qualityforlife.com.
Q® is a trademark of DSM.

Provides quality Vitamin C, a nutrient essential for bones, joints, and other connective tissues*

As it relates to connective tissue, vitamin C is required for collagen fiber synthesis, a process vital for tissue repair and healing. The proper assembly of collagen is dependent upon two enzymes that act immediately after collagen is synthesized in the body. Proline and lysyl hydroxylases convert proline and lysine into hydroxylated versions. These hydroxyl groups will later be used to crosslink trimers in collagen fibrils. Both enzymes require vitamin C as a cofactor and people who don't consume enough vitamin C will produce collagen that will be weaker leading to tissues that are more prone to damage and exposed to delay in repair and wound healing.

Regarding bones, vitamin C has been shown to be a vital modulator of bone health.*[25] Based on various in vitro as well as in vivo research, it was found that Vitamin C has effects on various types of bone cells. A number of in vitro studies have shown that vitamin C plays an important role in promoting expression of genes involved in differentiation of chondrocytes.[26,27] In human studies, outcomes indicated that dietary intake of vitamin C was associated with a reduction in the risk of cartilage loss in humans, which was related to its capacity against oxidative stress.[28,29] Although there is some inconsistency in studies conducted in humans, most point to the conclusion that reduced serum vitamin C levels or intake may be detrimental to bone health.*[25]

CLINICAL STUDIES

In a randomized, double-blind, eight-week trial, the impact of vitamin C on physical activity and respiratory tract infections during the peak of the cold season was studied among twenty-eight healthy non-smoking adult men. These participants received either 1000 mg of vitamin C daily or placebo. All participants completed the Wisconsin Upper Respiratory Symptom Survey-21 daily and detailed questionnaire weekly. In the final two weeks of the trial, the physical activity score rose modestly for the vitamin C group compared to placebo group. The number of participants

reporting cold episodes was 7 and 11 for the vitamin C and placebo groups respectively during the eight-week trial and cold duration was reduced 59% in the vitamin C versus placebo groups. Based on these data, the authors concluded measurable health advantages associated with vitamin C supplementation in a population with adequate-to-low vitamin C status.*[30]

A meta-analysis investigated the usefulness of vitamin C during the common cold season. Based on nine randomized placebo-controlled trials that met the criteria of the analysis, an extra dose of vitamin C at the onset of cold was found to help reduce its duration, shorten the time of confinement indoors, and relieve the symptoms associated with it, including chest pain, fever, and chills. The authors concluded that extra doses of vitamin C could benefit some individuals during the cold season despite taking daily vitamin C supplements.*[31]

A randomized, double-blind, placebo-controlled, crossover study was designed to evaluate the effect of short-term combined treatment with the antioxidants vitamins C (1000 mg)and E (400 IU) on endothelial function, arterial stiffness, and oxidative stress among 30 males with cardiovascular issues. Endothelium-dependent response was assessed as flow-mediated dilation (FMD) of the brachial artery. Arterial stiffness was assessed as central pulse wave velocity (PWV) and augmentation index (AIx). Plasma markers of oxidative stress and antioxidant status were measured. After vitamin supplementation, FMD was significantly improved. Central PWV was significantly reduced, while AIx tended to decrease. Plasma vitamin levels and antioxidant capacity increased significantly. Levels of oxidative stress decreased. Changes in central PWV were related to changes in levels of oxidative stress. The authors concluded that vitamin C combined with vitamin E, had beneficial effects on endothelium-dependent vasodilation and arterial stiffness. This effect was associated with changes in plasma markers of oxidative stress.*[32]

A study examined the association between plasma ascorbic acid concentration and blood pressure (BP) in 242 young-adult women from the Richmond, California, cohort of the National Heart, Lung and Blood Institute Growth and Health Study. The authors examined the associations of plasma ascorbic acid with BP at follow-up year 10, and with change in BP during the previous year. Results showed plasma ascorbic acid at year 10 was inversely associated with systolic BP and diastolic BP after adjusting for race, body mass index, education, and dietary intake of fat and sodium. In analysis of the change in BP, plasma ascorbic acid was also inversely associated with change in systolic BP and diastolic BP during the previous year. While diastolic blood pressure among persons in the lowest quartile of plasma ascorbic acid increased by 5.97 mmHg (95% CI 3.82 to 8.13 mmHg) from year 9 to year 10, those in the highest quartile of plasma vitamin C increased by only 0.23 mmHg (95% CI -1.90 to +2.36 mmHg) (test for linear trend: $p < 0.0001$). A similar effect was seen for change in systolic BP. IN conclusion, plasma ascorbic acid was found to be inversely associated with BP and change in BP during the prior year. The findings suggest the possibility that vitamin C may influence BP in healthy young adults. The authors concluded lower blood pressure in young adulthood may lead to lower pressure and decreased incidence of age-associated vascular events in older adults, further investigation of treatment effects of vitamin C on blood pressure regulation in young adults is warranted.*[33]

A clinical study evaluated the effects of prolonged antioxidant intake on arterial elasticity in participants with multiple cardiovascular risk factors. Participants were randomly assigned to two groups: group 1 received oral supplementation with 2 capsules per day that contained vitamin C (500 mg) vitamin E (200 IU), co-enzyme Q10 (60 mg) and selenium (100 mcg) and group 2 received matching placebo, for 6 months. Different biological parameters were evaluated such as lipid profile, HbA1C (indicator of blood sugar over the past 2 to 3 months), insulin, and arterial elasticity (evaluated using pulse wave contour analysis). Results showed that participants in group 1 exhibited significant increases in large arterial elasticity index (LAEI) as well as small arterial elasticity index (SAEI). A significant decline HbA1C and a significant increase in HDL-cholesterol were also observed. In the placebo group, significant changes in LAEI, SAEI or metabolic measures were not observed. The authors concluded that antioxidant supplementation significantly increased large and small artery elasticity and this beneficial vascular effect was associated with an improvement in glucose and lipid metabolism as well as decrease in blood pressure.*[34]

A comprehensive Medline literature search was done to locate relevant randomized controlled studies that investigated the effect of vitamin C supplementation on LDL (known as the "bad cholesterol") and HDL (known as the "good cholesterol") cholesterol as well as triglycerides. To be included in the meta-analysis, a study had to meet specific criteria defined by this meta-analysis related to dose of vitamin C given (500 mg daily taken by mouth), length of study, etc. Based on this meta-analysis (13 studies of the potential 1363 abstracts met the eligibility criteria), supplementation with at least 500 mg/d of vitamin C, for a minimum of 4 weeks, can result in a significant decrease in serum LDL cholesterol and triglyceride concentrations. However, there was a nonsignificant elevation of serum HDL cholesterol. Although these changes are modest, any small change can have beneficial effects on the cardiovascular health, especially considering the low cost and absence of toxicity when supplementing vitamin C within the ranges of 500 to 1000 mg daily.*[35]

One meta-analysis that showed promising results with vitamin C supplementation looked at its effects on blood pressure. This analysis looked at 29 trials with a median dose of 500 mg daily vitamin C. The median duration of supplementation in these trials was only eight weeks, but in these short-term studies, it was shown that vitamin C supplementation reduced both systolic and diastolic blood pressure.*[14]

A crossover clinical study was designed to determine the effects of ascorbic acid supplementation on circulating biomarkers of oxidative stress and muscle damage following a single bout of exercise in 19 healthy women. The participants performed 30 minutes of moderate intensity cycling after ingesting 1000 mg of ascorbic (AA cohort) acid or placebo. Blood samples were taken immediately before, immediately after and 30 minutes post-exercise to determine plasma albumin, total protein, glucose, oxidative stress and muscle damage markers. Results showed ferric reducing ability of plasma and vitamin C levels in AA cohort significantly increased after exercise ($p < 0.05$). Superoxide dismutase activity was significantly elevated after exercise ($p = 0.002$) in placebo but not AA. Plasma malondialdehyde did not change after exercise in placebo but was significantly decreased in AA ($p < 0.05$). The exercise protocol promoted slight muscle damage, reflected in significant increases in total creatine kinase in all subjects after exercise. The authors concluded that supplementation with ascorbic acid prior exercise improves antioxidant power but does not prevent muscle damage.*[36]

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