Vitamin C with Quali™-C

Ingredients
Doctor's Best Vitamin C featuring Quali™-C provides a brand of ascorbic acid (also known as ascorbate) that is manufactured at the only plant outside of Asia that produces high-quality vitamin C. Located on the coast of Scotland, the site is committed to minimizing the environmental impact of its production process, and ensures that their vitamin C is made from glucose originating from European non-GMO cornfields.1

Vitamin C is essential to the biosynthesis of the metabolic facilitator L-carnitine, the neurotransmitter norepinephrine, and the main connective tissue in the body, collagen. While these functions are obviously critical for our health, this vitamin is most widely revered for its role as a reducing agent (an electron donor), serving as a co-factor for hydroxylases (enzymes) in addition to enhancing the body's total antioxidant potential. As a reducing agent, ascorbate also can aid in the absorption of dietary nonheme iron, helping those who need more iron from their daily intake.2

Benefits
Enhances the body’s antioxidant network* Vitamin C is a key compound in the body’s “antioxidant network,” a chain of synergistic, inextricability linked, well-studied antioxidants that includes glutathione (GSH) and vitamin E. When vitamin E uses its antioxidant function in neutralizing free radicals, it also loses this antioxidant function. Vitamin C can change this status: it can regenerate vitamin E back to its native form, and is thought to “spare” glutathione in the body as well. Importantly, when ascorbate donates an electron and becomes itself oxidized, or “consumed,” the ascorbate radical is relatively harmless.3 In a double-blind, placebo-controlled study in which blood GSH was measured in healthy subjects at several stages, 500 mg of vitamin C taken daily for 2 weeks significantly raised erythrocyte (red blood cell) glutathione levels. The researchers concluded that vitamin C supplementation at that level can benefit the overall antioxidant capacity of the blood.4 In another study of similar design, 1000 mg of vitamin C taken daily for 4 weeks bolstered vitamin E and glutathione content in erythrocyte cell membranes, compared with placebo.5

The highest concentrations of vitamin C in the body are found in the central nervous system (in neurons of the brain & spinal cord) and the adrenal

Vitamin C 500mg, 120VC

Supplement Facts
<table>
<thead>
<tr>
<th>Serving Size</th>
<th>1 capsule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Servings per container</td>
<td>120 servings</td>
</tr>
<tr>
<td>Amount per serving</td>
<td>% Daily Value</td>
</tr>
<tr>
<td>Vitamin C (as Quali™-C ascorbic acid)</td>
<td>500 mg</td>
</tr>
</tbody>
</table>

† Daily Value not established.

Other ingredients: Modified cellulose (vegetarian capsule).

Suggested Adult Use: Take 1 capsule twice daily, preferably without food. Higher intakes may be useful, as recommended by a nutritionally-informed physician.

Non-GMO / Gluten Free / Vegan

Store in a cool dry place.

Vitamin C 1000mg, 120VC & 360VC

Supplement Facts
<table>
<thead>
<tr>
<th>Serving Size</th>
<th>1 veggie capsule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Servings per container</td>
<td>120 &amp; 360 Servings</td>
</tr>
<tr>
<td>Amount per serving</td>
<td>% Daily Value</td>
</tr>
<tr>
<td>Vitamin C (as Quali™-C ascorbic acid)</td>
<td>1000 mg</td>
</tr>
</tbody>
</table>

Other Ingredients: Modified cellulose (vegetarian capsule).

Suggested Adult Use: Take 1 capsule daily, preferably without food. Higher intakes may be useful, as recommended by a nutritionally-informed physician.

Non-GMO / Gluten Free / Soy Free / Vegan

Store in a cool dry place.

Quali™-C is a registered trademark of DSM.

* 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.
Although the presence of ascorbate in neurons is in part explained by its neuromodulatory enzyme activity, its high concentration suggests that vitamin C is so greatly retained by neurons in order to address the higher rates of oxidative metabolism experienced by the brain. This has led to the conclusion that under normal conditions, vitamin C helps safeguard the integrity of neurons (and therefore the brain), largely through neutralization of the free radicals of reactive oxygen species (ROS).6 Low levels of blood vitamin C and the resulting accumulation of ROS are thought to be detrimental—especially to aging populations.

Vitamin C Powder

Supports the Cardiovascular and Immune Systems*
Most prospective studies assessing vitamin C intake in large numbers of people who are followed over time indicate that the highest intakes of vitamin C are associated with enhanced cardiovascular benefits. In addition, some large studies of healthy individuals who take vitamin C supplements suggest that supplementation supports healthy heart function. The Nurses’ Health Study of more than 85,000 women followed for over 16 years found vitamin C intakes of more than 359 mg per day from diet plus supplements or from supplements alone were associated with a more favorable cardiovascular health status.7 In a recent review of studies in which more than 290,000 healthy adults were followed for an average of 10 years, those who took more than 700 mg per day of supplemental vitamin C had a substantially better cardiovascular profile than those who did not take vitamin C supplements.8

Oxidative stress is a central component of cardiovascular health, and vitamin C acts vigorously to counteract multiple avenues of oxidation that detract from cardiovascular health.9 Nitric oxide (NO) produced by endothelial cells (lining blood vessel walls) helps to maintain cardiovascular homeostasis and to safeguard blood vessels. Ascorbate helps to protect the normal NO biosynthesis pathway, which is easily disrupted by ROS.

High levels of certain proteins in the blood serve as indicators of disruptions to both cardiovascular and immune system health. In a study of 3,258 healthy men, levels of vitamin C in the blood have been found to be inversely associated with these protein markers of unbalanced immune activation.10

In a study examining the blood of 240 healthy subjects, the concentration of glutathione and ascorbate was measured in lymphocytes.11 Interestingly, the vitamin C levels of the lymphocytes varied significantly depending on the season (ascorbate levels were lower in the winter), confirming earlier research in which investigators had reported fluctuations in blood vitamin C levels with the seasons. The researchers propose that vitamin C supplementation will not only increase levels of ascorbate in lymphocytes, but GSH levels as well. Although not a controlled clinical trial, the results here are one more piece of the immune system puzzle, and they also hint at what time of year vitamin C supplementation may be most beneficial.

AREAS FOR FURTHER RESEARCH
Results from a pilot study in young adults with either marginal or adequate vitamin C status indicate that vitamin C status impacts fat oxidation.12 The investigators conclude that this is one factor to consider in planning effective weight management strategies.

In a subsequent study of 118 generally sedentary (some normal weight, some overweight) adults aged 20–60, the relationship between vitamin C, body mass index (BMI), and other measures of health was assessed. The researchers found that blood plasma vitamin C concentration was inversely correlated with BMI, percentage of body fat (adiposity), and waist circumference in both the men and women.13 This is particularly interesting because approximately one-third of Americans have marginal vitamin C concentrations. Previous studies also found an inverse relationship between plasma ascorbate and adiposity; it remains unknown whether the increased oxidative stress of carrying additional pounds accounts for this—but research will eventually provide us with an answer.

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Scientific References

10. Wannamethee, S.G., et al., Associations of vitamin C status, fruit and vegetable intakes, and markers of inflammation and hemo-
13. Johnston, C.S., C. Corte, and P.D. Swan, Plasma Vitamin C Is In-

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