Stellar C™

*Vitamin C + bioflavonoids for immune support & overall health**

designs for health®

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Stellar C™ is a blend of vitamin C (from a mixture of ascorbic acid and acerola fruit) and plant bioflavonoids hesperidin, rutin, quercetin, and other mixed citrus flavonoids, which are known for their antioxidative and immunoprotective properties. Bioflavonoids are part of the greater category of bioactive substances called polyphenols, which are a large group of naturally-occurring antioxidant compounds present in plant-based foods. Dietary polyphenols have beneficial effects against a broad group of conditions, particularly those that are inflammatory in pathology. In addition to supporting healthy immune function, these nutrients play a major role in maintaining healthy veins, capillaries, bones, tendons, skin, hair, and nails as vitamin C facilitates proper construction and repair of collagen, one of the body's most abundant proteins.

Benefits*:

- Supports proper collagen production for bone, skin, hair, nail, ligament, tendon and blood vessel health
- Supports immune health
- Supports a healthy inflammatory response
- Protects the body from oxidative stress

Vitamin C

Vitamin C (ascorbic acid) is an essential water-soluble nutrient that is unable to be synthesized endogenously by humans, thus it must be supplied through the diet or supplementation.[1,2] Dietary sources of vitamin C include kiwifruit, citrus fruits, bell peppers, strawberries, goji berries, broccoli, brussel sprouts, and various other fruits, vegetables, and herbs.

As a cofactor for enzymes involved in the synthesis of serotonin and norepinephrine, adequate vitamin C levels may help individuals maintain a positive mental outlook and mount a healthy response to everyday stress. Its function in catecholamine synthesis may be why vitamin C has long been recognized as helping to support the adrenal glands. In fact, the adrenal glands contain one of the highest concentrations of vitamin C in the body (in both the cortex and medulla), underscoring that this nutrient is instrumental for far more than antioxidant effects.[3]

Vitamin C is required for proper function of the enzymes that transform the amino acids proline and lysine into hydroxyproline and hydroxylysine, key components for the synthesis of collagen, including that which constitutes blood vessels. This underlies, in part, the crucial role of vitamin C in cardiovascular health, and explains why easy bruising and bleeding are potential signs of vitamin C deficiency.[1] Vitamin C is required for the biosynthesis of carnitine (from the amino acid lysine), which is needed for enzymatic transport of fatty acids into the mitochondria for subsequent oxidation and generation of ATP.[1]

Vitamin C's antioxidant function is a hallmark of this nutrient. It is a potent neutralizer of free radicals and helps to recycle vitamin E and glutathione. Increased levels of oxidative stress are associated with a wide array of chronic health issues and are both a potential contributor to, and a downstream effect of conditions including but not limited to type 2 diabetes,[4] Alzheimer's disease,[5] other neurodegenerative disorders,[6] and frailty in aging individuals.[7]

Bioflavonoids

Vitamin C and bioflavonoids are found together in nature as they work synergistically; for instance, citrus fruits are rich in both ascorbic acid and the flavonoid, hesperidin. The inclusion of quercetin, hesperidin, and rutin in Stellar C™ supports the proper absorption and utilization of vitamin C in the body, and assists in preventing vitamin C from being destroyed by oxidative stress and free radicals.[8] These three bioflavonoids have also been shown to possess protective, antioxidative, and immune-supportive properties, as well as their ability to favorably modulate the inflammatory response in times of severe acute or chronic stress, such as chronic illness, physical or psychological trauma, overexertion, and intense exercise. When combined with vitamin C, these polyphenolic compounds work together to protect and preserve the structure of blood vessels. Research shows that foods and supplements rich in antioxidants and polyphenols may help prevent or delay disease onset and that those who consumed more vegetables and fruits had a significantly reduced risk of cardiovascular disease, stroke, cancer, and cataract development.[9]

Supplement Facts

Serving Size 1 capsule

Amount Per Serving		% Daily Value
Vitamin C (as Ascorbic Acid and Acerola)	600 mg	667%
Acerola (*Malpighia glabra L.*)(fruit) [standardized to contain 25% vitamin C]	200 mg	*
Citrus Bioflavonoids [standardized to contain 50% hesperidin]	100 mg	*
Rutin	50 mg	*
Quercetin	50 mg	*

*Daily Value not established.

Other Ingredients: Cellulose (capsule), vegetable stearate.

- **Quercetin**, also known as the "king of the flavonoids", is considered to be among the top plant-based polyphenolic compounds due to its powerful antioxidant properties and its ability to support a healthy inflammatory response. Quercetin is a potent flavonol found in many foods that are recognized for their health benefits, such as red onions, apples, olive oil, dark berries and grapes, capers, broccoli, salad greens and culinary herbs such as dill, cilantro, watercress, and radicchio.[10] (This phytochemical contributes to the richly-colored pigments in these foods.) Novel genome research has found that upon binding to DNA or other genome-associated proteins, quercetin assumes the role of a cis-regulatory transcription factor for genetic expressions that are involved in the cell cycle, differentiation, and development.[11] Moreover, this polyphenolic compound also demonstrates an ability to aid in the attenuation of lipid peroxidation, capillary permeability, and platelet aggregation.[12] When exposed to environmental allergens, quercetin is known to inhibit the release of histamines from basophils and mast cell (MC) degranulation, as well as suppress eosinophil (EOS) activation, which are primarily responsible for many of the unpleasant symptoms associated with allergies and seasonal upper respiratory challenges, as they have the ability to release chemical pro-inflammatory compounds such as lipid mediators, cytokines, and chemokines that are contained in the granules.[13,14] A review elucidates how the properties of quercetin are effective for late-phase bronchial asthma responses, allergic rhinitis, and peanut-induced anaphylaxis, and that quercetin is more efficient in inhibiting interleukins 6 and 8 than sedative, anti-allergy/histamine medications.[10] Quercetin can improve T-regulatory helper cell (i.e., Th1/Th2) balance, and arrests antigen-specific IgE antibody formation.[15] In an animal model, quercetin significantly reduced epithelial thickness, goblet, and mast cell numbers, IgE levels, and immunohistochemical markers compared to untreated mice with allergic airway inflammation.[16]
- **Hesperidin** is another potent but lesser-known bioflavonoid found in oranges and grapefruits, particularly in the white part of the peel, called the pith. A review of both animal and human studies shows that hesperidin treatment applied significant antioxidative effects and reduced levels of inflammatory mediators, and showed that its anti-inflammatory effects were primarily mediated through the nuclear factor kappa-beta (NF-kB) signaling pathway.[17] A recent review of cellular and animal studies demonstrated hesperidin's inhibitory effects against the development of neurodegenerative diseases such as Parkinson's, Alzheimer's, Huntington's and multiple sclerosis.[18] The study found that this flavanone's neuroprotective potential is mediated by the enhancement of endogenous antioxidant defense functions and neural growth factors that weaken neuro-inflammatory and apoptotic pathways.[18]
- **Rutin** is a commonly found dietary flavanol antioxidant found in asparagus, citrus fruits, dark-colored berries, plums, and prunes that have protective effects against advanced glycation end-product (AGE) formation. AGEs are formed by the reaction between reducing sugars and proteins and are another group of substances that contribute directly to the initiation and advancement of age-related diseases such as Alzheimer's disease, type 2 diabetes, and atherosclerosis.[19] In an *in vitro* study, rutin inhibited protein glycation on eye lens proteins in an animal model[20] and showed a high capacity to act as a scavenger of reactive carbonyl species (RCS), which resulted in the inhibition of AGE formation[19]. Pretreatment with rutin protected human lens epithelial cells from oxidative stress and apoptosis caused by H2O2.[21] The results of an in vitro study evaluating the protective effects of rutin on the liver of type 2 diabetic mice found significant reductions in random blood glucose and oral glucose tolerance test levels in mice of the model group. Rutin-treated mice also showed reduced liver markers (ALT, AST), inhibition of AGE production, reduced necrosis of hepatocytes, promoting hepatocyte proliferation, and facilitated the signal transduction and activated several signaling pathways by potentiating the expression of insulin receptor substrate 2 and the phosphorylation of PI3K, Akt, and GSK-3β.[22] In a study of the effects of the combination of ascorbic acid and rutin treatment on human keratinocytes and fibroblasts exposed to UVA and UVB radiation, there was an increase of antioxidant enzyme activity (superoxide dismutase, catalase, and thioredoxin reductase), showed complementary effects against UV-induced free radical damage, silenced UV-induced expression of NF-κB and pro-apoptotic proteins, suggesting that these compounds have cytoprotective properties against skin damage.[23]

Recommended Use:

- As a dietary supplement, take one capsule per day, or as directed by your health care practitioner.

For a list of references cited in this document, please visit:
http://catalog.designsforhealth.com/assets/itemresources/Stellar_C_References.pdf

*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.

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