

# Chewable Vitamin C 500 mg Orange Tablets



## Product Summary:

Vitamin C Chewable Orange Flavour Tablets are a dietary supplement that can be used daily for the maintenance of good health. Vitamin C is a water-soluble vitamin that is used in the body to form collagen, cartilage, muscles and blood vessels. Vitamin C promotes wound healing, supports immune function and gum health and has strong antioxidant properties. Regular dietary intake of fresh fruits and vegetables by people of all ages provides adequate intake of vitamin C. Marginal deficiencies are common among the elderly, alcoholics and those with chronic illness and stress. Certain medication may also deplete vitamin C such as oral contraceptives, aspirin, corticosteroids, and furosemide.

## Properties/Uses:

The claim as approved by the *Natural Health Product Directorate* (NHPD): An antioxidant for the maintenance of good health. Vitamin C is a factor in the normal development and maintenance of healthy bones, cartilage, teeth and gums.



GENERAL HEALTH  
& WELLNESS



## Pharmacology:

Vitamin C (ascorbic acid) is an essential nutrient that supports numerous aspects in human health. Vitamin C is best known for its effects as an antioxidant and its role in maintaining proper immune function.<sup>1</sup> Inadequate and clinical deficiency of vitamin C results in impaired immune response with altered resistance to infections, impaired growth, and weakened collagenous structures with delayed wound healing.<sup>1</sup>

Vitamin C is involved in tyrosine metabolism and is a cofactor in the synthesis of carnitine, thyroxine, norepinephrine, dopamine, and tryptophan.<sup>2</sup> Vitamin C is involved in a variety of metabolic processes including oxidation-reduction reactions and cellular respiration, carbohydrate metabolism, synthesis of lipids and proteins, catabolism of cholesterol to bile acids, conversion of folic acid to folinic acid, and iron metabolism.<sup>2</sup> The recycling of vitamin C from oxidation-reduction activity is essential in maintaining the body's supply of vitamin E and glutathione.

Vitamin C's role as an antioxidant in biological fluids is to protect cells from the damaging effect of endogenously or exogenous reactive oxygen radicals and reactive nitrogen species.<sup>1,3</sup> As well, vitamin C prevents oxidative damage to lipids, proteins, and DNA, which has been implicated as a major contributing factor in the development of chronic diseases such as cardiovascular disease, cancer and cataracts.<sup>3</sup>

Vitamin C provides a reduced risk of cardiovascular disease through its antioxidant effect, by lowering total cholesterol and raising HDL, by helping to lower blood pressure, and by inhibiting platelet aggregation.<sup>4</sup> In a population-based prospective study, persons in the top quartiles of baseline plasma vitamin C concentrations had a 42% lower risk of stroke than did those in the bottom quartile. The authors concluded that plasma vitamin C concentrations may serve as a biological marker of lifestyle or other factors associated with reduced stroke risk and may be useful in identifying those at high risk of stroke.<sup>5</sup>

Vitamin C affects various immune functions, although it is not specifically and firmly linked to any single immunological mechanism.<sup>6</sup> Studies show that vitamin C concentrations in plasma and leukocytes are quickly depleted during infections<sup>7</sup> and during period of heavy physical stress.<sup>8</sup>

There is considerable epidemiological evidence that vitamin C plays a significant role in cancer risk reduction. A number of case-control studies have investigated the role of vitamin C in cancer prevention and most have shown that higher intakes of vitamin C are associated with decreased incidence of cancers of the mouth, throat and vocal chords, esophagus, stomach, colon-rectum, and lung.<sup>9</sup> Vitamin C provides an antioxidant effect, thus protecting cellular structures, and DNA in particular. Vitamin C mitigates many metabolic risk factors for cancer including detoxification of environmental pollution that reduces critical exposure to carcinogens.<sup>10,11</sup>





Smokers lose a considerable amount of vitamin C due to oxidative stress in the lungs and else where in the body. Smokers would benefit vitamin C supplements depending on the extent of smoking, to compensate vitamin C losses in the lungs and other smoke affected tissues (see dose section for dose recommendation). The lungs are endowed with one of the highest concentrations of vitamin C found in the body, thus demonstrating the need to meet atmospheric oxidative stress head on.

Vitamin C is also required for the synthesis and production of collagen. Normal collagen synthesis depends on the hydroxylation of proline and lysine residues in the endoplasmic reticulum.<sup>2</sup> The enzymes that catalyze the hydroxylation require ascorbic acid to function correctly.<sup>2</sup> Without ascorbic acid, normal collagen synthesis cannot take place, and tissues become weakened with potentially fatal results.<sup>2</sup> Tissues in the body are made strong by the protein collagen and therefore bones, teeth, gums, skin, tendons, and blood vessels depend on a steady production of collagen for growth, maintenance and repair. Vitamin C is required by the body to help in heal wounds and maintain cartilage.

Vitamin C helps increase non-heme iron absorption from the intestine by protecting iron oxidation. Vitamin C contributes to hemoglobin and red blood cell production in marrow.<sup>12</sup>

An epidemiology study published in 1997 further reveals the broader health enhancement role of vitamin C. James E. Enstrom, PhD, of UCLA followed 12,000 people for over 10 years, looking at the effects on health by different levels of vitamin C intake. He divided participants into three groups: those who consumed 0-50 mg of vitamin C per day from food, those who consumed 50 mg or more from food per day, and those who regularly supplemented vitamin C in excess of 50 mg per day. Dr. Enstrom found that those who consumed more than 50 mg of vitamin C per day achieved the greatest health benefit, with the lowest risk of death by heart disease and cancer, and mortality in general. In the analysis of the data, it was found that men who consumed 300 mg of vitamin C daily had a 45% lower risk of heart disease than those who consumed only 49 milligrams daily.<sup>13,14</sup>

Asthmatics and those with allergies may benefit from supplemented vitamin C by virtue of its antioxidant and antihistamine effects. Vitamin C inhibits excessive histamine release from neutrophils and enhances the detoxification of histamine, as well as neutrophil chemotaxis, thus the removal of offending allergens.<sup>15,16</sup>

Some, but not all, studies have observed increased dietary vitamin C intake and increased blood levels of vitamin C to be associated with decreased risk of cataracts.<sup>9</sup> It is thought that vitamin C prevents photon-generated oxidation of lens protein fibers. As early as 1939, Bouton showed that supplementing with 1000 mg per day was able to arrest for 11 years further cataract formation. Some had already had cataract surgery.<sup>17</sup> In general, studies that have found a relationship suggest that vitamin C intake may have to be higher than 300 mg/day for a number of years before a protective effect can be detected.<sup>9</sup>

A recently published a study (2011) indicates vitamin C's importance to nerve cells





in the eye and brain. Neuroscientists, from the University of Buenos Aires Argentina, discovered that nerve cells in the eye require relatively high levels of vitamin C inside and out of the cells in order to function properly. When vitamin C was removed, GABA-type receptor's (GABA-A and GABA-C) in the retinal cells stopped functioning. While not conclusive, this research provides support for the importance of regular and optimal vitamin C dietary intake and the findings could have implication for other diseases, like glaucoma and epilepsy. Both conditions are caused by the dysfunction of nerve cells in the retina and brain that become over excited in part because GABA receptors may not be functioning properly.<sup>18</sup>

In a prospective, double-blind, placebo-controlled, 12-week study, the effects of oral vitamin C with metformin was examined on fasting (FBG) and postmeal blood glucose (PPGB), as well as glycosylated hemoglobin (HbA1c) and plasma ascorbic acid level in patients with type 2 diabetes mellitus. The primary finding of the study was a significant decrease in FBG, PPBG, and HbA1c and an increase in plasma ascorbic acid level after vitamin C supplementation along with metformin. The authors concluded, "treatment with vitamin C with metformin was well tolerated and devoid of any side effects. The absence of any substantial side effects, cheaper cost, improvement in FBS, PPBS, and HBA1c, and the fact that plasma ascorbic acid levels are decreased in diabetes mellitus and increased after oral supplementation make it a particularly attractive therapeutic adjuvant in the treatment of type 2 diabetes mellitus".<sup>19</sup>

Vitamin C is a major player in lowering the risk of diabetic complications. In diabetes, vitamin C competes with glucose for cellular uptake and glucose usually wins. Also, diabetic patients accumulate sorbitol intracellularly, forcing vitamin C to exit the cells by osmolarity adjustments. The net effect is less intracellular vitamin C, which is the principal intracellular free radical modulator. Free-radical damage contributes to insulin resistance, a major perpetuating factor in type II diabetes, and a factor in advanced type I diabetes. Other diabetic complication factors of intracellular vitamin C deficiency include increased capillary permeability, poor wound healing, elevations of cholesterol, and depressed immune function. Profound risk of decline stems from intracellular sorbitol build-up, due to the nature of the disease, which accelerates diabetic cataract formation and other tissue declines. Daily vitamin C at 1000 to 3000 mg significantly reduces the rate of diabetic complications.<sup>20, 14</sup>

The bioflavonoids or flavonoids; rutin, hesperidin and citrus bioflavonoids, are polyphenolic compounds found in plants. Fruits and vegetables that are high in vitamin C are rich sources of flavonoids as well. A few studies have examined the effect of bioflavonoids on the bioavailability on ascorbic acid.

Dietary sources of vitamin C include fresh fruits and vegetables, particularly citrus fruits (oranges and lemons), berries and green vegetables including sweet peppers, broccoli, kale and spinach. High heat in cooking and processing of foods can destroy the vitamin C of a food item. Lightly steaming vegetables helps to preserve nutrient content of foods compared to cooking most vegetables and fruits in water.





## Manufactured product information:

**Manufacturer:**

WN Pharmaceuticals® Ltd.

**Size/UPC:**

120's ..... 7 77747 10321 8

**NPN:**

02245348

**Expiry Date:**

36 months from date of manufacture

**Active Ingredient:**

Each tablet contains:

Vitamin C (Sodium Ascorbate/Ascorbic acid) .....500 mg

**Non-Medicinal Ingredients (in descending order):**

Sorbitol, natural orange juice flavour, natural orange colour (annatto, turmeric), natural orange flavour, magnesium stearate, silica, citrus bioflavonoids, sucralose, rosehips, hesperidin, acerola, orange peel powder, quercetin, rutin.

**Appearance:**

Round peach to brown mottled tablet.

**Packaging:**

300 cc white round bottle with safety seal under a 45 mm white induction sealed cap with vented interior seal and a label applied to the bottle. Lot number and expiry date are printed on label applied to exterior of bottle.

**Storage:**

Preserve in tight, light resistant containers in a cool place.





## Dose:

Dose information for Vitamin C presented as dose per day [Health Canada, 2007]:

LIFE STAGE GROUP		VITAMIN C (MG/DAY)		
		Minimum*	RDI	Maximum
Children	1-3 years of age	2.2	15	400
	4-8 years of age	2.2	25	650
Adolescents	9-13 years of age	2.2	45	1,200
	14-18 years of age	6.0	65-75	1,800
Adults	≥ 19 years of age	6.0	75-90	2,000
Pregnancy	14-18 years of age		80	1,800
	19-50 years of age		85	2,000
Lactation	14-18 years of age		115	1,800
	19-50 years of age		120	2,000

Smokers are among those at increased risk of vitamin C deficiency, particularly when not accompanied by vitamin supplementation.<sup>21,22</sup> Health Canada states, because smoking increases oxidative stress and metabolic turnover of vitamin C, the requirement for smokers is increased by 35 mg/day.<sup>23</sup>

According to the Vitamin C Foundation, the optimum intake of vitamin C is likely to be in the region of 1,000 mg to 10,000 mg per day. In cases of cardiovascular disease, an infectious or immune system disease, or cancer the ideal level may be much higher. In addition, under circumstances of excessive amounts of alcohol, living in a polluted city, leading a stressful lifestyle, taking certain drugs such as aspirin, or smoking, the optimal intake will again be raised. An intake of 200 to 300 mg of vitamin C per day is required to raise the average smoker's vitamin C level to that of a non-smoker. An intake of around 50 mg per cigarette probably affords maximum protection.<sup>24</sup>

What constitutes the optimal daily amount is still debated. However, a broad base of nutritionally oriented health care providers generally agree on a recommended range of 250 mg to 1000 mg per day, preferably in divided amounts of no more than 250 mg, with meals to enhance absorption. In adults, the acute phase of an infection can be treated with 1000 to 8000 mg per day to shorten the course of the infection.<sup>25</sup> High dose supplementation later in the illness appears to be less productive and the usual daily maintenance amount will suffice.<sup>25</sup>



New pharmacokinetic data indicates that intravenous (i.v.) administration of ascorbate bypasses the tight control of the gut producing highly elevated plasma levels; ascorbate at very high levels can act as prodrug to deliver a significant flux of  $H(2)O(2)$  to tumors.<sup>26</sup> Patients with serious illness or who require larger-than-normal amounts of vitamin C should be advised to consult with their doctor about the use of vitamin C intravenously.

Diabetics will benefit from 1000 mg to 3000 mg per day in divided amounts to overcome a critical intracellular vitamin C deficiency.<sup>14, 20</sup>

Marginal deficiencies are common among the elderly, alcoholics, and those with chronic illness.<sup>27</sup>

## Directions:

**(Adults):** 1 – 3 tablets daily with a meal or as recommended by a physician.

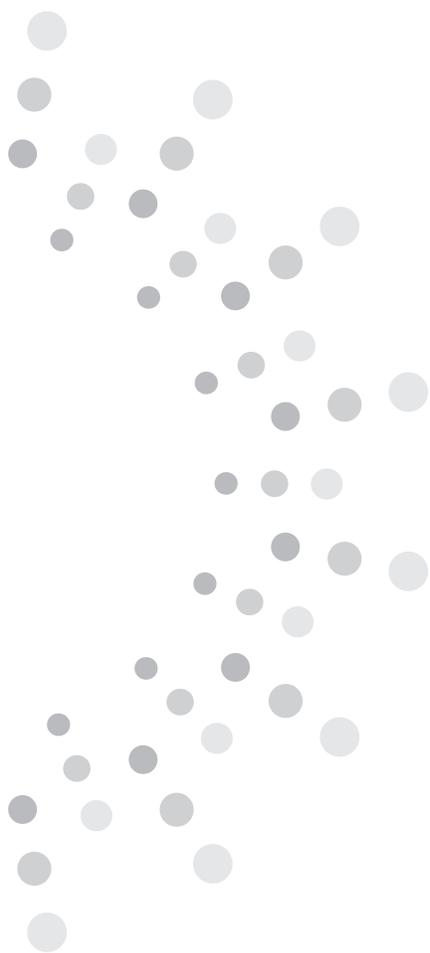
## Caution:

The caution as approved by the *Natural Health Product Directorate* (NHPD): KEEP OUT OF THE REACH OF CHILDREN. STORE AT ROOM TEMPERATURE IN A DARK, DRY PLACE. DO NOT USE IF INNER SEAL IS BROKEN OR MISSING.

## Deficiency Symptoms:

Vitamin C must be consumed in the diet as the body cannot manufacture it own source. Scurvy is the result of sever vitamin C deficiency. Scurvy is rare in developed countries as the minimum required daily amount of vitamin C is 10 mg. Symptoms of scurvy can be attributed to the breakdown of collagen in absence of vitamin C. Symptoms include bleeding gums, poor wound healing, extensive bruising, joint pain and swelling.<sup>9</sup> As well, susceptibility to infection, hysteria, and depression are also hallmark features.<sup>20</sup> Anemia may be another symptom as vitamin C helps the body absorb and use iron. One raw, medium sized orange provides approximately 70 mg of vitamin C.<sup>28</sup>

Alcohol, analgesics, antidepressants, anticoagulants, oral contraceptives, and steroids may reduce levels of vitamin C in the body. Smoking causes a serious depletion of vitamin C. (see Dose section).<sup>12</sup>





## Drug Interactions /Contraindications:

Vitamin C enhances iron absorption. This may present an added risk for those who suffer hemochromatosis, and for age-related iron overload in men, women with an early hysterectomy, and postmenopausal women. It may be necessary for some individuals to consume their vitamin C between meals to minimize dietary iron uptake. Patients with gout, kidney disease, a history of kidney stones, or who are on hemodialysis, should consult their physician for dosage information on vitamin C.

Vitamin E and vitamin C interact beneficially with C regenerating E, making it again active as a membrane radical chain-breaking antioxidant.

Vitamin B12 may be destroyed by vitamin C. Advise patients to take the supplements at least 2 hours apart.

Folic acid may be partially inactivated if taken at the same time with vitamin C and iron.<sup>29</sup>

The use of antioxidants like vitamin C during chemotherapy is controversial. Advise patients to consult their oncologist before using vitamin C supplements, especially in high doses.<sup>2</sup>

Aluminum-containing antacids; Vitamin C can increase the amount of aluminum the body absorbs, which could cause the side effects of these medications to be worse.<sup>30</sup>

Protease inhibitors; Vitamin C appear to slightly lower levels of indinavir (Crixivan), a medication used to treat HIV and AIDS.<sup>30</sup>

There is a possible interaction between vitamin C and aspirin, with increased excretion of vitamin C when dietary vitamin C levels are low in those who regularly use aspirin.<sup>31</sup>

Daily vitamin C supplementation (1000 mg) may increase blood levels of estrogen, impacting on birth control and HRT medications, and increasing the risk of estrogen related cancers. Side effects may become more noticeable. This interaction is controversial and may not be significant.<sup>31</sup>

Large daily doses (5 grams) of vitamin C may interfere with the effectiveness of blood thinners like warfarin.<sup>31</sup>

Stomach acid-lowering drugs may allow bacteria to produce the carcinogen, nitrosamine, from dietary nitrite, which can lead to gastric cancer. Vitamin C is known to block gastric nitrosamine production.<sup>31</sup>

Regular and large consumption of alcohol effectively reduces vitamin C absorption.<sup>31</sup>





## Toxicity/Adverse Reactions:

Vitamin C has been consistently found to be a safe nutritional supplement when used within the recommended optimal dosage range stated above. When ascorbic acid is used and the intestinal absorption capacity is exceeded or tissues are saturated, diarrhea and intestinal gas and/or distention usually results.<sup>20, 25</sup>

Other possible side effects include nausea, vomiting, heartburn or abdominal cramps. Such adverse effects are thought to extend from the acid nature of vitamin C. If high doses are deemed to be essential, they should be introduced more gradually and taken with food. High doses of vitamin C appear to be better tolerated at times of acute sickness, or when under increased stress loads, when tissue levels are being expended. Even with high amounts, the blood levels of vitamin C do not exceed 1.5 to 2.0 mg/dl because of decreased absorption and increased kidney excretion.<sup>26</sup> However, supplementing with mineral ascorbates, such as sodium or calcium ascorbate, greater tolerability is expected and generally reported. Nevertheless, high enough amounts of any supplement may still present GI upset.

The primary medical concern with high amounts of vitamin C (> 10 grams per day) is the possible development of calcium oxalate kidney stones. High amounts of vitamin C do present a risk factor for kidney stones in those already suffering recurrent kidney stones, those on hemodialysis, and in those suffering from kidney disease, or even gout. However, vitamin C up to 10 grams per day has been shown not to increase urinary oxalate levels.<sup>32, 33</sup>

Since vitamin C enhances iron absorption, its supplementation should be provisionally contraindicated in hemochromatosis until the user has been guided by their physician on how much supplemented vitamin C is appropriate

Women who are pregnant who want to take a dietary vitamin C supplement should not exceed the UL for their age group. High doses of vitamin C can affect the developing fetus causing it to become dependent on the nutrient and develop scurvy when deprived of the mega doses after birth.<sup>34</sup>

In children, large amounts of vitamin C may cause nausea and diarrhea, and lead to red blood cell hemolysis and reduced white blood cell bactericidal activity.<sup>26</sup>

Chewable vitamin C tablets could damage teeth enamel.

This product contains sodium ascorbate. Individuals following low-sodium diets (e.g., for high blood pressure) are generally advised to keep their total dietary sodium intake to less than 2,500 mg/day.





## Allergen Content/Ingredient Sensitivity:

NO	YES
Artificial Colors	Artificial Sweeteners
Artificial Flavors	Corn Products
Egg Products	Milk Products
Fish	Starch/Modified Starch
Gluten	
Hydrolyzed Plant Protein	
Lecithin	
Peanuts	
Preservatives	
Sesame Products	
Shellfish	
Soy Products	
Sulphites (<10 ppm)	
Tartrazine	
Tree Nuts	
Wheat Products	
Yeast	

### NOT ACCEPTABLE FOR THE FOLLOWING DIETARY RESTRICTIONS:

Free of animal products

Kosher





## References

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