



# Vitamin C

## AT A GLANCE

### Introduction

Vitamin C, also known as ascorbic acid, is a water-soluble vitamin. While most animals are able to synthesize vitamin C in their body, humans do not have the ability to make their own vitamin C; it must be obtained through their diet.

Low levels of vitamin C have been associated with a number of cardiovascular disorders, including heart disease, hypertension, stroke, and atherosclerosis, as well as some cancers. A sufficient vitamin C intake may help reduce the risk of developing some of these conditions.

### Health Functions

A sufficient intake of vitamin C (ascorbic acid), is important as it helps the body to

- make collagen, an important protein in skin, cartilage, tendons, ligaments, and blood vessels
- grow and repair tissues
- heal wounds
- repair and maintain bones and teeth
- synthesize neurotransmitters
- block, some of the damage caused by free radicals by working as an antioxidant along with vitamin E, beta-carotene and many other plant-based nutrients. This damage can contribute to the aging process and the development of cancer, heart disease, and arthritis.

The European Food Safety Authority (EFSA), which provides scientific advice to assist policy makers, has confirmed that clear health benefits have been established for the dietary intake of vitamin C in contributing to:

- the protection of cell constituents from oxidative damage;
- normal collagen formation and the normal function of bones, teeth, cartilage, gums, skin and blood vessels;
- the increase of non-heme iron absorption;
- the normal function of the nervous system;
- a normal function of the immune system;
- normal energy-yielding metabolism;
- the maintenance of the normal function of the immune system during and after intense physical exercise.

### Disease Risk Reduction

Low levels of vitamin C have been associated with a number of conditions, including heart disease, high blood pressure (hypertension), stroke, some cancers, and atherosclerosis. A sufficient vitamin C intake may help reduce the risk of developing some of these conditions.

### **Heart disease**

Results of scientific studies on whether vitamin C is helpful for preventing heart attack or stroke are mixed. Vitamin C was not shown to lower cholesterol levels or to reduce the overall risk of heart attack, but some evidence suggests that it may help protect arteries against damage (atherosclerosis) by acting as an antioxidant.

### **High blood pressure**

Population studies suggest that people who eat foods rich in antioxidants, including vitamin C, have a lower risk of high blood pressure (hypertension) than people who have poorer diets.

### **Cancer**

Results of many population studies suggest that eating foods rich in vitamin C may be associated with lower rates of cancer, including lung, stomach and possibly breast cancer. As these foods also contain many beneficial micronutrients and antioxidants, not only vitamin C, it is impossible to say for certain that vitamin C is protecting against cancer.

### **Arthritis**

Vitamin C is essential for the body to make collagen, which is a part of normal cartilage. Cartilage is destroyed in osteoarthritis, putting pressure on bones and joints. Research suggests that free radicals may also be involved in the destruction of cartilage, and that antioxidants such as vitamin C may limit these damaging effects.

There is some evidence that people who eat diets rich in vitamin C are less likely to be diagnosed with osteoarthritis or rheumatoid arthritis.

### **Age-related eye diseases**

Vitamin C appears to work with other antioxidants, including beta-carotene and vitamin E, to protect the eyes against developing disorders such as cataracts and macular degeneration (AMD); the leading causes of legal blindness in people over 55. The people who seem to benefit are those with advanced age-related eye diseases.

### **Other disorders**

Although the information is limited, studies suggest that vitamin C may also be helpful for boosting immune system functions, maintaining healthy gums, reducing effects of sun exposure (sunburn or redness), healing burns and wounds, reducing symptoms of exercise-induced asthma, and inhibiting the absorption of toxic lead.

## **Other Applications**

*Please note:*

*Any dietary or drug treatment with high-dosed micronutrients needs medical supervision.*

### **Diabetes**

Heart disease and stroke are the leading causes of death in individuals with diabetes. Evidence that diabetes is a condition of increased free radical activity led to the hypothesis that higher intakes of antioxidant nutrients such as vitamin C could help decrease heart disease risk in diabetic individuals. To date, trials have not proven that supplementation with vitamin C is beneficial in treating (or preventing) heart disease in individuals with diabetes.

### **Common cold**

Studies have shown that taking vitamin C supplements regularly (not just at the beginning of a cold) produces a small reduction in the duration of a cold (about 1 day). In studies examining people exercising in extreme environments (athletes such as skiers and marathon runners), vitamin C seemed to reduce the risk of getting a cold.

## Intake Recommendations

The recommended daily intake of vitamin C varies according to age, sex, risk group and criteria applied in individual countries. While in the European Union a daily intake of 45 mg vitamin C have been recommended for adults, in the U.S., 90 mg/day for men and 75 mg/day for women have been defined as adequate. Higher amounts of vitamin C are recommended for pregnant and breast-feeding women.

## Supply Situation

Nutrition surveys in European countries suggest that only close to 50% of the population meet national intake recommendations for vitamin C.

## Deficiency

Although serious deficiencies are rare in industrialized countries, some evidence suggests that many people may be mildly deficient in vitamin C.

Smoking cigarettes lowers the amount of vitamin C in the body, so smokers are more at risk of deficiency.

Signs of vitamin deficiency include dry and splitting hair, inflammation of the gums, bleeding gums, rough, dry, scaly skin, decreased wound-healing rate, easy bruising, nosebleeds, and a decreased ability to ward off infection.

A severe form of vitamin C deficiency is known as scurvy.

## Sources

Vitamin C is widely distributed in fruits and vegetables: citrus fruits: blackcurrants; peppers; green vegetables such as broccoli; Brussels sprouts, and fruits like strawberries, guava, mango and kiwi are particularly rich sources. Depending on the season, one medium-sized glass of freshly pressed orange juice (i.e., 100 g) yields from 15 to 35 mg vitamin C.

## Safety

Although a number of possible problems with very large doses of vitamin C have been suggested, none of these adverse health effects have been confirmed, and there is no reliable scientific evidence that large amounts of vitamin C (up to 10 g/day in adults) are toxic.

### **Tolerable upper intake level**

In the U.S., a tolerable upper intake level for vitamin C of 2 g (2,000 mg) daily has been set for adults in order to avoid diarrhea and gastrointestinal disturbances.

### **Drug interactions**

*Please note:*

*Because of the potential for interactions, dietary supplements should not be taken with medication without first talking to an experienced healthcare provider.*