Vitamin C
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- Vitamin C (ascorbic acid) is a natural substance found in many common foods (e.g., tomatoes, potatoes, green vegetables, citrus fruits, strawberries, etc.).
- Used as an antioxidant. Claims include that vitamin C can be used to treat colon cancer and can improve the recovery from colds and/or the flu. Further, some proponents of vitamin C also claim that supplementation with this water-soluble vitamin will improve human exercise performance.
- To date, there is no conclusive evidence to indicate that mega doses of vitamin C are useful in the treatment of colon cancer. Although controversial, some evidence exists that vitamin C can reduce the severity of a cold. At present, there is limited evidence that vitamin C supplementation will improve endurance exercise performance in humans.
- Moderate supplementation (e.g., 0.25-1.0 gram/day) with vitamin C is considered safe and well tolerated by most healthy adults. Nonetheless, high doses of vitamin C (e.g., >2 grams/day) can be toxic and cause destruction of vitamin B-12 and enhance iron absorption.
- Vitamin C is a legal substance and its use is permitted by sports governing bodies.

Name
Vitamin C (Ascorbic acid)

Description
Vitamin C exists in two chemical forms: 1) ascorbic acid (reduced form); and 2) dehydroascorbic acid (oxidized form). Both forms are interchangeable and have biological activity. Vitamin C is found in a variety of common foods including tomatoes, potatoes, green vegetables, citrus fruits, and strawberries.
Usage
Vitamin C (a water-soluble vitamin) is a common vitamin supplement and has been in use for many years. It has been argued that vitamin C supplementation may reduce the incidence and severity of colds; nonetheless, this issue remains controversial. Further, some vitamin advocates claim that vitamin C may also improve human exercise performance.

Prevalence
Prevalence rates and incidence of use of vitamin C by athletes and consumers are unknown. However, the annual sales in the United States remain high.

Chemical Mechanism
Vitamin C acts as a nonspecific reducing agent (i.e., donates electrons) and is important for several biological functions in the body. For example, vitamin C is required for the synthesis of collagen (component of connective tissue) and is an important biological antioxidant. Further, vitamin C plays an active role in the function of the immune system. The biological impact of vitamin C on human health continues to be investigated. However, a primary benefit of vitamin C comes from its antioxidant properties. As an antioxidant, vitamin C scavenges free radicals and reduces the potential for oxidative damage in tissues. Reduction of oxidative damage to tissues has been postulated to slow the aging process, and reduce the risk of cataracts, heart disease, and cancer.

Clinical Evidence
The efficacy of vitamin C as a treatment for cancer and shortening the duration of colds has been investigated primarily through epidemiological studies. At present, clinicians remain divided about the clinical usefulness of vitamin C supplementation to treat colon cancer.

Scientific Research
There is growing human literature on the effects of vitamin C as a treatment for cancer and as a cold therapy. In this regard, studies remain divided on the ability ofmega doses (e.g., 10 grams/day) of vitamin C to cure colon cancer. In contrast, scientific evidence does support the notion that dietary supplementation (1 gram/day) of vitamin C may decrease the severity of a cold. Several studies have also investigated the effects of vitamin C on muscular fatigue and human performance. To date, there is no convincing evidence that vitamin C supplementation will improve athletic performance in humans. Nonetheless, additional research will be required before a firm conclusion can be formed about the ergogenic potential of vitamin C in humans.

Administration
Vitamin C is typically taken orally in tablet form.
Dosage
The recommended daily allowance (RDA) of vitamin C for adults is 60 mg/day. The current RDA publication suggests that cigarette smokers should consume 100 mg/day to overcome the rapid destruction of vitamin C in the lungs. Vitamin C is probably not toxic to most healthy adults when consumed in amounts of less than 1 to 2 grams/day. Two grams or more per day causes destruction of some vitamin B-12 and enhances iron absorption.

Contraindications
There are few contraindications for vitamin C supplementation. However, high doses (>2 grams/day) of vitamin C has been shown to cause stomach inflammation, diarrhea, and oxalate kidney stones in people with a history of kidney stones.

Precautions/Warnings
To date, there are few (if any) reported harmful interactions between vitamin C and other common nutritional supplements.

Banned/Permitted
Neither the International Olympic Committee nor the U.S. Olympic Committee currently includes vitamin C on their lists of banned substances.

Legality
Vitamin C is a legal substance and can be purchased at a variety of commercial outlets in the United States and around the world.

References

**Degree of Confidence**

1.0

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