

Vitamin C

History

- Vitamin C (ascorbic acid) is an essential, water-soluble vitamin.
- It is found in high quantities in citrus fruits, strawberries, kiwi fruit, and tomatoes.
- It first received widespread attention in 1971 when Nobel Prize winner Linus Pauling published his book *Vitamin C and the Common Cold*.

Most studied uses

Prevention and treatment of upper respiratory infections.

Other common uses

Hypertension, asthma, ischemic heart disease. (See also “Antioxidant Combinations”)

Summary of the evidence

- There is some evidence that vitamin C may reduce the duration of URI's slightly, but it has been shown to be no better than placebo at preventing episodes.
- Even at high doses, vitamin C appears to be safe and well-tolerated, although caution should be used in those with a history of kidney stones.

Pharmacology

- Vitamin C is well absorbed after oral dosing, although its bioavailability drops off considerably at doses greater than 1.5 g.
- At high serum concentrations, it is excreted unchanged in the urine.
- Serum levels tend to plateau at doses greater than 3 grams per day.
- High intake may stimulate the metabolism of vitamin C such that relative deficiency may occur if long-term administration of megadoses is abruptly discontinued

Mechanism of action

- Vitamin C has been shown to have both antioxidant and pro-oxidant effects.
- T-lymphocyte activity, phagocyte function, leukocyte mobility, and possibly antibody and interferon production seem to be increased by vitamin C.

Clinical studies

- There have been more than 60 RCT's of vitamin C to prevent and treat the common cold. A Cochrane meta-analysis (Douglas 2004) pooled the data from 21 of the best of these trials and concluded that vitamin C did have a small, consistent benefit in decreasing the duration and severity of symptoms, shortening episodes of URI's by an average of 0.5 days (approximately 8%).
- Vitamin C had no benefit for URI prevention.

Adverse effects

- Mild side effects can occur from doses greater than 1 gram, but high dose vitamin C is generally very well tolerated.
- Patients may sometimes report nausea, heartburn, gas, or diarrhea.

Contraindications/cautions

- Caution should be used in those with a history of nephrolithiasis or renal dysfunction.
- About 5% of those who take more than 1 gram per day of vitamin C on a regular basis will develop hyperoxaluria, which could promote the formation of kidney stones.

Important interactions

- Vitamin C facilitates the absorption of iron and decreases the excretion of aspirin.
- Vitamin C can cause false negative results in both fecal occult blood testing and in routine urine dipstick tests for glucose.

Formulation and dosage

- Most trials of abortive therapy have used 2 g or more per day divided into 2-3 equal doses. Cigarette smokers should use somewhat higher doses since smoking increases the metabolic turnover of vitamin C.
- The Recommended Daily Allowance (RDA) of vitamin C is 60 mg per day. An eight-ounce glass of orange juice contains about 100 mg of vitamin C.
- No documented differences in biologic activity or bioavailability have been found between vitamin C derived from natural vs. synthetic sources. Because vitamin C is so readily absorbed, there is no indication that powders have an advantage over tablets. Most studies have tested 400 mg tid.

Key Vitamin C References

1. Douglas RM, et al. Vitamin C for preventing and treating the common cold (Cochrane Review). In: The Cochrane Library, Issue 2, 2004. Chichester, UK: John Wiley & Sons, Ltd.
2. Anderson TW, et al. Vitamin C and the common cold: a double blind trial. Canadian Med Assoc Journal. 1972;107:503-508.
3. Audera C, et al. Mega-dose vitamin C in treatment of the common cold: a randomised controlled trial. Med J Aust. 2001 Oct 1;175(7):359-62