Vitamin C

L-ascorbic acid; ascorbate. Sold as ascorbic acid, sodium and calcium ascorbate (Ester-C), and liposomal ascorbate.

Vitamin C is the most-studied supplement in the pharmacy and one of the least useful for the average buyer. Pooled Cochrane data across 29 comparisons and 11,306 participants show that continuous supplementation does not prevent colds in the general population (RR 0.97) but shortens them by about 8% in adults and 14% in children — while halving incidence in people under extreme physical stress. In sepsis, a meta-analysis published September 4, 2026 found a mortality signal that vanishes in the multicenter trials. Beyond roughly 200 mg per day, oral dosing stops raising plasma and starts raising urinary oxalate.

SUMMARY TABLE

ATTRIBUTE	SUMMARY
What it is	Water-soluble essential vitamin; cofactor for collagen hydroxylases and carnitine and norepinephrine synthesis. Deficiency disease: scurvy.
Best-evidenced use	Correcting deficiency. Secondarily, a small reduction in cold duration with continuous prophylactic dosing, and a ~50% reduction in cold incidence under extreme physical or cold stress.
Clinical dose	RDA 90 mg/day (men), 75 mg/day (women), +35 mg/day for smokers. Prophylaxis trials used 200 mg–2 g/day; absorption and plasma saturate near 200–400 mg/day.
Time to effect	Deficiency resolves in days to weeks. The cold-duration effect requires daily dosing established before illness; dosing begun at symptom onset has not shown consistent benefit.
Evidence grade	High for deficiency. Moderate but small for cold duration. Negative for cold prevention in the general population. Low and internally contradictory for sepsis.
Key risks & interactions	Osmotic diarrhea above ~1 g. Raises urinary oxalate; ≥1,000 mg/day is associated with higher kidney-stone risk in men. Enhances non-heme iron absorption (avoid in hemochromatosis). Hemolysis risk in G6PD deficiency at IV doses. Interferes with glucometer and fecal occult blood testing.
Product quality note	Plain ascorbic acid is fully bioavailable at supplement doses; liposomal, buffered and Ester-C formats carry large premiums without outcome data.

PROPHYLAXIS, DURATION, AND THE SIZE OF THE EFFECT

The reference analysis remains Hemilä and Chalker's Cochrane review (2013, CD000980.pub4). Across 29 trial comparisons and 11,306 participants taking at least 200 mg daily, cold incidence was essentially unchanged (RR 0.97, 95% CI 0.94–1.00). The one robust exception was five trials in 598 marathon runners, skiers and soldiers on subarctic exercises, where incidence halved (RR 0.48, 95% CI 0.35–0.64).

Duration is the honest positive finding: an 8% shortening in adults across 31 comparisons and 9,745 episodes, 14% in children across 15 comparisons and 1,532 episodes. On a seven-day cold that is roughly half a day. A 2023 BMC Public Health meta-analysis found severity reductions that scaled with dose. Critically, trials starting vitamin C at symptom onset have not reproduced the duration benefit — this is a prophylaxis regimen or nothing.

THE CRITICAL-CARE QUESTION AND THE CEILING ON ORAL DOSING

An updated review in Frontiers in Nutrition (September 4, 2026) pooled 14 randomized trials and 1,958 septic patients, reporting reduced 28-day mortality (RR 0.70, 95% CI 0.53–0.93), shorter vasopressor duration and greater SOFA improvement. The authors' caveat is the finding: the benefit came from single-center studies and was absent in multicenter trials. LOVIT (NEJM 2022, n=872) found high-dose intravenous vitamin C associated with a higher risk of death or persistent organ dysfunction than placebo.

None of this transfers to a capsule. Padayatty's pharmacokinetic work (Annals of Internal Medicine, 2004) showed that oral dosing plateaus plasma ascorbate near 70–80 µmol/L regardless of dose, while intravenous administration reaches millimolar

concentrations. Oral vitamin C cannot reproduce the exposure under study in critical care or high-dose oncology.

SAFETY CEILING, LABORATORY INTERFERENCE, AND ENFORCEMENT

The tolerable upper intake level is 2,000 mg/day, set on gastrointestinal tolerance. The more consequential signal is renal: ascorbate is metabolized in part to oxalate. In pooled prospective cohorts (American Journal of Kidney Diseases, 2016), supplemental intake ≥1,000 mg/day was associated with roughly 40% higher kidney-stone incidence in men, with no association for dietary intake; a Swedish cohort (JAMA Internal Medicine, 2013) reported nearly double the risk in male users.

Two interferences are widely missed: gram-level ascorbate falsely elevates many glucose meter readings and produces false-negative fecal occult blood results. Enforcement history is also evidence — across 2020–2021 the FDA and FTC issued a large volume of joint warning letters to firms marketing vitamin C for COVID-19.

BOTTOM LINE

Eat the RDA; supplement only for a reason. If you supplement, 200 mg/day of plain generic ascorbic acid reaches the saturation point of oral absorption — everything above it is expensive urine with a rising oxalate load. No outcome evidence supports liposomal or Ester-C premiums.

Two defensible exceptions: sustained extreme physical or cold stress, where 200 mg–1 g daily through the season halves cold incidence, and documented low intake. Do not start dosing at the first sneeze, stay below 500 mg/day with any stone history, and dose well away from home glucose testing.

SOURCES

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