

The new potential of vitamin C

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Linus Pauling and the NIH

Oral doses of vitamin C may be far more powerful than previously realized. Elements of the medical establishment have alleged that Linus Pauling's claims for high dose vitamin C were disproven by research at the National Institutes of Health (NIH), published shortly after Pauling's death. The basis for this was the NIH group's claim that the body could absorb only about 200 mg of vitamin C through vitamin C supplementation: beyond this, the body was "saturated" and could absorb no more.

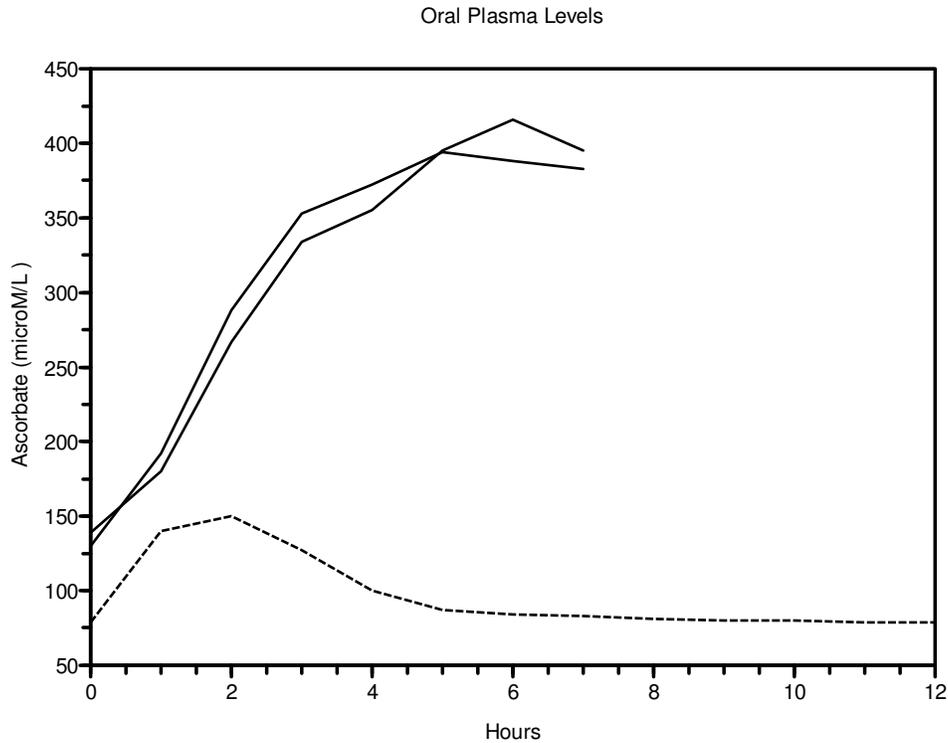
In our book, *Ascorbate: the Science of Vitamin C*,¹ we explained how the NIH interpretation was flawed. The NIH researchers had given a single dose of vitamin C, waited several hours until the dose had been excreted, and only then had they measured the blood levels. They repeated this process with doses up to 1250 mg and, when the plasma concentration did not increase with dose (because the dose had been excreted), concluded that the plasma was "saturated". This occurs at about 70 $\mu\text{M/L}$, equivalent to a daily dose of 200 mg. Since the NIH's own graphs show levels up to 220 $\mu\text{M/L}$ from oral doses, saturation is clearly the wrong word to describe what is more accurately represented as a plasma baseline, defended by kidney reabsorption.

Despite the evidence of their own data, the NIH and others have clung to the idea that oral doses of vitamin C are not well absorbed. Over time, they have modified their language, from the indefensible "saturated" to the less specific "tightly controlled", and have increased their proposed maximum level from 70 to 220 $\mu\text{M/L}$. They did this without admitting previous errors or mentioning that the intake needed to reach their new plasma maximum had risen from 200 mg to 18,000+ mg per day!

Independent measurements

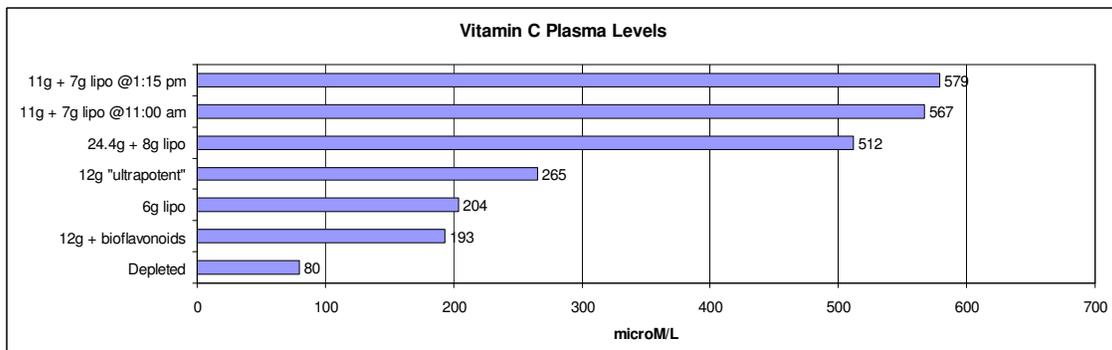
Some time after the NIH study, we investigated the absorption of vitamin C supplements. Using single 36g doses of a liposomal formulation, we achieved plasma levels of 417 $\mu\text{M/L}$, refuting the NIH's proposed maximum.² Importantly, they also showed that, in people with regular high intakes, the background level was not "saturated" or "tightly controlled" at about 70 $\mu\text{M/L}$, but could increase to at least 150 $\mu\text{M/L}$. Dr Ron Hunnighake in the US obtained similar results, in a partial replication of this work.

Ascorbate Plasma Levels



The dotted line shows typical NIH data for "saturation", with a single 1.25g dose. The solid line shows responses over 7 hours following a single 36g dose of liposomal vitamin C.

Dr Johan Bolhuis has recently provided additional independent results,³ as shown in the following table:



Bolhuis made seven determinations of plasma vitamin C. The first (80 $\mu\text{M/L}$) followed two days of depletion and is consistent with previous

measures in depleted individuals. The second (193 $\mu\text{M/L}$) followed a single 12g intake of vitamin C with bioflavonoids. Six grams of liposomal vitamin C (Livon Laboratories) yielded 204 $\mu\text{M/L}$, suggesting that absorption of the liposomal intake was approximately twice as effective as that of the standard formulation, at these doses and time interval. For comparison, Bolhuis also tested 12g of a form of vitamin C claiming improved absorption (UltraPotent), which he measured at 265 $\mu\text{M/L}$.

Bolhuis also tried combinations of standard and liposomal vitamin C. Using 24.4g vitamin C and 8g liposomal C, the plasma level was measured at 512 $\mu\text{M/L}$. Finally, he took two measures using 11g vitamin C and 7g liposomal C. After administering the dose at 7am, he took measurements at 11am (567 $\mu\text{M/L}$) and 1:15pm (579 $\mu\text{M/L}$).

Note that these individual measurements may not have been taken at the maximum blood level and thus can be considered a minimum limit value for the peak concentration. The results are consistent with the previous results for liposomal vitamin C and support our predictions, that plasma levels of at least 500-600 $\mu\text{M/L}$ can be attained and sustained.

Bolhuis included NAC, Selenium, alpha-lipoic acid, vitamin E, ECGC, and a multivitamin with the Ultrapotent vitamin C and with the combined standard and liposomal intakes. This complicates interpretation of his results; however, the indications are clear: high plasma levels can be achieved with oral intakes.

Implications for vitamin C intakes

Initially, the NIH and others claimed that, since the plasma becomes saturated at an intake of 200 mg per day, large doses of vitamin C could not be effective against the common cold, cancer, or a range of other diseases. However, with their revised assertion of "tight control", we need to modify their claim to a suggestion that intakes above 18g of vitamin C a day, in divided doses, are unlikely to be more effective (than 18g in divided doses) in some healthy individuals. This revision might perhaps bring a smile to the reader's face.

Dr Robert Cathcart has shown that sick people can absorb far more vitamin C than healthy ones. This negates the argument that high dose vitamin C is ineffective against disease because levels in the body are "tightly controlled" or "saturated", or because doses above about 200 mg are not absorbed.

Implications for disease

The data presented here suggest that standard vitamin C and liposomal formulations may be absorbed by independent mechanisms. Bolhuis's data suggests that, at these high doses, the plasma level from combination intakes may be the sum of the levels arising from standard and liposomal intakes. If this is confirmed, plasma levels from repeated doses of a combination of standard and liposomal C may be considerably

higher than 600 $\mu\text{M/L}$, and these levels could be sustained indefinitely with repeated doses.

Sustained plasma ascorbate levels above 250-300 $\mu\text{M/L}$ are likely to be toxic to cancer cells. The highest vitamin C levels reported here were well above this, at 579 $\mu\text{M/L}$. Moreover, the concentration of vitamin C in a tumor may be much higher than that in plasma, since tumor cells can actively absorb vitamin C from their surroundings. This suggests that cytotoxic vitamin C levels can be achieved using oral administration.

When used alone, vitamin C is a relatively weak anticancer agent. However, other agents, such as alpha-lipoic acid or selenium, act synergistically, greatly increasing the anticancer effects. One current approach to cancer treatment promotes the effectiveness of intravenous sodium ascorbate over oral vitamin C.⁴ This assumption is premature and ignores the benefits of nutrient synergy. There is increasing evidence that an oral vitamin C based redox therapy could extend the lives of terminal cancer patients, whilst also improving their quality of life.

Claims that high intakes of vitamin C have no benefit for prevention or treatment of the common cold (or other infections) are unfounded. Such studies have used doses that are too low and too infrequent to provide direct evidence. By contrast, repeated case studies of high intakes have uniformly reported positive results, when using appropriate dynamic flow level intakes of vitamin C.

Accumulating evidence suggests that conventional medicine was premature in rejecting the claims for high dose vitamin C. Furthermore, as we have seen, their objections rely on faulty premises. The studies reported here suggest we may be on the verge of a new appreciation of the massive benefits of a substance with unique therapeutic power.

¹ S. Hickey H. Roberts (2004) *Ascorbate: The Science of Vitamin C*, Lulu press.

² S. Hickey, H. Roberts and N.J. Miller (2008) Pharmacokinetics of oral ascorbate liposomes, *JNEM*, July, 10.1080/13590840802305423.

³ J. Bolhuis (2008) Personal communication.

⁴ S.J. Padayatty M. Levine (2000) Reevaluation of ascorbate in cancer treatment: emerging evidence, open minds and serendipity, *J Am Coll Nutr*, 19(4), 423-425.