

Bioavailability of Synthetic Ascorbic Acid and a Citrus Extract

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INTRODUCTION

There is now considerable general interest in vitamin C supplementation due to recent popular books on the treatment of the common cold and cancer by ascorbic acid (AA). Also, certain populations such as smokers and the elderly are known to be deficient in AA^{1,2} and would benefit from supplementation. Although natural and synthetic AA are chemically identical, citrus fruits contain bioflavonoids that might affect the bioavailability of AA.

A new formulation of ascorbate has recently become available, Renatured Vitamin C in Citrus Fruit Media (CF), from Grow Company, Hackensack, N.J. CF was compared with AA in animal and human studies to determine relative bioavailability.

RESULTS AND DISCUSSION

An *in vitro* accelerated aging study was conducted at 45°C in a dry, dark oven to determine the relative stability of CF vs. AA. Powdered AA decomposed 15% after 8 weeks and CF 1%. At pH 7 in solution, AA decomposed 99% and CF 65%. At pH 4, where AA is less stable, it decomposed 100% while CF only lost 82%. Thus, the CF is more stable than AA alone.

Adult male guinea pigs (2-5 per group) were fed an ascorbate-deficient diet for a period of 1 month. Then three doses of ascorbate alone or in CF were given, 8 mg, 16 mg, and 32 mg in 1 ml of Gatorade three times a week. At the end of 6 weeks, the animals were sacrificed and serum analyzed for AA. A comparison of the slopes of the dose-response lines showed that CF was three times more absorbed than AA.

A single dose of 50 mg AA alone or in CF was given orally to 10 fasting guinea pigs divided into two groups. Blood samples were taken periodically from 0 to 4 hours. The CF was 48% more absorbed than the AA by measurement of the area under the curves. The half-life of the AA elimination was 1.0 hours and the CF 1.6 hours. Thus, the CF was more absorbed than AA, took longer to reach its maximum concentration (2.0 vs. 1.5 hours, respectively) and lasted for a longer time in the blood.³

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These studies may not conform to peer review standards. Therefore, the results are not conclusive.

Most recently, a human study was done to confirm the animal results. Eight healthy nonsmoker individuals (five males and three females) with an average age of 22 years participated with informed consent. CF showed a 68% greater area under the curve than AA ($p < 0.005$) and took longer to reach its maximum concentration (4.1 vs. 2.9 hours).

CF has been shown in guinea pigs and humans to be more absorbed than AA and to remain in the body for a longer period of time. CF is thus the preferred form of ascorbate for supplementation.

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