

Bioavailability of Vitamin C

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Introduction

Vitamin C (ascorbic acid) is an essential vitamin for human beings and guinea pigs as these organisms cannot synthesise Vitamin C. Ascorbic acid is needed to prevent scurvy, promote wound healing and to manufacture the protein collagen which is the most prevalent protein in the human body. Vitamin C has also been found useful in therapy against viruses and cancer.

This work represents a long-term bioavailability study of guinea pigs fed Vitamin C deficient food and supplemented by oral dosing with Vitamin C. At the end of the supplementation period, the plasma levels of ascorbic acid are determined and related to bioavailability.

Bioavailability Study

Fifteen adult male guinea pigs were assigned to each of two groups - Ascorbic Acid (average weight 213 ± 15 g). They were fed an ascorbic acid deficient diet (Bioserve Inc.) for a period of one month. They were then fed USP Ascorbic acid and Citrus Extract (25.0%). There were three sub-groups in each group which were fed graded doses of USP (8, 16 and 32 mg) three times a week dissolved in Gatorade. At the end of the supplementation period, the animals were sacrificed and blood withdrawn for conversion into serum and analysis by fluorometry (*Clin. Chim. Acta.*, **25**, 161, 1969). Statistics were done using a two tailed *t*-test. The concentrations of Vitamin C in the serum of the different groups are listed in the following table.

Form of vitamin C	Dose (mg)	Average Vitamin C Serum (mg/100 ml)
USP	8	0.124 ± 0.021
USP	16	0.132 ± 0.006
USP	32	0.137 ± 0.017
Citrus Extract	8	0.136 ± 0.016
Citrus Extract	16	0.149 ± 0.021
Citrus Extract	32	0.172 ± 0.033

The Citrus Extract 8 and 16 mg groups had a higher concentration than the corresponding USP groups at a confidence level of 70% and 85% respectively. No statistical comparison could be made with the 32 mg groups because of insufficient numbers of animals.

The bioavailability can be calculated by plotting the Vitamin C dose (x-axis) vs. the concentration of Vitamin C in the serum (y-axis).

The results of the dose response curve are shown below.

Group	Slope	Relative Bioavailability
USP	1.33×10^{-4}	100%
Citrus Extract	1.61×10^{-3}	1210%

The slope of the Citrus Extract groups was significantly greater than the USP group at a confidence level of 74%. The Citrus Extract Citrus Extract was 1210% more bioavailable than USP Ascorbic Acid and this is the preferred form for human supplementation.