

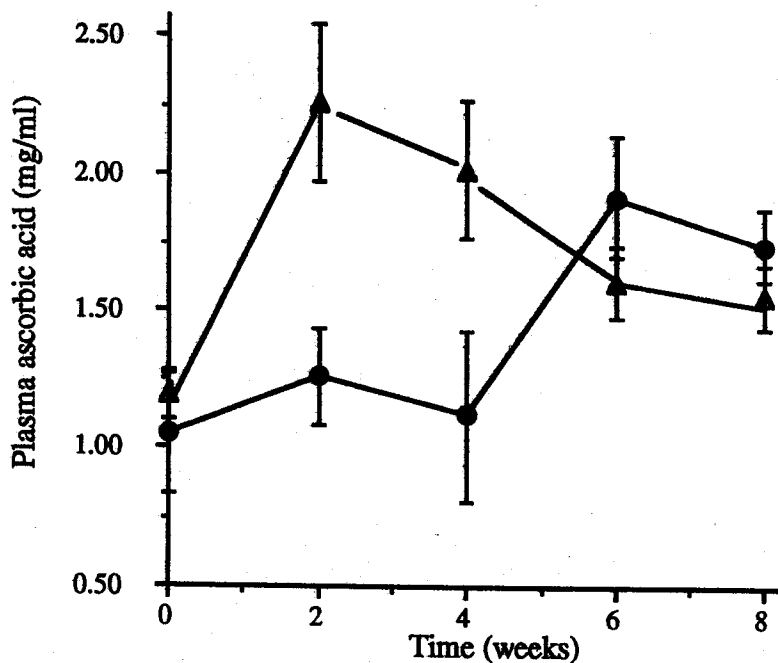
## THE IMPACT OF MICRONUTRIENT INTERACTIONS ON ANTIOXIDANT STATUS IN HEALTHY SUBJECTS : ASCORBIC ACID AND COPPER

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A reduction in tissue copper (Cu) concentrations in animals occurs following large intakes of ascorbic acid (AA). Cu is an essential nutrient and a vital component of enzymes which possess antioxidant activity. These include superoxide dismutase (SOD) and caeruloplasmin. The aim of this study was to test the hypothesis that AA supplements reduce Cu status and hence alter the balance of antioxidants in humans.

Ten female subjects (age 19-24 years), non-smokers and not using oral contraceptive agents or nutritional supplements, took part in a randomised, single-blind, cross-over trial of eight weeks. Subjects were asked maintain their habitual diet in addition to consuming either 500 mg AA or a placebo, twice per day. Blood samples were taken at two-weekly intervals.

Dietary AA intake exceeded the RDI and remained constant throughout the study ( $158 \pm 32$  mg/day, mean  $\pm$  SE,  $n=10$ ). As shown in the Figure below, the plasma AA concentration rose initially but later decreased despite continued supplementation (apparent compliance was  $97 \pm 0.9$  %). This is consistent with the postulated renal reabsorption threshold for AA. Dietary Cu intake was not quantitatively determined however, as Cu-rich foods were reportedly eaten more than twice per month, it was assumed that the subjects were consuming adequate dietary Cu. With AA supplementation, SOD activity in erythrocytes (E) was reduced significantly from  $2840 \pm 254$  to  $2072 \pm 130$  U/gHb,  $P<0.01$ . Concordant with the decrease in enzyme activity, E-Cu concentrations were reduced from  $3.61 \pm 0.22$  to  $2.85 \pm 0.20$  nmol/g Hb,  $P<0.05$ . Plasma Cu was unaffected.



The decrease in E-Cu in our study is consistent with the observation in laboratory animals that large doses of AA deplete tissue Cu concentrations. The decrease in E-Cu may explain the reduction in E-SOD activity. In conclusion, AA supplements equivalent to 1000 mg/day result in a reduction in Cu status and alter the balance of antioxidants in healthy, free living women consuming their usual food intake.