

THE ABSORPTION OF β -CAROTENE FROM THE HUMAN INTESTINE

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β -carotene is the major source of vitamin A for humans. Although vitamin A deficiency is not a problem in Western societies, it is the cause of 250000 cases of childhood blindness each year in Third World countries, particularly Indonesia, Africa and Bangladesh. Recently, this nutritional deficiency has also been implicated as an important risk factor of childhood mortality in Indonesia (Sommer et al. 1986). It has generally been assumed that β -carotene is well absorbed from the intestine and that deficiency symptoms are the result of insufficient nutritional intake. Our present study casts doubt on this assumption. Its aim was to assess the absorption efficiency of β -carotene in humans.

The 116 subjects were composed of 70 males and 46 females whose ages ranged from 30-76 with a mean of 58 years. They had all had at least one adenomatous polyp removed at colonoscopy but were otherwise healthy and were part of the multi-centre Australian Polyp Prevention Project. Half of the subjects were taking a 20 mg/day supplement of β -carotene and the rest were taking a daily placebo capsule. Four-day dietary records were used to assess nutritional intake; serum and faecal β -carotene were analysed by HPLC.

With normal nutrition (1-6 mg β -carotene/day), the mean serum β -carotene concentration was 0.61 $\mu\text{mol/l}$. This was elevated to 5.12 $\mu\text{mol/l}$ (an 8.4 fold increase) after 6 months of dietary supplementation ($P < 0.001$). The mean serum levels remained constant at this level up to the 18 month sampling period. Mild carotenoderma was observed in these supplemented subjects. Their mean serum retinol level did not increase from the baseline concentration of 3.36 $\mu\text{mol/l}$. The serum half-life of β -carotene is 7-14 days. Calculations based on the nutritional replacement at the rate of serum elimination show an absorption efficiency of 7%. Analyses of nutritional intake and faecal content of β -carotene on subsets of subjects have confirmed an expectedly low level of absorption. Unsupplemented subjects ($n=7$) had a mean \pm sd daily nutritional intake of 2.3 ± 1.8 mg and a faecal output of 3.0 ± 2.1 mg of β -carotene. Supplemented subjects ($n=10$) ingested 22.7 ± 1.9 mg and excreted 22.4 ± 9.0 mg of β -carotene. There was no statistical difference between ingestion and excretion and thus no detectable absorption of β -carotene in either group. It is concluded that β -carotene is very poorly, and probably passively, absorbed from the intestine. This may be an important part of the explanation for vitamin A deficiency in the Third World.

SOMMER, A., TARWOTJO, I., DJUNAEDI, E., WEST, K.P., LOEDIN, A.A., TILDEN, R., MELE, L. (1986), Lancet 1: 1169.

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