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BIOAVAILABILITY OF VITAMIN E

Introduction

Vitamin E is a fat-soluble vitamin which is required by animals and man. The daily requirement for adult humans is 25-30 IU which is equivalent to 25-30 mg of tocopherol acetate. Vitamin E was found to be necessary for normal growth maintenance and for normal reproduction. A deficiency also produced myocardial degeneration, muscular dystrophy, encephalacia and liver necrosis. In man a deficiency produces skin collagenosis, red cell haemolysis, cirrhosis of the gall bladder and creatinuria.

Vitamin E is a biological antioxidant and detoxifying agent which protects unsaturated fatty acids and membrane structure. It aids intestinal absorption of unsaturated fatty acids and other fat-soluble vitamins. Vitamin E maintains normal muscle metabolism and also maintains the integrity of the vascular and central nervous systems. It is necessary for the maintenance of kidney tubules, lungs, genital structure, liver and red blood cell membranes.

At the cellular level, Vitamin E maintains protein synthesis by prevention of the formation of enzyme toxic peroxides derived from unsaturated fatty acids. It participates in oxidation-reduction reactions via co-enzyme Q and respiratory enzyme systems.

Bioavailability

Blood concentration of Vitamin E in animals and man have little relation to the amount in the body because ingested Vitamin E is rapidly cleared from the blood into the tissues. One of the most commonly used bioasssay techniques is the liver storage assay. After a dose or doses of Vitamin E, the animals are sacrificed and the liver assayed for Vitamin E.

In this study, adult, male Sprague-Dawley rats weighing 265-350 g were divided into 3 groups of 5 rats each for the experimental and 1 group of 2 rats for the control. All of the groups except the control were given 25 mg of Vitamin E dissolved or suspended in sunflower oil which contains negligible quantity of Vitamin E. The rats were orally gavaged with 0.5 ml of the sunflower oil. The groups were the following: Control which received only sunflower oil, Oil which received Renatured Vitamin E in vegetable oils (523 ± 36 IU/g), Natural Source powder which received a commercial natural source Vitamin E (571 ± 113 IU/g) and Renatured powder which received Renatured Vitamin E in vegetable oils spray dried (226 ± 6 IU/g). Twenty four hours after administration of the Vitamin E, the rats were sacrificed, the liver removed and the liver stored at -20°C until assayed.

The livers were analysed by a published fluorometric method (Taylor, Lamden and Tappel, *Lipids*, **11**, 530, 1976) after extraction, saponification and finally extraction into heptane. The results are shown in the following table:

Group	Average Liver Vitamin E (micrograms/liver)
Control	1855 ± 71
Oil	2075 ± 1060
Natural Source Powder	3089 ± 1755
Renatured Powder	13464 ± 14167

As can be seen, the Renatured powder E was the most retained. It was significantly more retained than the Oil at the 95% confidence level. The Renatured powder was significantly more retained than the Natural Source powder at the 94% confidence level.

The per cent absorbed can be calculated by subtracting the average concentration of E in the control group not given any E from the average in each group (net retained) and dividing by the dose of Vitamin E, 25,000 micrograms. The results are listed in the following table.

Group	Average Net amount Retained (Microgram)	Average % Retained
Oil	220	0.88%
Natural Source Powder	1234	4.94%
Renatured Powder	11609	46.4%

Discussion

The results clearly show that the powder forms of E were more retained than the oil form. The Renatured powder was 9.4 times more retained than the Natural Source powder. Thus, the Renatured powder was significantly more bioavailable than the Natural Source powder.