Dietary Oxidized Frying Oil Enhances Tissue -Tocopherol Depletion and Radioisotope Tracer Excretion in Vitamin E-Deficient Rats

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Abstract

Rats fed a diet containing 15% oxidized frying soybean oil (OFO) have been shown to have significantly lower tissue -tocopherol (-T) concentration than rats fed a 15% fresh soybean oil diet. To examine the turnover of -tocopherol, a depletion-repletion experiment and a radioisotope tracer study were conducted. Two groups of male weanling Long-Evans rats were fed vitamin E-deficient diets containing either 15% OFO or 15% vitamin E-stripped fresh soybean oil (control). After 9 wk of depletion, rats fed the OFO diet had significantly higher plasma pyruvate kinase (PK) activity and lower concentrations of -T in RBC, adrenal gland, heart, kidney, liver, spleen, testis and muscle compared with controls ($P < 0.05$), indicating that the vitamin E-deficient status was aggravated by feeding the OFO diet. After 12 wk, the depleted rats were intraperitoneally injected with a dose of all-rac--T (2.5 mg/rat, dissolved in Vitamin E-stripped corn oil) every other day. Three doses were administered to each rat during the 1-wk repletion period. Plasma PK activity decreased in both groups ($P < 0.05$) after repletion but that of the OFO rats was still significantly higher than that of the control group. The repleted OFO group also had significantly lower -T concentration in adrenal gland, epididymal fat, liver and spleen than the repleted control group. Two rats from each group that had been vitamin E-depleted for 16 wk were injected intraperitoneally with a single dose of 5-methyl-14C-RRR--T (740 kBq/kg body weight). During the week after dosing, the radioactivity excreted in urine and feces of the OFO group was 1.3- and 1.7-fold, respectively, that of the control group. Tissue retention of radioactivity was also lower in the OFO rats than in the control rats. The results suggest that more of the -T in the body was catabolized or turned over in rats fed the OFO-containing diet.