

Zinc Nutrition Influences the Fatty Acid Oxidation Enzyme Delta3, Delta2-Enoyl-CoA Isomerase in Rats Fed Safflower Oil

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The oxidative degradation of fatty acids provides a major source of energy in human nutrition. It is generally recommended that fat intake should come predominantly from unsaturated sources. In animals, zinc deficiency has been reported to reduce gene expression of certain lipolytic and fatty acid-degrading enzymes. The aim of our study was to determine the influence of marginal zinc deficiency and dietary fat source on the activity and mRNA level of mitochondrial delta3, delta2-enoyl-CoA isomerase (ECI), a key enzyme in beta-oxidation of unsaturated fatty acids. Young male Wistar rats were fed either low-zinc (7 mg Zn/kg) or zinc-adequate (50 mg Zn/kg) diets containing 22 % cocoa butter as saturated fat (SFA diet) or safflower oil rich in linoleic acid (UFA diet) for four weeks. Intake of the zinc-adequate diets was restricted by pair-feeding within dietary fat source. A fifth group was fed *ad libitum* the zinc-adequate UFA diet. All diets contained 3 % soy bean oil. Zinc status of the two low-zinc groups was significantly impaired, but food intake, final live weights, and zinc concentrations in plasma and femur of the animals fed the low-zinc UFA diet were even lower than in those fed the low-zinc SFA diet. The ECI activity, assayed with *trans*-3-hexenoyl-CoA, was greatly influenced by zinc supply and dietary fat in the liver, but not in the kidney, heart, skeletal muscle, testis and adipose tissue. In the liver, the ECI activity was about threefold higher in rats fed safflower oil than in those fed cocoa butter. The marginal zinc deficiency caused a 28% reduction in ECI activity for the UFA group as compared to the pair-fed group given the zinc-adequate UFA diet. Results were confirmed by relating ECI activity to succinate dehydrogenase activity. No significant differences were found in the hepatic mRNA level of ECI between dietary treatments. It can be concluded that the marginal zinc deficiency reduced the hepatic ECI activity of the rats fed safflower oil, and *beta*-oxidation of the unsaturated fatty acids may have been impaired.