THE EFFECT OF ZINC DEFICIENCY ON SOME KEY ENZYMES OF LIPID METABOLISM IN RATS FED OLIVE OIL OR LINSEED OIL

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Previous studies demonstrated that zinc deficiency increases the levels of n-3 polyunsaturated fatty acids (PUFA) at the expense of n-6 PUFA in tissue phospholipids (PL). The reason for this is unknown. Altered activities of phospholipase A2 (PL A2) and lyso-phospholipid acyl transferases (AT) could be possible reasons for this phenomenon. Therefore, the present study investigated the activities of those enzymes in zinc-deficient rats fed diets containing linseed oil (rich in n-3 PUFA) or olive oil (rich in monounsaturated fatty acids). In order to control for the food intake, all the rats were fed by gastric tube. Semisynthetic diets used contained 0.5 (zinc-deficient diets) or 45 mg zinc per kg (control diets). The rats fed the zinc-deficient diets became severely zinc-deficient after 13 days as proved by their zinc concentrations and activities of alkaline phosphatase in plasma. Zinc-deficient rats fed linseed oil diets exhibited increased levels of n-3 PUFA, particularly of eicosapentaenoic acid in hepatic PL at the expense of n-6 PUFA compared to their equivalent controls. In contrast, zinc-deficient rats fed olive oil exhibited only slight alterations of fatty acid levels compared to their controls. The concentration of phosphatidylcholine, the major PL in the liver was reduced by zinc deficiency in the rats fed linseed oil but not in the rats fed olive oil. The activity of hepatic PL A2 was not influenced by zinc deficiency, regardless of the dietary fat. In contrast, the activities of AT with various substrates were reduced by zinc deficiency in the rats fed linseed oil, but not in the rats fed olive oil. This suggests that an altered balance between n-6 and n-3 PUFA by zinc deficiency in rats fed diets rich in n-3 might be rather due to a disturbed incorporation of PUFA into PL than to a disturbed PL degradation. Additionally, the study shows that the effects of zinc deficiency on fatty acid metabolism are more severe in rats fed diets rich in n-3 PUFA than in rats fed diets with low levels of n-3 PUFA.