Effects of Dietary Factors on Hepatic Activity and mRNA Levels of Enzymes Involved in Lipid Metabolism

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Physiological activity of soybean oil, soybean phospholipid, fish oil and fish phospholipid as well as the interaction of sesamin, a sesame lignan, and fish oil in affecting hepatic fatty acid metabolism was examined in mice and rats. In the first experiment, control group of mice were fed the diet containing 10% fatty acid as palm oil, and the other four groups were fed the diets containing 9% fatty acid as palm oil together with 1% fatty acid either as soybean oil, soybean phospholipid, fish oil or fish egg phospholipids for 22 d. A diet containing soybean phospholipid compared to control diet caused significant 20-50% decreases in the activity and mRNA levels of hepatic lipogenic enzymes. However, soybean oil was rather irrelevant in decreasing these parameters. Diets containing fish oil and fish phospholipid compared to a control diet also decreased the activity and mRNA levels of various lipogenic enzymes. However, the decreases were generally greater in the former than in the latter. Analysis of hepatic fatty acid indicated that dietary n-3 fatty acids are less bio-available in the form of phospholipids than in the form of triacylglycerol. This may account for the weaker physiological activity of fish phospholid relative to fish oil in decreasing hepatic lipogenesis. In the second experiment, rats were fed purified experimental diets supplemented with 0, 0.1 and 0.4% sesamin (1:1 mixture of sesamin and episesamin), and containing either 0% or 2% fish oil. Diets containing sesamin dose-dependently increased the activity of various hepatic enzymes involved in fatty acid oxidation. Increases were much greater with the diets simultaneously containing sesamin and than with diets containing sesamin alone except for several occasions. Examination of the abundance of mRNA for hepatic fatty acid oxidation enzymes indicated that combination of sesamin and fish oil irrespective of dietary levels of sesamin synergistically increased mRNA levels of peroxisomal fatty acid oxidations enzymes. The combination of fish oil and sesamin also appears to increase mRNA levels of some mitochondrial enzymes synergistically. It is apparent, enhancing effect of fish oil on sesamin?induced increase in hepatic fatty acid oxidation can be observed at different dietary levels of this lignan, and is not saturable at least up to dietary level of 0.4%. Combination of fish oil and sesamin is considered to be beneficial in improving lipid metabolism.