FATTY-ACID PROFILES OF PLASMA AND LIVER LIPIDS FROM RATS FED CHOLESTEROL-SUPPLEMENTED DIETS

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The concept of lipid homeostasis of cellular membranes (Sabine 1983) implies that the physico-chemical status of membrane lipids, sometimes referred to as fluidity, is maintained relatively constant in the face of various dietary, physiological and environmental stresses. As part of a continuing examinatiion of this hypothesis we have studied the effect of a variety of high-lipid diets on plasma and liver lipids, and on the function of liver membrane-bound enzyme.

In the work reported here we have examined the lipid composition including fatty acid profiles, of plasma and liver lipids from rats fed a high-cholesterol diet, both with and without high levels of saturated or unsaturated fat. Six groups of male adult rats were fed either a reference diet (standard commercial diet) or reference diet supplemented with one of the following; 2% cholesterol, 15% sunflower seed oil, cholesterol plus sunflower seed oil, 15% coconut oil, or cholesterol plus coconut oil. As expected cholesterol-supplemented diets raised the cholesterol content of both plasma and liver. Both the free and esterified cholesterol fractions were elevated, but the increase was greater in the ester fraction. Feeding cholesterol with sunflower oil resulted in a greater accumulation of cholesterol in the liver. In the plasma of both high-fat, high-cholesterol groups of animals, the cholesterol content was raised to the same extent. The phospholipid content of both plasma and liver remained unaltered under all dietary conditions. Feeding cholesterol-supplemented diets resulted in the accumulation of 16:1, 18:1 and 18:2 acids, with a simultaneous decrease in 16:0, 18:0 and 20:4 acids, both in plasma and liver. These changes in fatty-acid composition were associated to some extent with all the lipid fractions, but the cholesterol-ester fraction again exhibited the greatest differences.

It is conclded that dietary cholesterol affects both the cholesterol and the fatty-acid composition of liver and that the type of dietary fat fed has a pronounced effect on this process. Excess dietary cholesterol alters the metabolism of hepatic fatty acids, producing a rapid conversion of 16:0 and 18:0 acids to 16:1 and 18:1 acids respectively but, on the other hand, a block in the conversion of 18:2 to 20:4 acid. The mechanisms underlying these changes are likely to be complex.

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