Effects of fat emulsions with different fatty acid composition on plasma and hepatic lipids in rats receiving total parenteral nutrition

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Abstract

Effects of different fatty acids on the development of hepatic steatosis were studied in rats receiving total parenteral nutrition (TPN). 65 rats, with internal jugular catheters, were divided into one control group (n = 8), and four experimental groups (n = 13–15 each). The control group was fed a chow diet and all experimental groups received TPN. TPN provided 300 kcal/kg/day with 40% of the non-protein energy provided as fat. All TPN solutions were isonitrogenous and identical in nutrient composition except for the fatty acid composition of the fat emulsion. Four kinds of fat emulsions rich in: 1) medium chain fatty acids (C8:0,C10:0), 2) oleic acid (C18:1 n-9), 3) linoleic acid (C18:2 n-6), 4) eicosapentaenoic acid (C20:5 n-3)/docosahexaenoic acid (C22:6 n-3), were used. These fat emulsions were prepared with: 1) a mixture of medium chain triglycerides (MCT) and soybean oil (9:1), 2) olive oil, 3) safflower oil, 4) fish oil, respectively. The results of the study demonstrated a higher hepatic lipid content in the olive oil and safflower oil groups than in the control group, whereas no significant difference was seen between the MCT and control groups. Also, no difference was observed between the fish oil and control groups. With regard to the plasma lipids, the MCT group and olive oil group produced hyperlipidaemia. The plasma of the safflower oil and fish oil groups, however, had a low lipid concentration comparable to the control group. These results suggest that TPN with a fat emulsion prepared with fish oil does not cause hyperlipidaemia nor induce hepatic steatosis in normal rats.