

PREVENTIVE EFFECT OF FOODS ENRICHED IN NATURAL CONJUGATED LINOLEIC ACID ON SOME METABOLIC ALTERATIONS INDUCED BY HIGH FAT DIETS IN RATS

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Intake of high-fat (HF) diets has been associated with liver, muscle and adipose tissue lipid accretion and insulin resistance in humans and experimental animal models. *c*9,*t*11-conjugated linoleic acid (CLA), also known as rumenic acid (RA) and its precursor vaccenic acid (VA), naturally present on dairy products, showed to induce health benefits on lipid and carbohydrate metabolism. Therefore, some efforts have been made to increase the levels of these compounds in the milk fat (MF) and obtain a modified milk fat (MMF) with bioactive properties.

The aim of this study was to investigate whether the intake of MMF enriched in RA and VA could prevent alterations in liver, muscle and adipose tissue triacylglycerol (TAG) metabolism and glucose utilization induced by high-fat diets in an experimental animal model.

Male Wistar rats were fed (60-d) with S7 (soybean oil, 7%), S30 (soybean oil, 30%), MF30 (soybean oil, 3% + MF, 27%) or MMF30 (soybean oil, 3% + MMF, 27%) diets. The MMF was obtained by PUFA supplementation to dairy cow diets. Activities and/ or expression of lipogenic and β -oxidative enzymes, lipid transporters, and regulators of fatty acids metabolism in liver, adipose tissue and muscle, as well as the hepatic TAG secretion rate *in vivo* were measured. In addition, an oral glucose tolerance test, the metabolites from glycolysis and some key enzyme activities in skeletal muscle were assessed.

High levels of dietary lipids (S30 vs S7) increased the TAG accretion in liver (+48%) and skeletal muscle (+61%) and decreased muscle glucose utilization. The animals fed MMF30 showed lower levels of TAG in liver (-31%) associated with a reduction of the FA transporter (FATP2 -47% and CD36 -51%), an enhanced β -oxidation (CPT-I activity +32%) and a higher VLDL-TAG secretion rate (+31%) compared to those fed

S30 diet. In muscle, MMF30 also reduced the TAG levels (-49%) and increased the flux through the 6-phosphofructokinase (+113%) improving the glucose utilization.

Although some of these beneficial effects were also present in MF30 fed rats, significant differences were observed with the MMF30 group, which can be attributed to the high incorporation of VA and RA into the tissues. Notoriously, MF30, but not MMF30 increased the fat accretion in epididymal white adipose tissue. In MMF30 rats, the compensatory mechanisms were related to an increased lipolysis (ATGL expression +49%) and β -oxidation (CPT expression +71%), as well as, to a lower TAG esterification (DGAT -76%).

In conclusion, the MMF prevented the TAG accretion induced by HF diets and improved the glucose utilization in skeletal muscle. This knowledge could be important to develop some dietary strategies to reduce the incidence of obesity, fatty acid liver disease and glucose intolerance in humans.