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Isomer Specific Anti-diabetic and Anti-lipogenic Effect of Conjugated Linoleic Acid

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This study was carried out to examine the anti-diabetic and anti-obesity effects of specific conjugated linoleic acid (CLA). Sprague Dawley rats were fed for 8 weeks either a high fat diet [23% of diet(w/w); 45% of total Kcal] as control or one of three CLA supplemented [1.0% of diet (w/w)] high-fat diets containing differing isoforms of CLA, which were CLA mixture or cis9,trans11-CLA or trans10, cis12-CLA. We determined whether specific CLA isomers were able 1) to affect blood glucose, oral glucose tolerance(OGT) and glucose metabolizing enzyme activities in liver such as phosphoenolpyruvate carboxylase(PEPCK) and glucose-6-phosphatase(G6P), leading to increased glucose output and glucokinase (GK) leading to glucose catabolism. 2) to reduce blood and liver free fatty acids(FFA), triglyceride(TG) and cholesterol(Chol) and abdominal fat content, which may be the metabolic alteration in obesity that leads to insulin resistance and type II diabetes. 3) to change the expression of glucose transporter GLUT4 and peroxisomal proliferator-activated receptor γ (PPAR γ) in muscle and adipose tissue. cis9, trans11-CLA group reduced food intake and body weight. The reduced food intake and slower growth rates for cis9,trans11-CLA group were mirrored by lower abdominal fat pads. Blood glucose level at 5wk, 7wk and 8wk were lower in all CLA supplemented groups compared with control group and more lowered in trans10,cis12-CLA group than CLA mixture and cis9,trans11-CLA groups. All CLA supplemented groups were effective on OGT tolerance compared with control group but not significantly different between CLA isomers. FFA at 7wk was lowered in all CLA supplemented groups compared with control group and more lowered in CLA mixture and cis9,trans11-CLA groups. FFA, TG and Chol at 8wk were not significantly differentiated compared control group. PEPCK and G6P activities were lowered in CLA groups than control group and GK activities was increased in CLA groups. Lipogenic enzyme activities, glucose 6-phosphatate dehydrogenase(G6PDH), 6-phosphogluconate dehydrogenase(6PGDH) and malic enzyme (ME), were not significantly differentiated between groups but more lowered in CLA groups. The expression of GLUT4 and PPAR γ were not significantly differentiated between groups.