

A Rice Bran Oil Diet Increases LDL-Receptor and HMG-CoA Reductase mRNA Expressions and Insulin Sensitivity in Rats with Streptozotocin/Nicotinamide-Induced Type 2 Diabetes

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Abstract

A rice bran oil (RBO) diet can reduce plasma lipids; this was attributed to the specific components, gamma-oryzanol and gamma-tocotrienol, which individually were shown to be hypocholesterolemic; however, the mechanism of their effects on diabetic hyperlipidemia and the development of diabetes is not known. Rats with streptozotocin/nicotinamide-induced type 2 diabetes were divided into control, RO10, and RO15 groups, and fed cholesterol-free diets containing 0, 10, and 15 g RBO with 0, 352, and 528 g gamma-oryzanol and 0, 6.0 and 9.0 mg gamma-tocotrienol/100 g diet for 4 wk. Diabetic rats fed the RBO diet had greater insulin sensitivity ($P = 0.02$) than rats fed the control diet. Diabetic rats fed the RBO diet also had lower plasma triglyceride ($P = 0.003$), LDL cholesterol ($P = 0.028$), and hepatic triglyceride concentrations ($P = 0.04$), as well as greater fecal neutral sterol and bile acid excretion than those fed the control diet. After 4 wk, there was an approximately 100% ($P < 0.001$) increase in the abundance of hepatic cholesterol 7 α -hydroxylase, an 89% ($P < 0.001$) increase in the hepatic LDL-receptor, and a 50% ($P < 0.001$) increase in hepatic 3-hydroxy-3-methylglutaryl coenzyme A reductase mRNA in rats fed the RBO diet compared with those fed the control diet. These findings support the conclusion that a rice bran oil-containing diet can significantly suppress hyperlipidemic and hyperinsulinemic responses in diabetic rats. The high contents of gamma-oryzanol and gamma-tocotrienol in RBO can lead to increased fecal neutral sterol and bile acid excretion, via upregulation of cholesterol synthesis and catabolism.