**Note**

**Effects of Soybean β-Conglycinin on Hepatic Lipid Metabolism and Fecal Lipid Excretion in Normal Adult Rats**

Kensuke **FUKUI, Makiko KOJIMA, Nobuhiko TACHIBANA, Mitsutaka KOHNO,**
Kiyoharu **TAKAMATSU, Motohiko HIROTSUKA,** and **Makoto KITO**

1Food Science Research Institute, Fuji Oil Co., Ltd., 1 Sumiyoshi-cho, Izumisano, Osaka 598-8540, Japan
2Emeritus Professor of Kyoto University

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β-Conglycinin decreased blood triacylglycerol (TAG) levels in male Wistar adult rats. Liver mitochondrial carnitine palmitoyltransferase activity in the β-conglycinin-fed group significantly increased as against that of the casein-fed group. Hepatic fatty acid synthase activity in the β-conglycinin group significantly decreased as against that of the casein-fed group. Fecal fatty acid excretion in the β-conglycinin group was significantly higher than in the casein group.

**Key words:** soybean β-conglycinin; triacylglycerol (TAG); fatty acid synthase; carnitine palmitoyltransferase; fatty acid excretion

In our previous study, β-conglycinin, which is one of the major components of soy protein, lowered plasma triacylglycerol (TAG) levels.1 Moriyama et al.2 reported that β-conglycinin induced β-oxidation, down-regulation of liver fatty acid synthase, and inhibition of TAG absorption in normal and genetically obese mice under energy restriction conditions. But it appears that more studies are necessary to explain how β-conglycinin affects lipid metabolism. In this study, in order to mimic middle-aged adult humans, in whom lifestyle-related diseases occur frequently, we made an experimental design feeding a high cholesterol diet ad libitum to normal adult rats to induce dietary hyperlipidemia, and examined the effects of β-conglycinin on liver lipid metabolic enzymes and fecal excretion to explain how β-conglycinin reduces plasma TAG.

All animals were treated in accordance with the guidelines established by the Japanese Society of Nutrition and Food Science (Law No. 105 and Notification No. 6 of the Japanese Government). β-Conglycinin was prepared according to the method described by Saito.3 Animals, diets, and measurements were performed according to the our previous study.1 In brief, 20-week old male Wistar rats were fed experimental diets containing 20% casein or β-conglycinin with free access for 10 d. Each diet contained 0.5% cholesterol and 0.125% sodium cholate, and the further components were based on the AIN-93G formula. On day 11, after 6 h of food deprivation (0730–1330), blood was withdrawn from the abdominal aorta into a heparinized syringe under intraperitoneal sodium pentobarbital anesthesia. Livers were excised, rinsed, and weighed, and then stored at −80℃ pending analysis. Plasma was separated by centrifugation and stored at −80℃ pending analysis.

All results of this study are shown in Table 1. Food consumption in the β-conglycinin group increased compared with the casein group. On the other hand, there was no difference in weight gain between these groups. The plasma TAG level in the β-conglycinin group was significantly lower than that in the casein group. There was no difference in plasma glucose concentration between groups. Liver weight in the β-conglycinin group was significantly lower than in the casein group. Hepatic carnitine palmitoyltransferase activity in the β-conglycinin group was significantly higher than in the casein group. Fatty acid synthase activity in the β-conglycinin group was significantly lower than that in the casein group. Fecal fatty acid excretion in the β-conglycinin group was significantly higher than that in the casein group.

In this experiment, β-conglycinin lowered plasma TAG levels. This supports the hypolipidemic effect of β-conglycinin described previously.1β-Conglycinin decreased liver fatty acid synthesis, promoted liver mitochondrial β-oxidation of fatty acids, and decreased liver weights. These results suggest that β-conglycinin may influence lipid metabolism in the liver. Moriyama et al.2 reported that a β-conglycinin diet lowered serum TAG levels by acceleration of β-oxidation and suppression of fatty acid synthase in mice under energy restriction conditions. Itatani et al.7 reported that commercial soy protein isolate decreased the activity of hepatic lipogenic enzymes in Wistar fatty rats and their lean littermates.

An increase in the fatty acid excretion was observed

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1 To whom correspondence should be addressed. Tel: +81-724-63-1830; Fax: +81-724-61-1356; E-mail: 910293@so.fujioil.co.jp

**Abbreviations:** TAG, triacylglycerol; SE, standard error
in the β-conglycinin group. This result suggests that β-conglycinin or its derived peptides might inhibit pancreatic lipase or bind fatty acid to enhance fecal excretion, and this might be one of the mechanisms that explain the low plasma levels of TAG in the β-conglycinin group. Moriyama et al.\textsuperscript{2} reported that fecal TAG excretion was increased in mice fed β-conglycinin under energy restriction conditions.

In addition to the protein component per se, various soy components such as amino acids and peptides, saponins, fiber, and isoflavones may affect lipid metabolism.\textsuperscript{8-9} The effects of soy isofoavones on lipid metabolism are attracting interest.\textsuperscript{8-9} But the intake of isofoavones showed no significant effect on plasma TAG levels.\textsuperscript{10-12} The isofoavones content of the β-conglycinin used in this experiment was about 0.3%, the same level of the commercial soy protein isolate used in our previous study.\textsuperscript{13}

The effects of β-conglycinin in repressing liver fatty acid synthesis, promoting liver mitochondrial β-oxidation of fatty acids, and stimulating fecal fatty acid excretion were confirmed in this experiment. These results support the conclusion that soybean β-conglycinin may contribute to a decrease in plasma TAG concentration in adult rats.

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