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Suppressive Effect of Kuroawabitake on Serum Cholesterol in Rat

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Abstract

Suppressive effect of kuroawabitake(*Pleurotus abalonus*), a mushroom, on serum cholesterol was studied in rats in respect of its usefulness for a functional food. Cellulose was used in a diet as a control for kuroawabitake. Rats were maintained on the kuroawabitake and cellulose diets for 18 days, respectively. Kuroawabitake diet reduced serum cholesterol greater than cellulose diet. Effect on HDL-cholesterol and triglyceride in rats fed kuroawabitake diet was as much as same to that in rats fed cellulose diet. Thereby kuroawabitake would be useful for a functional food, since cellulose is already regarded to be so.

Key words: serum cholesterol, dietary fiber, kuroawabitake, mushroom

Introduction

It is about 20 years ago that the name of kuroawabitake (*Pleurotus abalonus* Han, Chen et Cheng[1], a kind of mushroom, was seen in scientific report. Kuroawabitake was originally found in Taiwan and Okinawa, and food industries in Okinawa are exploring its utilization as a functional food because of some physiological characteristics pertaining to it. In fact, eritadenin, a cholesterol reducing substance, is one of the constituents of some other mushrooms[2-3]. Mushroom is also expected to be a useful foodstuff by its undigestability as dietary fiber was found to prevent effectively adult diseases[4-5].

In the previous work we reported that kuroawabitake has a suppressive effect on blood sugar in mice not less than cellulose[6]. This study was undertaken to investigate the influence of kuroawabitake on serum cholesterol in rat.

Methods

Two sets of diets, control and experimental diet, were prepared (Table 1). The control diet contained 12% of cellulose, and the experimental diet, 2% of cellulose and 10% of freeze-dried kuroawabitake powder. The other components were the same. Both diets contain 1% of cholesterol, being high cholesterol diet.

Male Wistar rats weighing 120g were devided into two, control and kuroawabitake group, and they were maintained on 15g of either the control or experimental diet per rat each day for 18 days. After fasting for 15

Table 1 Diet composition (%)

	Control (Cellulose)	Experimental (Kuroawabitake)
Casein[1]	30	30
DL-Methionine[2]	0.15	0.15
α-Cornstarch[1]	27	27
Sucrose[3]	13.5	13.5
Cholesterol[2]	1.0	1.0
Cholic acid[4]	0.25	0.25
Cellulose powder[1]	12.0	2.0
Kuroawabitake[5]	0	10.0
Mineral mixture[6]	5.0	5.0
Vitamin mixture[7]	1.0	1.0
Soybean oil[8]	10.0	10.0

[1] Casein, α-cornstarch and cellulose powder were obtained from Oriental Yeast Co., Tokyo.

[2] Product of Wako Pure Chemical Industries, LTD.

[3] Commercial granular sugar was used.

[4] Product of Sigma Chemical Co.

[5] Freeze-dried kuroawabitake powder was obtained from Okinawa developing center for functional food.

[6] Obtained from Oriental Yeast Co., Tokyo. The composition was as follows in mg/kg : $CaHPO_4 \cdot 2H_2O$, 7, 280; NaH_2PO_4; 4680; NaCl, 2, 330; Ca-lactate, 17, 550; Fe-citrate, 1, 590; $MgSO_4$, 3, 590; $ZnCO_3$, 55; $MnSO_4 \cdot 4\text{-}6H_2O$, 60; $CuSO_4 \cdot 5H_2O$, 15; KI, 5.

[7] Obtained from Oriental Yeast Co., Tokyo. The composition was as follows in mg/kg : thiamine·HCl, 12; riboflavin, 40; pyridoxine·HCl, 8; Vitamin B12, 0.005; ascorbic acid, 300; D-biotin, 0. 2; folic acid, 2; Ca-pantothenate, 50; γ-aminobenzoic acid, 50; niacin, 60; inositol, 60; choline chloride, 2,000; tocopheryl acetate, 50; menadione, 52 and in IU/Kg retinyl acetate, 5,000; ergocarciferol, 1,000.

[8] Product of Fuji Oil Co.

hours the blood was collected from axillary artery under anesthetization with pentobarbital sodium and centrifuged by 2,500g for 10 minutes to separate serum. Serum was stored in -20℃ until analyses of total cholesterol, HDL-cholesterol and triglycerides. Commercial analyzing kits, total cholesterol C-II test Wako,

HDL-cholesterol test Wako, and triglyceride G-test Wako, the products of Wako Pure Chemicals, Ltd., Osaka, Japan, were used for the analyses.

Results

Table 2 shows food intake and change of body weights during the experimental period. Food intake of the cellulose and kuroawabitake groups for 18 days were 246g and 232g, respectively. The initial body weight of the cellu-

Table 2. Food intake and body weight of the rats fed control or kuroawabitake diet during experimental period

Group	Initial weight	Final weight	Food intake
Control (5)	124±23[2]	206±15	246± 9
Kuroawabittake (6)	123±8	200±13	232±17

[1] Number of rats used is shown in parentheses.
[2] Numerals are mean and standard deviation in grams.

lose and kuroawabitake groups were 124g and 123g and the final weight was 206g and 200g, respectively. Weights were almost the same in the initial and feeding period in both groups, respectively.

Figure 1 shows the values of total serum cholesterol, HDL-cholesterol and triglycerides in both groups. Total cholesterol was 217mg/dl in control group and 171mg/dl in kuroawabitake group, being statistically significantly lower in the latter. HDL-cholesterol was 28mg/dl in control group and 38mg/dl in kuroawabitake group. Triglycerides were 113mg/dl in control group and 121mg/dl in kuroawabitake group. The values of HDL-cholesterol and triglycerides were statistically not different in both groups.

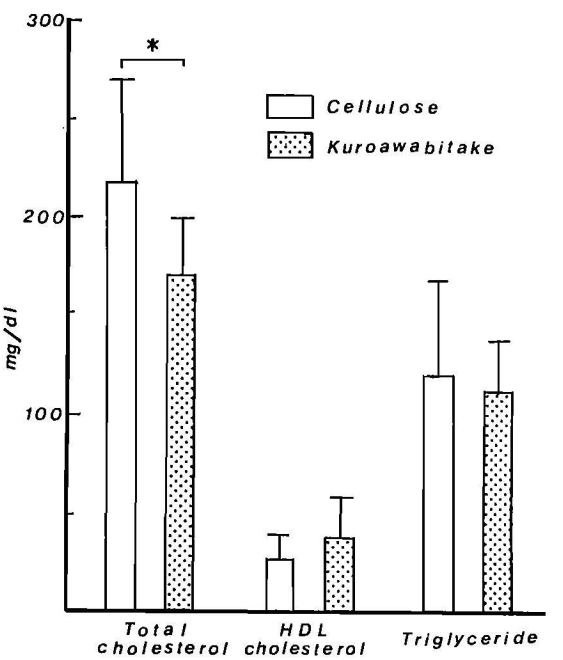

Fig. 1 Effect of kuroawabitake on serum cholesterol and triglyceride in rat. Asterisk(*) in the figure shows the statistically significant difference in 5% level by Student's t'test.

Discussion

In this experiment, suppressive effect of kuroawabitake on total serum cholesterol was evident. Moreover there was no significant diference in food intake or body weight as compared to rats fed cellulose diet. Considering that "shiitake" mushroom has the same effect by eritadenin[2-3], the suppressive mechanism may be similar.

Effect on HDL-cholesterol and triglycerides was observed as much as same in both rats fed kuroawabitake and cellulose diet, respectively. Thereby, kuroawabitake could be expected as a hopeful functional food from Okinawa's food industries.

Further studies ought to be undertaken in order to detect eritadenin or the suppressive mechanism of cholesterol.

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