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EFFECT OF GLUCOMANNAN ON OBESE PATIENTS: A CLINICAL STUDY

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An eight-week double-blind trial was conducted to test purified glucomannan fiber as a food supplement in 20 obese subjects. Glucomannan fiber (from konjac root) or placebo was given in 1-g doses (two 500 mg capsules) with 8 oz water, 1 h prior to each of three meals per d. Subjects were instructed not to change their eating or exercise patterns. Results showed a significant mean weight loss (5.5 lbs) using glucomannan over an eight-week period. Serum cholesterol and low-density lipoprotein cholesterol were significantly reduced (21.7 and 15.0 mg/dl respectively) in the glucomannan treated group. No adverse reactions to glucomannan were reported.

Introduction

Fiber in the diet is essential for good health[2,22]. Consumption of fiber has been shown to reduce the occurrence of obesity[2,22] by acting as a bulking agent[2,4,22]. High intake of dietary fiber is also reported to reduce caloric consumption, food ingestion rate, and nutrient absorption[6,19,20,21].

The type of fiber eaten is also important[12]. Cellulose fiber does not effect serum cholesterol levels[9,17] but pectin gel fiber has been shown to reduce blood serum cholesterol in a number of studies[3,7,8,15]. Glucomannan is a pectin-like gel fiber composed of a polysaccharide chain of repeating units of β-1,4-linked glucose and mannose[16]. Glucomannan is a natural component of konjac root, which has been safely consumed as food for over 1000 years in the Orient[16].

Studies of human subjects and rats have indicated that glucomannan forms a gel and greatly increases the moisture content of the food bolus during digestion[10,18]. Terasawa *et al.*[18] reported a 23 mg/dl drop in cholesterol over a two-week period while their human subjects were on glucomannan. Kiriyama *et al.*[10] observed similar results in experiments with rats on hypercholesterolemic diets. One gram of glucomannan will absorb about 100 ml of water *in vitro*. Studies with rats showed that the gel forms around the food particles, causing digestive enzymes to release sugars and fats at a slow rate[10].

The objectives of the present study were: (1) To determine the effect of glucomannan as a weight reduction aid in obese patients, and (2) To determine the effect of glucomannan on serum cholesterol, triglycerides, low-density lipoprotein cholesterol, and high-density lipoprotein cholesterol.

Subjects and methods

A total of 20 obese women were randomly selected from a larger group of obese females who responded to a newspaper advertisement. Those who responded and were 20 percent or more over their ideal weight[11] formed a group from which 20 subjects were randomly selected. The 20 subjects were randomly placed into two groups of ten with little difference in weight and height distribution. This was achieved by repeatedly selecting two random groups and comparing them with respect to their weight and height distribution. When two groups with similar weight and height distribution were found, one was named the placebo group and the other the glucomannan group.

The glucomannan group took two capsules of a supplement containing 500 mg of purified glucomannan, three times per day, with 8 oz of water, 1 h before each meal. The placebo group took two capsules containing 500 mg starch under the same conditions. Both supplements were identical in shape, color, and appearance. Neither patients nor researchers knew in which group each subject was entered.

Prior to the experiment, both groups were advised that they were participants in a clinical study and that the objective of the study was to determine the effectiveness of the supplement as a weight-loss diet aid. All patients were instructed not to deviate from their previously established eating and exercise patterns.

Each patient's weight and height, without shoes, were recorded using a Health-O-Meter scale, model DQF400. The same scale was used for all weighings. Starting weight (pounds), height (inches), and blood samples were obtained for each person at the beginning of the study; and weight and blood samples were taken after four and eight weeks. The blood samples were analyzed for total serum cholesterol, total triglycerides (TG), and high-density lipoprotein (HDL) cholesterol using an enzymatic method[1,13,14]. Low-density lipoprotein cholesterol (LDL) was calculated by difference from cholesterol, high-density lipoprotein cholesterol, and triglycerides using the following common formula: $C_{LDL} = C_{Serum} - (C_{HDL} + TG/5)$, were C_{LDL} = Low-Density Lipoprotein Cholesterol, C_{Serum} = Total Serum Cholesterol, C_{HDL} = High-Density Lipoprotein Cholesterol, and TG = Serum Triglycerides[5]. Neither subjects nor investigators were advised of the blood chemistry results until after the study was completed.

Results

Table 1 shows weight and height distribution for the two groups. The average weight in the glucomannan group was 185 lb, in a range from 132 lb to 218 lb. The average percentage overweight of this group was 54.5 percent. The placebo group, by design, had similar characteristics. The average weight in the placebo group was 183 lb and the weight range and percentage overweight were 133 to 214 lb and 51.2 percent respectively.

Table 1. *Patients' starting weight, overweight, and height*

Group	*Mean weight (lb)*	*Weight range*	*Mean overweight (%)*	*Mean (in)*
Glucomannan	185	132–218	54.5	64.2
Placebo	183	133–214	51.2	63.9
Significant difference	n.s. $P>0.90$		n.s. $P>0.70$	n.s. $P>0.90$

Acceptance of the food supplement was very good. Many subjects indicated that they had a 'full' feeling after taking glucomannan. Observations of satiety were made occasionally in patient interviews, but no complete survey was done. In the future, investigators might measure satiety to determine if there is a statistical significance to this observation. No adverse effects were reported by subjects in either the glucomannan group or the placebo group. There were, however, several in the glucomannan group who reported that the food supplement had relieved mild constipation.

Table 2. *Changes in weight, cholesterol, LDL cholesterol and triglycerides measured four and eight weeks after beginning the study*

	*Weight decrease (lb)**		*Cholesterol decrease (mg/dl)**		*LDL cholesterol decrease (mg/dl)**		*Triglycerides decrease (mg/dl)**	
	4 weeks	*8 weeks*	*4 weeks*	*8 weeks*	*4 weeks*	*8 weeks*	*4 weeks*	*8 weeks*
Glucomannan group								
Mean = y_1	4.9	5.5	20.9	21.7	14.8	15.0	15.5	23.4
s.e.m.	±1.3	±1.5	±10.0	±9.3	±8.2	±9.5	±20.0	±21.8
Placebo group								
Mean = y_2	0.4	-1.5	-5.9	-4.7	2.1	-5.9	-18.6	2.6
s.e.m.	±1.1	±1.5	±7.0	±6.3	±8.5	±6.0	±11.0	±4.3
Difference between groups								
$y_1 - y_2$	4.5	7.0	26.8	26.2	12.7	20.9	34.1	20.8
s.e.m.	±1.3	±1.4	±11.0	±8.3	±8.0	±8.2	±26.0	±23.2
Significant difference	$P<0.02$	$P<0.005$	$P\leq0.03$	$P\leq0.024$	$P\leq0.10$	$P\leq0.05$	$P\leq0.10$	$P<0.20$ n.s.

*Negative numbers indicate increase in measurement

There were significant changes in weight, cholesterol, LDL cholesterol and triglycerides when the glucomannan group was compared with the placebo group (Table 2). The mean weight loss for the glucomannan group was 5.5 lb in eight weeks. Compared with the placebo group which gained 1.5 lb in eight weeks, the difference in weight loss between the two groups is highly significant ($P \leq 0.005$).

The mean cholesterol for all subjects was 198 mg/dl. This value is high, but is still in the normal range. After four weeks, the glucomannan group had a substantial decrease in cholesterol level of 20.9 mg/dl whereas the cholesterol level for the placebo group increased by 5.9 mg/dl. The difference of 26.8 mg/dl between the two groups was very significant ($P<0.03$). Variability among subjects was greatest for those who had lower starting cholesterol levels. This result suggests that glucomannan may lower the cholesterol level of subjects who have high cholesterol levels more than those who have normal cholesterol. There was a significant ($P<0.1$) positive correlation ($r>0.6$) between the starting level of cholesterol and the decrease in the cholesterol level.

After eight weeks, the glucomannan group maintained a cholesterol level 21.7 mg/dl lower than their initial cholesterol. Cholesterol levels did not, however, decrease significantly between four and eight weeks. This finding indicates that cholesterol levels decrease quickly and remain constant at a depressed level while taking glucomannan.

The mean low-density lipoprotein (LDL) cholesterol for all subjects was 125 mg/dl. After four weeks, the glucomannan group had a mean LDL cholesterol decrease of 12.7 mg/dl when compared to the placebo group. After eight weeks, the difference of 20.9 mg/dl in LDL cholesterol between the two groups was significant ($P<0.05$). HDL cholesterol did not change significantly during this study. This suggests that the change in cholesterol observed in this study was due to a decrease in the LDL cholestrol.

The change in triglycerides was significant ($P<0.10$) after four weeks when the glucomannan group was compared with the placebo group. There was no significant difference after eight weeks. Because of the variability of triglyceride data no firm conclusion relating glucomannan intake to triglyceride could be drawn.

Discussion

Our results agree generally with findings of previous researchers[10,18]. Reduced serum cholesterol was shown when glucomannan (two 550 mg capsules three times per d) was taken. Presumably, glucomannan works in a manner similar to other fibers, by carrying bile out through the intestines and thereby reducing the cholesterol.

The mode of action of glucomannan for weight loss, on the other hand, appears to arise from its bulk-forming properties (3 g of glucomannan will absorb approximately 300 ml of water). This added bulk in the stomach just before each meal, may decrease the appetite and causes the subject to eat less at each meal.

Although the number of subjects used in this study was small, the results support the use of glucomannan food supplement for the purpose of weight reduction and reducing cholesterol in those who have high cholesterol.

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