

# Usefulness of “BioBran” (rice bran arabinoxylan compound) in improvement of hyperglycemia

## Potential inhibition of hyperglycemia through a mechanism of action different from that of conventional dietary fibers

The number of patients with diabetes mellitus has increased rapidly in recent years. It has been shown that even borderline abnormal glucose tolerance accelerates arteriosclerosis. This suggests the importance of prevention and early improvement approach.

“BioBran” (rice bran arabinoxylan compound), sold by Daiwa Pharmaceutical Co., Ltd., has dietary fiber properties and is expected to delay sugar absorption. In the current issue, we invite Professor Ikuo Ohara at Aichi Gakusen University to explain the potential improvement of hyperglycemia by “BioBran” based on his experimental data.



Dr. Ikuo Ohara

Professor at Aichi Gakusen University

Completed an early doctoral course in agriculture at Nagoya University. Joined Ajinomoto Co., Inc. in 1970. Became a guest researcher at the Monell Chemical Senses Center, University of Pennsylvania in 1976, assistant professor at Kobe Women’s University in 1983, and professor at the same university in 1988. He has been a professor at Aichi Gakusen University since 2001 and also the dean of the faculty of home economics since 2006.

His books: *Contemporary Nutritional Science Series*, Asakura Publishing Co., Ltd., *Basic Dietetics from Viewpoint of Health*, I&K Corporation, and many others.

## Potential prevention of diabetes mellitus expected based on the property of dietary fiber

**First of all, what is your understanding of diabetes mellitus as a nutrition specialist?**

Ohara: My understanding of diabetes mellitus is that it is a chronic hyperglycemic state arising from the inhibition of sugar uptake into cells, caused by insufficient insulin action and insulin resistance.

I emphasize that it is a metabolic disease leading to abnormal metabolism of lipid and protein besides sugar. I think that the occurrence of many complications including hyperlipidemia and hypertension reflects such overall impairment of metabolism.

**Why did you begin to look at “BioBran”? And what usefulness did you expect for diabetes mellitus?**

Ohara: Rice bran is a byproduct from rice polishing and is usually unused for food because of its bad taste. Some is utilized for plant food or animal food.

“BioBran” is a functional food produced from rice bran and has been shown to have an immunomodulatory action due to enhanced NK cell activity. Although “BioBran” is also expected to function as a dietary fiber that slows blood glucose increase, there has been no report on its effect on diabetes mellitus. This is why I began to study the prevention and treatment of diabetes mellitus with “BioBran” in experimental animals.

**Inhibited blood glucose increase after glucose challenge and tendency of lipid metabolism improvement confirmed**

**You have studied the relationship between “BioBran” intake and blood glucose level. Please, outline the study.**

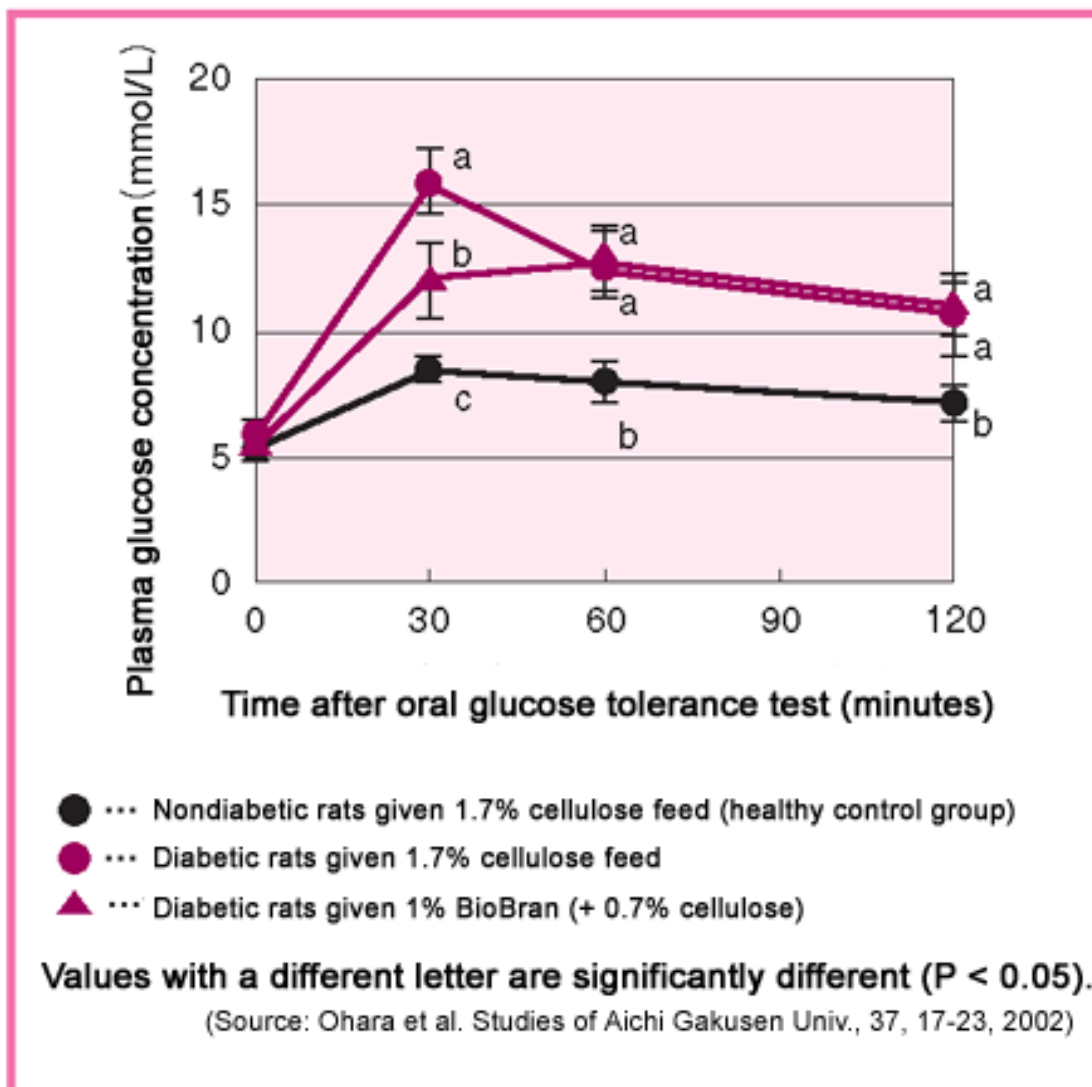
Ohara: Rats given the diabetes mellitus inducer streptozocin (STZ) immediately after birth develop a pathologic condition close to human type 2 diabetes mellitus after maturation. An experiment was performed using this rat model of type 2 diabetes mellitus in which insulin secretion remains.

Rats were divided into 3 groups: the healthy control group given 1.7% cellulose feed, the diabetic group given 1.7% cellulose feed, and the other diabetic group given 1% “BioBran” feed (+ 0.7% cellulose) *ad libitum* for 60 days. After 60 days, biochemical analysis of plasma was performed. Blood insulin, blood glucose, triglyceride, and total cholesterol were determined.

**What were the results of the experiment?**

Ohara: The blood glucose concentration rapidly increased after oral glucose tolerance tests (OGTT) on Day 58 in the diabetic group given 1.7% cellulose feed compared with the control group. On the other hand, rapid increase in blood glucose after glucose challenge was inhibited in diabetic rats given “BioBran” (Fig. 1).

**Figure 1 Glucose tolerance in nondiabetic and diabetic rats (males)**

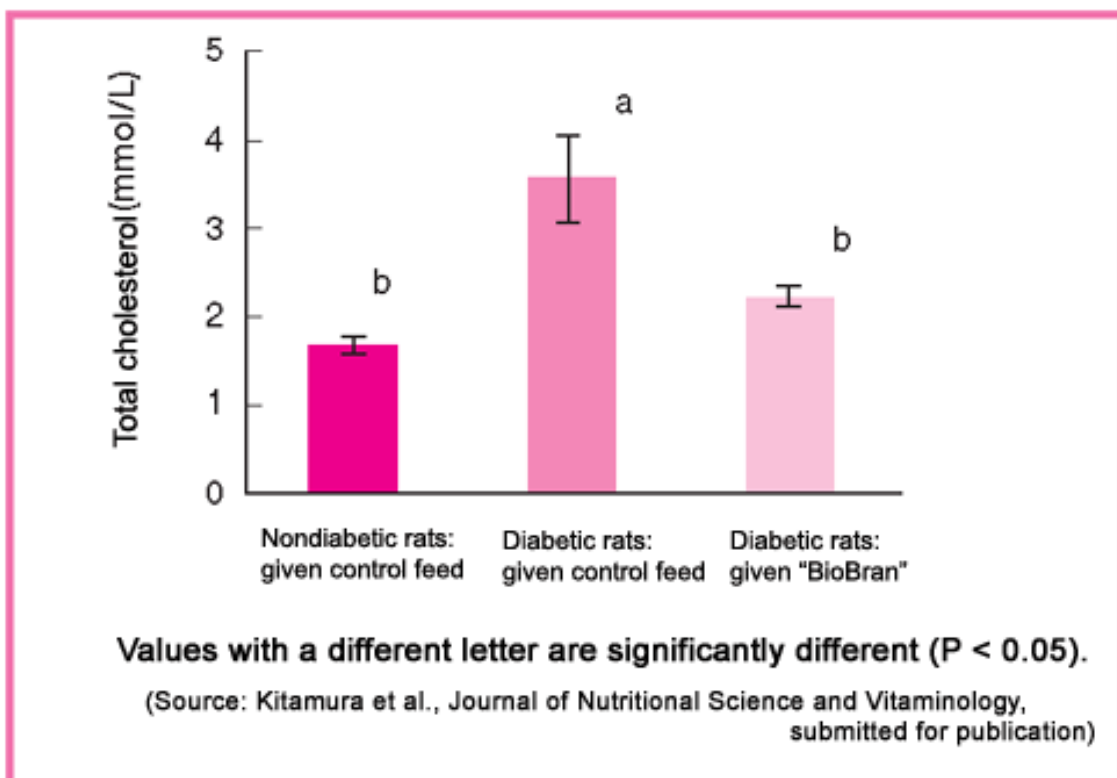


**What were the results of the biochemical analysis of plasma?**

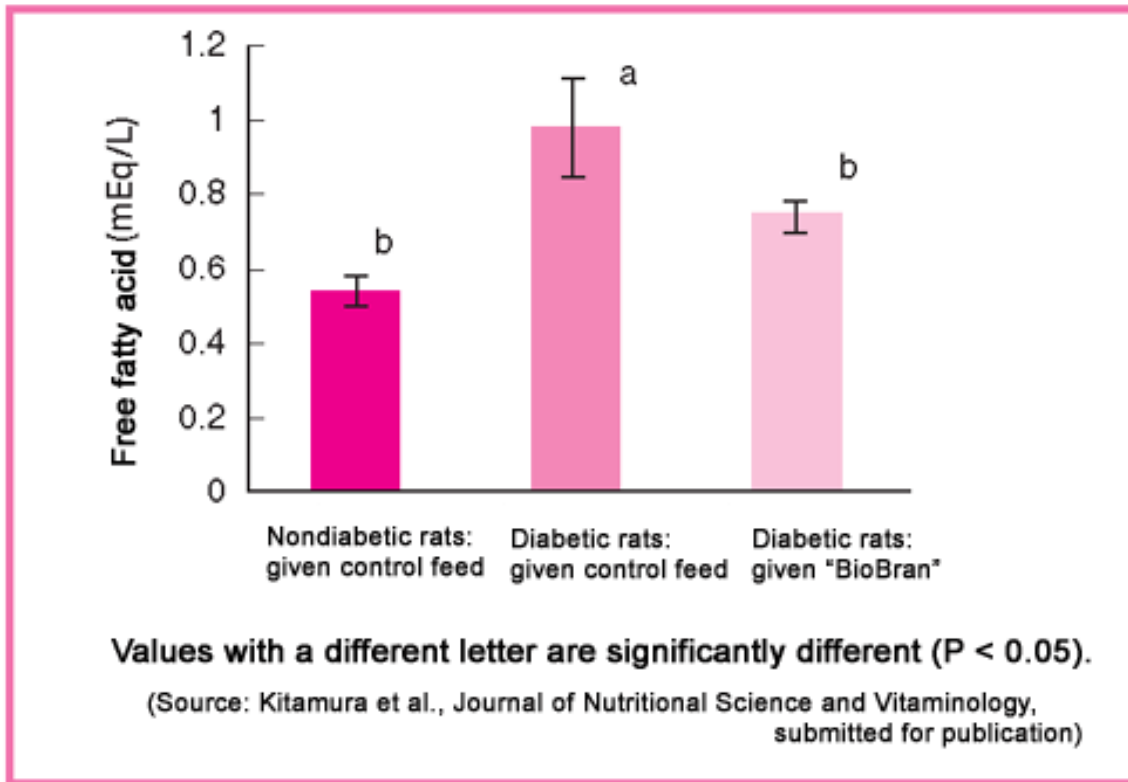
Ohara: Increase in the blood total cholesterol concentration was significantly inhibited in the diabetic group given “BioBran.”

In a different experiment where diabetic rats were given “BioBran” at 75 mg/kg for 20 days, the blood total cholesterol and free fatty acid concentrations were also lower (Figs. 2 and 3). In this experiment, rapid increase in blood glucose was inhibited again.

**Figure 2** Change in blood total cholesterol after administration of “BioBran” in diabetic rats



**Figure 3 Change in blood free fatty acid after administration of "BioBran" in diabetic rats**



### Physiological activity at low concentration suggests contribution of low molecular components

**Does the action as a dietary fiber largely contribute to inhibited increase in blood sugar after sugar challenge?**

Ohara: The inhibition of blood sugar by dietary fiber is generally explained by decreased and delayed sugar absorption due to changed viscosity in the gastrointestinal tract. However, "BioBran" exerts the physiological activity at a very low concentration as a dietary fiber. This is notable. The tendency to improve diabetes mellitus is observed at about 1/5 to 1/10 of the intakes of other functional foods. The physiological activity of "BioBran" cannot be explained by the function of dietary fiber alone.

**“BioBran” is very different from conventional dietary fibers, isn’t it?**

Ohara: Generally, dietary fiber, orally administered is not absorbed from the intestinal mucous membrane. Thus, the obtained results suggest the contribution of low molecular components able to permeate the intestinal mucous membrane to be absorbed.

“BioBran” is produced by hydrolyzing soluble hemicellulose extracted from rice bran with enzymes from shiitake mycelia. It has been confirmed to contain low molecular components with molecular weight of about 200. Besides changed viscosity in the gastrointestinal tract, the low molecular components may be transported to brush border cells to act on the pancreas and insulin receptors directly.

**Intends to establish the most appropriate ingestion method based on experiments taking into account nutritional conditions**

**These experimental results suggest the potential prevention and improvement of abnormal glucose tolerance.**

Ohara: Of course, “BioBran” may be useful for the prevention of diabetes mellitus. Eating habit is very important for the prevention of diabetes mellitus. In future, I would like to advance my research, taking into account various conditions such as meals and exercise.

**What role do you expect for functional food?**

Ohara: The basis of disease prevention and health maintenance is diet. However, regular eating habits do not necessarily provide sufficient nutrition.

Moreover, there are people who have difficulty in eating and those who eat poorly because of aging. So, the basis is meals and exercise and if there is any shortage, it should be supplemented with functional food. This would be effective usage of functional food.

**Please, tell me your challenge or plan to study, if any.**

Ohara: I plan an experiment taking into account various nutritional conditions, especially the lipid/carbohydrate energy ratio. This experiment aims to find the most effective conditions for taking “BioBran.”

The results mentioned above were obtained from animal experiments. In future, I will need clinical data from patients with diabetes mellitus. In addition, I will strive to identify the

physiological active component and to clarify what action “BioBran” produces on pancreatic beta cells.

**Thank you very much.**

For inquiry about “BioBran”:

Daiwa Pharmaceutical Co., Ltd.

Customer Response Centre: 0120-797-867

URL: [www.daiwa-pharm.com](http://www.daiwa-pharm.com)

E-mail: [info@daiwa-pharm.com](mailto:info@daiwa-pharm.com)