Agronomic Science Society of Japan blog Vol. 65, No.11, pp. 1651～1653, 1991

Effect of xylooligosaccharides on Feces of Men

Takumi KOBAYASHI, Masako OKAZAKI*, Shigcaki FUJIKAWA and Kunimasa KOGA

Department of Business Development. Research & Development Division. Suntory Ltd,.
The Garden Court, 9th Floor. 4-1 Kioicho. Chiyoda-ku Tokyo 102
**Institute for Fundamental Research, Suntory Ltd,.*
Ooaza-yaazaki, Shimamoto-cho. Mishima-gun, Osaka 618.

The administration of xylooligosaccharides selectively promoted the growth of intestinal bifidobacteria in men. The effects of the administration of 2 to 10 g of xylooligosaccharides on the fecal hardness and the frequency of diarrhea were investigated in 10 men. Both the hardness of feces and the frequency of diarrhea were decreased by such administration of 2 g of xylooligosaccharides. (April 22, 1991 accepted)

The balance of composition of the intestinal flora is closely related to human health. If the advantages of bifidobacteria has been in the state, then the intestinal flora can be considered to be in a good balance (1-5). In recent years, the research investigating the relationship between bifidobacteria and the colonic health has been in progress. Some studies reported that both bifidobacteria and various oligosaccharides, as energy sources for bifidobacteria, play a role in colonic health (6-10). Among these oligosaccharides, XOS at doses of 1-5 g or less can selectively promotes the activity of bifidobacteria. Moreover，XOS is known to maintain fecal moisture (11,12). A questionnaire survey summarized "the change of feces state after further increasing the intake of XOS ".

Trial methods

Test sample: XOS70L(Hereinafter referred to as XOS), a syrup which contains 75% dry substance. The proportion of saccharides in the dry substance is as follows，XOS with a polymerization degree of more than 2 accounts for 70%，xylose, glucose and other sugars account for 30%.

Subjects: Ten 10 male volunteers aged 30 to 60 years were administered 2 , 5, or 10g XOS for 5 days in a cross over design. A washout period between each experiment was 9 days. During the four days before intake and the intake period, volunteers were demanded to record the times of defecation and stool hardness in the prescribed form paper. The stool hardness is divided into six level with score (1: hard, 2: slightly

harder, 3: normal, 4 : slightly soft, 5: slightly soft, 6: water-like). Ten individual results were collected and the data were evaluated using t-test.

In addition, stools were sampled from randomly selected two volunteers. The intestinal flora of the samples were analyzed according to the method of Mitsuoka. Briefly, one gram sample was transferred into test tubes containing 9 ml anaerobic diluent, then was mixed and diluted to 10^8 under sterile CO_2. The sample solution (0.05ml), which was applied to anaerobic bacteria plates (9 species) and aerobic bacteria plates (7 species), was incubated at 37 ℃ for 24 to 72 hours. After incubation, the shape of colonies, Gram dyeing (Gram staining), and cell morphology were examined.

Observation and results

Figure 1 shows the percentage of diarrhea (ratio of 6 score or watery defecation) among 10 subjects during the 5 day intake period; 7.7% before XOS intake，2.1% after 2 g XOS intake, 5.0% after 5 g intake，6.7% after 10 g XOS intake. Frequency of evacuation was 1.4 times before intake, 1.1 times after 2 g XOS intake ($P < 0.05$), and 1.2 times after 5 g XOS intake, and 1.3 times after 10 g XOS intake. In this trial, The maximum times of defecation was 4 times a day.

The hardness of stool before the intake was 4.1 points, the feces was slightly soft. After the intake of 2, 5, or 10 g, the scores were decreased to 3.4 points ($P < 0.01$), 3.7 points ($P < 0.05$), or 3.9 points, respectively. These scores were close to the normal score 3 point.

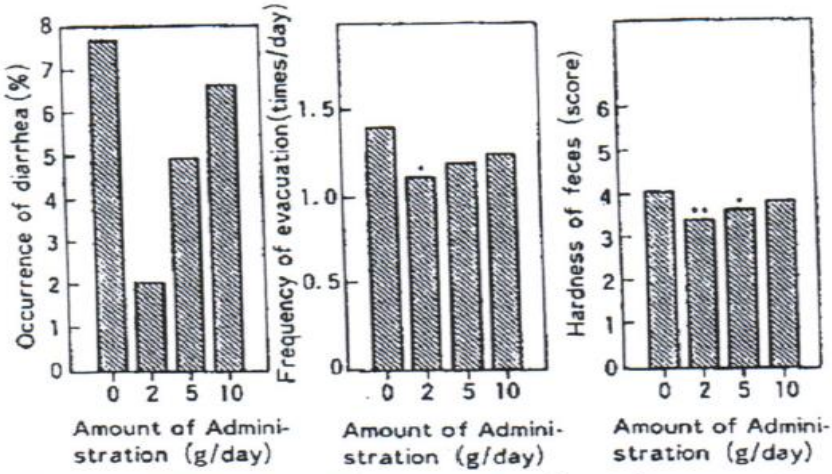

Fig. 1. Changes in Fecal Status by the Administration of Xylooligosaccharides in Men. * Significantly different from the control period : $p<0.05$; ** significantly different from the control period : $p<0.01$.

The results indicate that the best fecal state was observed at the dose of 2 g XOS. With the intake of 10 g, the fecal characteristics were close to those found during the

no-intake period, and stools tended to be soft. Figure 2 shows at the first day of XOS intake, the incidence of diarrhea. Prior to the intake of XOS the incidence of diarrhea is 8%. On day 1, the rate was reduced to 0 when the intake of 2-5 g XOS was administered. But the rate was increased to 18% when 10 g of XOS was administered.

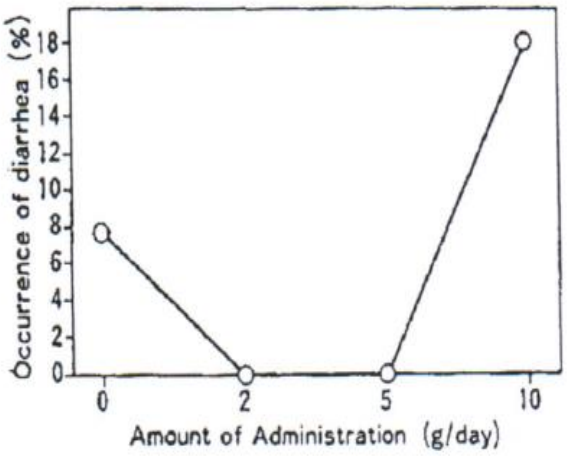

Fig. 2. Occurrence of Diarrhea by the Administration of Xylooligosaccharides in Men.

The incidence of diarrhea observed on the first day was transient: the incidence of diarrhea started to reduce and the average diarrhea rate during 5 days was reduced to 6.7% (Figure 1).

Figure 3 shows the fecal bifidobacteria ratio changes in two volunteers. The Bifidobacterium ratio of one volunteer (volunteer B) was 7.9% before intake and was increased to 23.1%, 20.2%, or 33.9% after XOS intake of 2, 5, or 10 g, respectively. In volunteer A, corresponding Bifidobacterium ratios were 33.4% before intake and 55.4%, 60.8%, and 44.1% after intake. The results are consistent with the previous reports in which 5-9 volunteers who consumed 1, 2, or 5 g XOS had increased numbers of bifidobacteria[11-12].

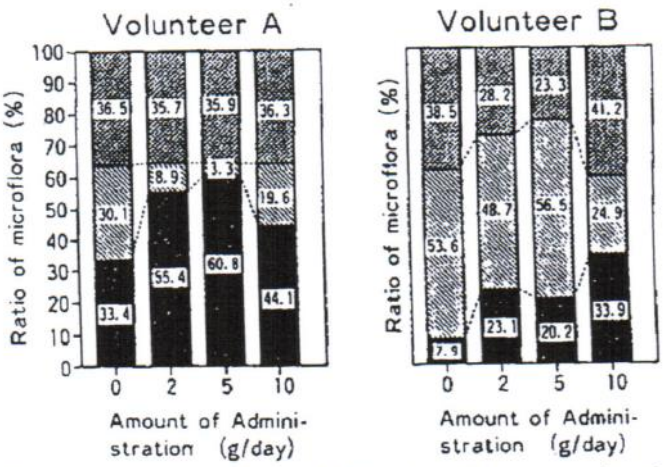

Fig. 3. Changes in Fecal Flora of 2 Volunteers by the Administration of Xylooligosaccharides in Men.
■, Bifidobacterium ; ▨, Bacteroidaceae ; ▩, Others.

When the intake of 10g, although there are a number of incidence of transient diarrhea increased, but the average has no difference during the entire test period. Results show that intakes of 1 or 10 g XOS had similar bifidogenic effects. From the smallest to the largest efficacious level, there is a 10 times difference. Thus, XOS appears to be efficacious in wide range of doses.

Reference

（1）光冈知足（Tomotari Mitsuoka）：肠道细菌的世界，丛文社，1980，P-15。
（2）本间道（Michi Honma），光冈知足（Tomotari Mitsuoka），双歧杆菌，养乐多（Yakult）总公司，1979。
（3）托摩武人（Takuma Takehito），本间道（Michi Honma），西乡正胜（Masakatsu Saigou），久保义明（Yoshiaki Kubo）：日本医事新报，1564，3（1954）。
（4）平田美穗（Miho Hirata）：医学的历程，26，979（1958）。
(5) J.B.Mayer：Mschr. Kinderheilk.，114，67（1966）。
（6）K. Yazawa, K.Imai and Z. Tamura：Chem. Pharm. Bull，26，3306（1978）
（7）田中隆一郎（Ryuichiro Tanaka），高山博夫（Hiroo Takayam），诸富正巳（Masami Morodomi），黑岛敏方（T. Kuroshima），寺岛经男（Terajima），务台方彦（M. Mutai）：日细志，34，304（1979）
（8）R. Tanaka, H. Takayama, M. Morotomi, T. Kuroshima, S. Ueyama, K. Matsumoto, A. Kuroda and M. Mutai：Bifidobacteria Microflora, 2, 17(1983)
（9）正井辉久：食品工业，8，31（1987）
（10）H. Hidaka, T. Eida, T. Takizawa, T. Tokunaga and Y. Tashiro：Bifidobacteria Microflora, 5, 37（1986）
（11）M. Okazaki, S. Fujikawa and N. Matsumoto：Bifidobacteria Microflora, 9, 77（1990）
（12）冈崎昌子（Okazaki M），藤川茂昭（Fujikawa S），松元信也（Matsumoto N）：日本营食・食粮学会志，43，395（1990）