

[Summary]

The effect of improving the intestinal environment , body weight and body fat by ingesting foods containing butyric acid bacteria and propionic acid

<Improvement of intestinal environment>

[Title] The effect of improving the intestinal environment by ingesting food containing *Clostridium butyricum* and 3-(4-hydroxy-3-methoxyphenyl)propionic acid (hereinafter referred to as HMPA).

[Purpose] Targeting healthy Japanese men and women who defecate less than 5 days a week . The purpose of this study was to verify whether the intestinal environment improved compared to the placebo.

[Background] In recent years, due to eating habits centered on meat, requests to refrain from going out, and promotion of telework, we are living in a high-fat, low-fiber diet, lack of exercise, irregular lifestyles, and stressful environments. In particular, the number of people who complain of constipation due to lack of vegetables and lack of exercise is increasing year by year, and one in two women is said to be constipated. Butyric acid, one of the short-chain fatty acids, is used as an energy source for the colonic epithelium and is essential for creating good intestinal flora (intestinal flora). If it is possible to promote the production of short-chain fatty acids such as butyric acid in the intestine, it will lead to the improvement of the intestinal flora (intestinal flora), and it is believed that it will also lead to the improvement of bowel movements. Although there are reports on the intestinal environment and bowel movements caused by *Clostridium butyricum* and short-chain fatty acids, there are no reports on the effects of combined use of *Clostridium butyricum* and HMPA.

[Method] Healthy men and women aged 20 to 59 years with a BMI of 23 or more and less than 30 were selected. In order to confirm the effect of improving the environment and intestinal flora (intestinal flora), the test product intake group was given *Clostridium butyricum* at 14.0 mg/day (14 million cells/day) and HMPA derived from fermented rice bran at 11.5 mg/day. mg/day for 12 weeks, and the placebo group did not receive this component. A randomized, double-blind, placebo-controlled, parallel-group comparison study was conducted with metagenome analysis (transition of intestinal bacteria) and metabolome analysis (short-chain fatty acids) set as endpoints, and defecation status was confirmed by recording. We also checked for side effects during the trial period. This test was conducted by the submitter after requesting and providing funding to an external testing institution.

[Main results] After 8 weeks of intake , the test product group showed significant levels of *Clostridium butyricum* and *Coprococcus* , a butyrate-producing bacterium, compared with the placebo group, and after 12 weeks of intake, *Clostridium butyricum* . A significant increase was observed, as well as promotion of the production of butyric acid and acetic acid. In addition, a significant improvement was observed in the subjective evaluation of exhilaration of bowel movements. There were no safety issues in this study.

<Improved body weight and body fat (visceral fat, subcutaneous fat)>

[Title] The effects of intake of food containing *Clostridium butyricum* and HMPA on improving body weight and body fat (visceral fat and subcutaneous fat).

[Purpose] Targeting healthy men and women aged 20 to 59 with a BMI of 23 or more and less than 30, and continuously ingesting *Clostridium butyricum* and HMPA-containing foods. The purpose of this study was to verify whether the functionality of reducing body weight and body fat (visceral fat/subcutaneous fat) can be obtained compared to the placebo.

[Background] Due to the epidemic of infectious diseases in recent years, the Ministry of Health, Labor and Welfare has announced measures to prevent the spread of infection, such as requesting people to refrain from going out and promoting telework. Changes in people's lifestyles in such an environment have led to problems such as loss of opportunities for exercise and uneven nutritional intake due to eating alone, resulting in an increase in the number of people suffering from lack of exercise and weight gain. According to a questionnaire survey conducted on 350 teleworkers in May 2020, 40% of them are aware of the tendency to gain weight.

The short-chain fatty acids butyric acid, acetic acid, and propionic acid are said to have many physiological effects that maintain health. It has been reported one after another that the intestinal flora metabolizes undigested food components, supplies nutritional components, and also participates in metabolic receptors, affecting lipid metabolism and fat accumulation. In other words, if it is possible to promote the production of short-chain fatty acids such as butyric acid in the intestine, it will lead to the improvement of the intestinal flora (intestinal flora), and it will also lead to the improvement of lipid metabolism and fat accumulation. . Although there are reports on the metabolism of *Clostridium butyricum* , short-chain fatty acids, and HMPA itself regarding the improvement of lipid metabolism and fat accumulation , there are no reports on the effects of combined use of *Clostridium butyricum* and HMPA.

[Method] A randomized, double-blind, placebo-controlled, parallel-group comparison study was conducted to evaluate the effects of foods containing *Clostridium butyricum* and HMPA on reducing body weight and body fat (visceral and subcutaneous fat) . In addition, subjective evaluation and physical examination including blood glucose level were performed as secondary outcomes.

Subjects were healthy men and women aged 20-59 years with a BMI of 23 or more and less than 30. A test product intake group of 16 subjects (6 men, 10 women) and a placebo group of 14 subjects (8 men, 6 women) were set. In order to confirm the effect of reducing body fat (visceral fat and subcutaneous fat), the test product intake group took *Clostridium butyricum* 14.0 mg/day (14 million pieces/day) and HMPA 11.5 mg/day continuously for 12 weeks. Meanwhile the placebo group did not receive the component. Outcomes were weight, BMI, body fat (visceral fat, subcutaneous fat), waist circumference, body fat percentage, etc., and were conducted in a randomized, double-blind, placebo-controlled, parallel-group comparison study . We also checked for side effects during the trial period. This test was conducted by the submitter after requesting and providing funding to an external testing institution.

[Main results] After 12 weeks of intake, significant differences were observed in body weight, BMI, body fat (visceral fat, subcutaneous fat), waist circumference, and body fat percentage in the test product group compared to the placebo group. In addition, subjective evaluation showed a significant improvement in body lightness and a significant trend in clothes size. There were no issues with safety.