The anti-obesity effect of wheat polyphenols

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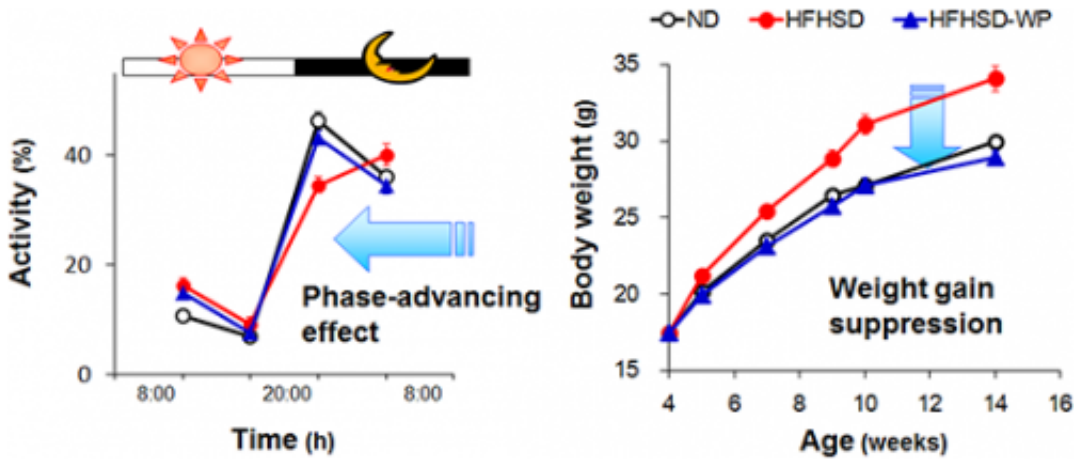

Figure 1: Activity rhythm improvement effect and anti-obesity effect of wheat polyphenols.

Researchers from the National Institute of Advanced Industrial Science and Technology (AIST), have discovered that wheat polyphenols have effects that improve the rhythm of activity and suppress obesity and glucose intolerance in model mice of diet-induced obesity, in collaboration with Nisshin Seifun Group Inc.

The present study revealed that wheat polyphenols contained in the outer layers of wheat suppress the disruption of activity rhythm and glucose intolerance in model mice of diet-induced obesity, and exhibit a marked anti-obesity effect on the model mice. The consumption of whole-wheat flour, which contains polyphenols, is expected to possibly prevent metabolic disorders such as diabetes, obesity, and the metabolic

syndrome.

The results were presented at the 67th Annual Meeting of the Japan Society of Nutrition and Food Science held on May 24 to 26, 2013, at Nagoya University (Nagoya, Aichi Pref.).

It has been pointed out that society's recent shift toward "24 hours a day" and irregular dietary habits may affect a circadian clock and increase not only psychological disorders, such as sleep disorders and depression, but also lifestyle-related diseases, such as obesity, diabetes, and the metabolic syndrome. In particular, the increase in caloric intake associated with the expansion of the Western diet can not only trigger metabolic disorders directly, but can also exacerbate such disorders secondarily by causing a nocturnal shift in a person's activity. However, there are presently no drugs that fundamentally cure the disruption of a circadian clock, and the development of a method utilizing the functionality of food to improve circadian rhythm is expected.

AIST aims to uncover the mechanism of the onset of diseases due to the disruption of a circadian clock and to develop methods of preventing and ameliorating diseases by the active control of circadian rhythm. In recent years, the various functionalities of polyphenols have gained attention. Since 2011, AIST has been collaborating with Nisshin Seifun Group Inc. and Oriental Yeast to study novel functionalities of wheat polyphenols contained in whole-wheat flour and wheat bran, dietary ingredients that can be consumed on a regular basis.

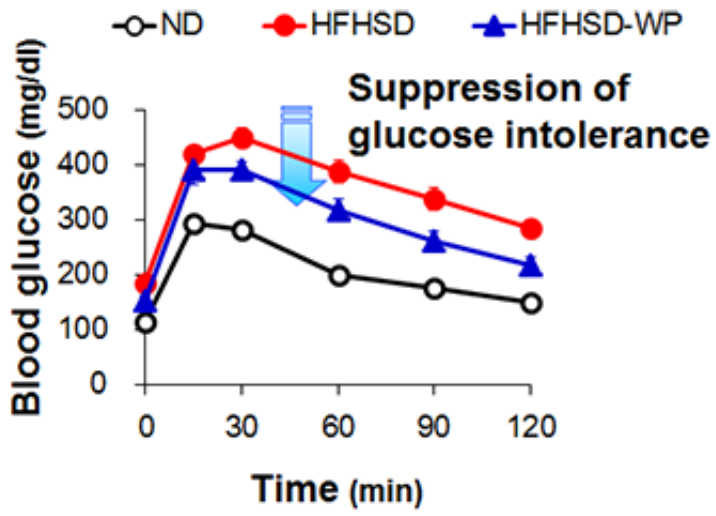

Figure 2: Suppression effect of wheat polyphenols on glucose tolerance decline.

The circadian clock is affected by the timing of eating and the content of the diet. Studies on mice and other rodents have reported that a high-fat diet causes a nocturnal shift in the time period of activity. In this study, the researchers used model mice of diet-induced obesity that exhibited a nocturnal shift in activity as well as glucose intolerance and obesity in order to evaluate the functionality of wheat polyphenols.

The mice were divided into three groups: a normal diet group, a high-fat, high-sucrose diet group, and a group with a high-fat, high-sucrose diet containing 0.4% wheat polyphenols. The mice were reared over a period of 10 weeks, and the rhythm of activity and body weight were measured and compared. Also, when the test was completed, glucose tolerance was assessed through glucose loading tests, and in addition, liver tissue samples were collected, and lipid accumulation was investigated.

The mouse is a nocturnal animal. The peak in their activity normally occurs in the first half of the dark period, but the peak of activity in mice that consumed a high-fat, high-sucrose diet shifted toward the

latter half of the dark period after 10 weeks, demonstrating a nocturnal shift in the rhythm of activity (Fig. 1). Meanwhile, the mice that consumed a high-fat, high-sucrose diet that included wheat polyphenols did not exhibit a nocturnal shift in the rhythm of activity, showing that wheat polyphenols have an effect that improves the rhythm of activity.

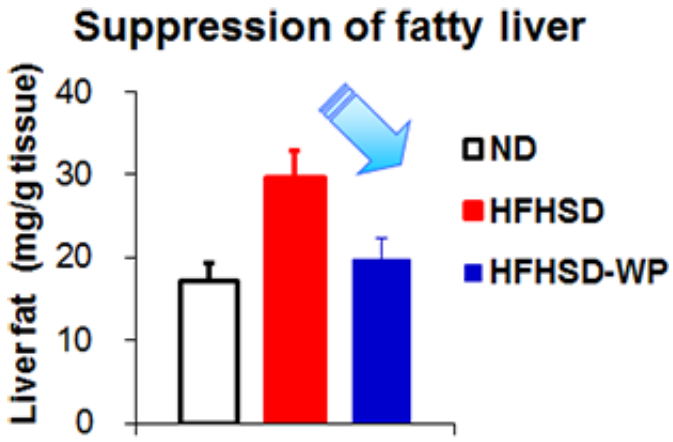

Figure 3: Suppression effect of wheat polyphenols on fatty liver.

In addition, the changes in body weight of the mice that consumed a high-fat, high-sucrose diet containing wheat polyphenols were almost the same as the body weight changes of the mice that consumed a normal diet, which demonstrates that wheat polyphenols suppress weight gain caused by a high-fat, high-sucrose diet (Fig. 1).

Glucose tolerance tests to investigate the effect of wheat polyphenols on glucose metabolic function in mice showed that the decline in glucose tolerance that occurred over 10 weeks due to a high-fat, high-sucrose diet had been suppressed by the simultaneous consumption of wheat polyphenols (Fig. 2). Also, after comparing the accumulation of fat in the liver, it was clear that the simultaneous intake of wheat polyphenols suppressed fat accumulation caused by a high-fat, high-sucrose diet (Fig.

3).

The results demonstrate a novel functionality of wheat polyphenols contained in the outer layers of wheat. In the future, the researcher intends to continue to conduct collaborative research with Nisshin Seifun Group Inc. and Oriental Yeast in order to uncover the molecular mechanisms of the effects that wheat polyphenols have in improving the rhythm of activity and suppressing obesity.

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