

New prebiotic identified in fermented Japanese vegetable: Enzyme improves colon health in rats

July 4 2016

An enzyme produced by fermenting a vegetable common in Japanese cuisine may be responsible for increasing the amount of at least one beneficial bacterium associated with healthy colons in a study using rats. The results of this prebiotic research study will be presented at the International Conference on Nutraceuticals and Nutrition Supplements in July 2016 by Norihisa Kato, Ph.D., and at the International Nutrition and Diagnostic Conference in October 2016 by doctoral student Yongshou Yang, both from Hiroshima University.

The vegetable, called burdock root in English and gobo in Japanese, has a minimal positive effect on colon health when eaten raw or cooked. Like many high-fiber foods, gobo must be eaten in unpalatable quantities to change the bacterial composition of the colon.

However, in a previous study, rats that ate gobo after it was fermented by the fungus *Aspergillus* showed improved colon health. Kato's research group has now further investigated the effect, and discovered that the fermentation process produces a protease preparation, a liquid full of different enzymes. These enzymes may be responsible for the boost in colon health.

"Rats that ate a diet supplemented with the protease preparation that was derived from gobo fermented by the fungus *Aspergillus* had amounts of the bacterium *Bifidobacterium* in their colons that were several hundred

times higher than rats on a non-supplemented diet. In addition to the microflora improvements, we observed a remarkable improvement of the overall luminal environment of their colons," said Kato.

An equivalent amount of the enzyme for an adult person to eat would be approximately 0.1 to 0.4 grams, or 0.04 to 0.16 teaspoons, per day. Comparatively, adults would need to consume about 20g, or about 5 teaspoons, per day of un-fermented gobo or other dietary fibers to experience a similar effect.

The research team's current, untested hypothesis is that, in the large intestine, the protease may break down undigested proteins into amino acids, the smaller building blocks of proteins. Greater availability of amino acids could contribute to improved nutrient utilization and therefore more favorable growth of [beneficial bacteria](#).

The bacterium, Bifidobacterium, is a common member of a healthy intestine, but it becomes less numerous as people age. Other studies have correlated boosting Bifidobacterium numbers with better mental health, increased immune function, and lower rates of bowel diseases including colitis and colon cancer. However, the biological cause of these effects remains a mystery and researchers continue to search for practical methods to increase Bifidobacterium numbers in adult colons.

"Bifidobacterium is not normally included in probiotic foods like yogurt because it is so sensitive and not easy to keep alive or grow," said Kato.

Probiotic supplements containing beneficial bacteria add extra bacterial cells to the body. Prebiotic supplements, such as some dietary fibers and oligosaccharides, support the growth of beneficial bacteria that are already present in the intestine, avoiding the challenges of growing bacteria outside the body and adding it to food products. The protease preparation derived from *Aspergillus* may be a new prebiotic and it has a

far stronger effect on Bifidobacterium in the colon than that of previous varieties of prebiotics, such as dietary fiber and oligosaccharides.

Japanese cuisine includes many foods fermented with Aspergillus, including the soybean paste miso, the rice wine sake, and many types of pickled vegetables eaten as a side-dish. However, the results from the Hiroshima University team indicate that regardless of the food, Aspergillus may be responsible for producing a variety of beneficial enzymes that the team is beginning to identify and study individually.

"We have completed three years of research on fermented gobo and we're beginning to understand what component of the fermented product has this beneficial impact on bacteria in the colon. We're excited to do more research to reveal how and why Aspergillus-fermented foods and enzymes, especially acid protease derived from Aspergillus, have positive health effects," said Kato.

Researchers are planning additional studies on the enzyme's long-term effects on the colon of rats and the enzyme's effects on the overall bacterial composition in the intestine of humans.

Provided by Hiroshima University

Citation: New prebiotic identified in fermented Japanese vegetable: Enzyme improves colon health in rats (2016, July 4) retrieved 17 April 2024 from <https://medicalxpress.com/news/2016-07-prebiotic-fermented-japanese-vegetable-enzyme.html>

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