Discovery may help scientists boost broccoli's cancer-fighting power

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A University of Illinois study has shown for the first time that sulforaphane, the powerful cancer-fighting agent in broccoli, can be released from its parent compound by bacteria in the lower gut and absorbed into the body.

"This discovery raises the possibility that we will be able to enhance the activity of these bacteria in the colon, increasing broccoli's cancer-preventive power," said Elizabeth Jeffery, a U of I professor of human nutrition.

"It's also comforting because many people overcook their broccoli, unwittingly destroying the plant enzyme that gives us sulforaphane. Now we know the microbiota in our digestive tract can salvage some of this important cancer-preventive agent even if that happens," she said.

Although scientists had long theorized that the intestinal microbiota could perform this trick, no one knew it for certain.

Now Jeffery and U of I colleagues Michael Miller and Ren-Hau Lai have proved it by injecting glucoraphanin, the parent compound for sulforaphane, into the ligated lower gut of rats and demonstrating that sulforaphane is present in blood from the mesenteric vein, which flows from the gut to the liver.

"The presence of sulforaphane in measurable amounts shows that it's being converted in the lower intestine and is available for absorption in

the body," Jeffery said.

The cecum, the part of the rat's lower gut into which the scientists infused the glucoraphanin, houses bacteria that aid in digestion and metabolism, similar to the human colon.

According to Jeffery, sulforaphane is an extremely potent cancer-fighting agent. "The amount that you get in three to five servings a week—that's less than one daily serving of broccoli—is enough to have an anti-cancer effect. With many of the other bioactive foods you hear about, vast amounts are required for a measurable outcome."

Sulforaphane also has anti-inflammatory properties, which are interesting to scientists for their ability to counter the effects of many of the chronic diseases that accompany obesity and aging.

Miller suggests two ways bacteria in the colon could be manipulated to get a boost out of broccoli. "One way might be to feed the desirable bacteria with prebiotics like fiber to encourage their proliferation. Another way would be to use a probiotic approach—combining, say, broccoli with a yogurt sauce that contains the hydrolyzing bacteria, and in that way boosting your cancer protection."

Doesn't sound particularly appealing? Bacteria aren't always bad news, said Jeffery.

"One of the things we don't think about very much is the enormous amount of benefit we experience when a healthy community of bacteria colonizes the lower intestine," she said.

"We humans have a symbiotic relationship with countless hungry microbes that metabolize vitamins and other bioactive components of food. Now we can see another exciting example of their activity with the

role they play in delivering sulforaphane from broccoli," she added.

More information: The study is the cover story of the November 2010 issue of the new journal *Food & Function* (Vol. 1, pp. 162-167) and is available online pre-publication at pubs.rsc.org/en/Journals/JournalIssues/FO

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