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Scientists learn how soy foods protect against colon cancer

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University of Illinois scientists have evidence that lifelong exposure to genistein, a bioactive component in soy foods, protects against colon cancer by repressing a signal that leads to accelerated growth of cells, polyps, and eventually malignant tumors.

"In our study, we report a change in the expression of three genes that control an important signaling pathway," said Hong Chen, a U of I professor of food science and human nutrition.

The cells in the lining of the human gut turn over and are completely replaced weekly, she noted. "However, in 90 percent of colon cancer patients, an important growth-promoting signal is always on, leading to uncontrolled growth and malignancies. Our study suggests that the aberrant Wnt signaling during the development of colon cancer can be regulated by soy-rich diets."

"The good news is that a diet rich in soy genistein represses those signals through epigenetic modifications at the regulatory regions of those genes," said Yukun Zhang, a doctoral student in Chen's laboratory.

Chronic exposure to genistein, a soy isoflavone, reduced the number of pre-cancerous lesions in the colons of laboratory rats exposed to a carcinogen by 40 percent and reduced Wnt signaling to normal levels, she said.

In their study, the scientists modeled lifetime exposure to soy by feeding

pregnant rats and their offspring a diet containing soy protein isolate and a diet that contained genistein compound. At seven weeks of age, offspring rats were exposed to a carcinogen, and they continued eating either the soy protein or the genistein diet until they were 13 weeks old.

At that time, the researchers inspected the colons of rats in both soy groups and compared them to rats in a control group, noting the number and severity of tiny abnormal growths in each. They also compared Wnt signaling before and after the carcinogen to see whether either diet had any effect on its upregulation.

In the genistein-fed animals, signaling levels were similar to rats that had not received the carcinogen.

"Genistein decreased the expression of three genes and repressed this signaling process that is associated with abnormal cell growth and cancer development," Chen said.

She said this shows that colon cancer is an epigenetic disease, meaning that dietary and environmental factors can influence genes to be switched on or off so you have a different pattern of gene expression, leading to a change in disease susceptibility.

It has long been known that immigrants from Asia—where soy is traditionally a food staple—experience rising levels of colon cancer as they adopt the eating habits of the Western nations they now call home, she said.

"The genetic information you inherit from your parents is not the whole story. Our dietary choices, our exposure to environmental toxins, even our stress levels, affect the expression of those genes," she said.

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