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# Strawberries could help reduce harmful inflammation in the colon

AMERICAN CHEMICAL SOCIETY

BOSTON, Aug. 20, 2018 -- Inflammatory bowel disease (IBD) is a set of painful conditions that can cause severe diarrhea and fatigue. Treatments can include medications and surgery. But now researchers report that a simple dietary intervention could mitigate colonic inflammation and improve gut health. In this case, a strawberry -- or rather, less than a cupful of strawberries -- a day could help keep the doctor away.

The researchers are presenting their results today at the 256th National Meeting & Exposition of the American Chemical Society (ACS). ACS, the world's largest scientific society, is holding the meeting here through Thursday. It features more than 10,000 presentations on a wide range of science topics.

"The sedentary lifestyle and dietary habits of many people in this country -- high-sugar, high-animal-fat, but low-fiber diets -- may promote colonic inflammation and increase the risk of IBD," says Hang Xiao, Ph.D., who led the study.

In 2015, 3 million adults in the U.S. reported being diagnosed with IBD, according to the U.S. Centers for Disease Control and Prevention. IBD includes both Crohn's disease, which can infect any part of the gastrointestinal tract, and ulcerative colitis, which is characterized by inflammation of the colon and rectum. People with IBD also have a higher risk of colorectal cancer.

The dietary consumption of fruits and vegetables has been associated with a lowered risk of IBD. To establish an effective and practical approach to decrease colonic inflammation in both IBD patients and the general population, Xiao and his team at the University of Massachusetts Amherst focused on strawberries due to their wide consumption. According to Yanhui Han, a Ph.D. student who conducted the study, most of the previous reports focused on the effects of purified compounds and extracts from strawberries. "But when you only test the purified compounds and extracts, you miss out on a lot of other important components in the berries, such as dietary fiber, as well as phenolic compounds bound to the fibers, that can't be extracted by solvents," he says. He adds that it also makes sense to study the effects of whole berries because people mostly consume the whole fruits rather than their extracts.

In their experiment, Han and Xiao used four groups of mice -- a group of healthy mice consuming a regular diet, and three groups of mice with IBD consuming a regular diet, a diet with 2.5 percent whole strawberry powder or a diet with 5 percent whole strawberry powder. Xiao says they tried to feed the mice doses of strawberries that would be in line with what a human could reasonably consume.

The researchers found that dietary consumption of whole strawberries at a dose equivalent to as low as three-quarters of a cup of strawberries per day in humans significantly suppressed symptoms like body weight loss and bloody diarrhea in mice with IBD. Strawberry treatments also diminished inflammatory responses in the mice's colonic tissue.

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But decreased inflammation wasn't the strawberry's only conferred benefit during this study. Colonic inflammation adversely impacts the composition of microbiota in the gut. With IBD, the abundance of harmful bacteria increases, while levels of beneficial bacteria decrease in the colon. Following the dietary treatments of whole strawberries, the researchers observed a reversal of that unhealthy microbiota composition in the IBD mice. Xiao's team also obtained experimental data that indicated strawberries might impact abnormal metabolic pathways in the IBD mice, which in turn could lead to the decreased colonic inflammation they observed.

Next, the team will try to validate their findings in IBD patients. While eating three-quarters of a cup of strawberries a day could be beneficial for those looking to enhance their gut health, Xiao advises patients to consult with their doctors before changing their diets. He also suggests avoiding this type of nutritional intervention if one is allergic to the fruit.

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**A press conference on this topic will be held Monday, Aug. 20, at 10:30 a.m. Eastern time in the Boston Convention & Exhibition Center. Reporters may check-in at the press center, Room 102 A or watch live on YouTube [http://bit.ly/ACSLive\\_Boston2018](http://bit.ly/ACSLive_Boston2018). To ask questions online, sign in with a Google account.**

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**Note to journalists: Please report that this research was presented at a meeting of the American Chemical Society.**

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#### Title

Dietary intake of the whole strawberry inhibited colonic inflammation, restored immune homeostasis and alleviated gut microbiota dysbiosis in dextran sulfate sodium-treated mice

#### Abstract

Strawberry (*Fragaria Chiloensis*) is a major edible berry with various potential health benefits. However, the detailed mechanistic information on the biological effects of strawberry is lacking, which greatly limited its utilization for health-promotion. This study determined the protective effects of dietary intake of whole strawberry (WS) against dextran sulfate sodium (DSS)-induced colitis in mice. Our results demonstrated that dietary WS reduced the disease activity index (DAI), prevented the colon shortening and spleen enlargement, and alleviated the histological damages on colonic tissues in the colitic mice. The abundance of pro-inflammatory immune cells was reduced by dietary WS in the colonic mucosa, which was accompanied by the suppression of abnormal overproduction of pro-inflammatory cytokines such as TNF- $\alpha$ , IL-1 $\beta$ , and IFN- $\gamma$  in the colon of the colonic mice. Western blotting and

immunohistochemical analysis revealed that dietary WS decreased the expression levels of pro-inflammatory proteins in the colonic mucosa. Moreover, dietary WS partially reversed DSS-induced alteration of gut microbiota in the colitic mice by increasing the abundance of Lactobacillus and Bifidobacterium and decreasing the abundance of Akkermansia and Dorea. Dietary WS also restored the decreased production of short chain fatty acids (SCFAs) in the cecum of the colitic mice. The changes in the gut microbiota induced by dietary WS were closely correlated with its effects on pro-inflammatory cytokines and SCFAs. Our findings revealed the anti-inflammatory effects and mechanisms of dietary WS in the colon, which is critical for the rational utilization of strawberry as a dietary agent for the prevention of inflammation-driven diseases.

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