Medical Xpress

Oral curcumin may protect gut function

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Oral curcumin may be a viable therapy to improve intestinal barrier function changes caused by consuming a high-fat Western diet, according to a preclinical study by Virginia Commonwealth University School of Medicine researchers.

A Western diet packed with high-fat, high-cholesterol foods is one of the key factors contributing to the growing obesity epidemic and the rise in cases of metabolic diseases such as Type 2 diabetes, heart disease and chronic kidney disease among Americans.

Curcumin, a pure chemical found in the Asian spice turmeric, has been reported to have anti-inflammatory and antioxidant properties, but the mechanisms underlying its observed effects have not been well understood.

In a study published today in the journal *PLOS ONE*, researchers examined the effect of curcumin on intestinal barrier function at the molecular level and in an animal model. They report that a Western diet directly affects the intestinal barrier function and oral curcumin reduced this effect of Western diet on the intestinal barrier function.

"Our study for the first time shows that curcumin does not need to be absorbed to bring about its effects since it had profound effects on the intestinal wall and can effectively reduce inflammation by this mechanism … and thereby attenuate the development of diabetes and atherosclerosis," said principal investigator Shobha Ghosh, Ph.D., professor of medicine and physiology in the VCU School of Medicine.

According to Ghosh, consuming a Western diet changes the gut bacterial composition leading to an increase in harmful bacteria in the intestines. Previous studies have cited diet-induced changes on gut microbiome.

"However, our results show that a Western diet affects the intestinal barrier at several levels," Ghosh said. "It decreases the activity of a key enzyme—Intestinal Alkaline Phosphatase— involved in LPS detoxification, which is the luminal component of intestinal barrier. Western diet also decreases the expression of tight junction proteins that are required to restrict the movement of molecules such as LPS across the intestinal wall."

"Collectively, these direct effects of Western diet on the intestinal wall itself results in the movement of bacteria-derived toxin (LPS) into the circulation where it contributes to the low-grade chronic inflammation," she said.

Ghosh added that once in circulation, the bacteria-derived toxin such as LPS can activate key cells involved with metabolic diseases. If activated, those key cells infiltrate the adipose tissue and can lead to glucose intolerance, or they enter the artery wall where they form plaques, resulting in heart disease.

"If we can restrict the release of LPS from the intestine by protecting/restoring the intestinal barrier function, as we did by using curcumin, then we can reduce the development of these diseases."

In the study, the team used two approaches. The first was non-absorbable antibiotics that would decrease the intestinal bacteria to show that bacteria-derived products are responsible for low-grade inflammation and by reducing the bacteria they can reduce this to a low-grade inflammation. The second was oral curcumin, which is very mildly antibacterial but is not absorbed, and yet has very profound anti-

inflammatory effects.

Ghosh's team plans to conduct pilot clinical studies to further develop curcumin as a therapy for metabolic or diet-induced diseases.

More information: Ghosh SS, Bie J, Wang J, Ghosh S (2014) "Oral Supplementation with Non-Absorbable Antibiotics or Curcumin Attenuates Western Diet-Induced Atherosclerosis and Glucose Intolerance in LDLR−/− Mice – Role of Intestinal Permeability and Macrophage Activation." *PLoS ONE* 9(9): e108577. DOI: 10.1371/journal.pone.0108577

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