MedicalXpress

Food scientists find cranberries may aid the gut microbiome

July 10 2017

Many scientists are paying new attention to prebiotics, that is, molecules we eat but cannot digest, because some may promote the growth and health of beneficial microorganisms in our intestines, says nutritional microbiologist David Sela at the University of Massachusetts Amherst. In a new study, he and colleagues report the first evidence that certain beneficial gut bacteria are able to grow when fed a carbohydrate found in cranberries and further, that they exhibit a special nontypical metabolism.

Findings could add value to future food products or lead to a new supplement based on the cranberry, of which Massachusetts is a major producer. Details appear this week in the current early online edition of *Applied and Environmental Microbiology*, where the editors feature it in the "Spotlight" section that calls attention to "research articles in the upcoming issue that have been deemed of significant interest."

What we eat not only nourishes us but also feeds the beneficial bacteria, the microbiome, in our intestines, Sela points out, and food scientists are increasingly interested in these less obvious benefits of food. There are thought to be as many bacterial cells in our bodies as our own human cells, he points out, "so we're basically eating for two. These gut bacteria are extremely significant to us, they really are very important. Our food makes a difference for us as well as the beneficial microbes that we carry around with us."

Further, "a lot of plant cell walls are indigestible," he explains, "and

indeed we cannot digest the special sugars found in cranberry cell walls called xyloglucans. But when we eat cranberries, the xyloglucans make their way into our intestines where beneficial bacteria can break them down into useful molecules and compounds."

Using the model beneficial bacterium bifidobacteria, Sela, an expert in the human gut microbiome, and colleagues tested the hypothesis that cranberries, a research topic at UMass Amherst for more than 60 years, might be a candidate for a new supplement to boost gut health. To obtain a supply of purified xyloglucan for these experiments, not an easy task, he enlisted help from Ocean Spray, Inc., who provided the original research material, and collaborating experts David Rowley and Jiadong Sun at the University of Rhode Island (URI).

Sela and his Ph.D. student and first author Ezgi Özcan could then feed this purified plant sugar as the only carbohydrate available to the bifidobacteria living in 96-well plates in an anaerobic environment in the laboratory.

Bifidobacteria are found in adults to some degree but the highest concentrations are found in the gut microbiome of newborn, breast-fed babies, Sela says. This study provides the first evidence that certain bifidobacteria do consume xyloglucans, and the ones that do exhibit a special metabolism that is not typical. Specifically, these bifidobacteria produce formic acid while consuming xyloglucans and less lactic acid than is typically secreted.

It is not clear yet what the impacts to health are, but the authors suspect this unusual production has implications for the rest of the microbial community in the gut. "This is not traditional food science," says Sela, a food scientist who has adjunct appointments in microbiology at UMass Amherst and in microbiology and physiological systems at UMass Medical School. The work was supported by a $64,000 grant from

Ocean Spray, Inc. to Sela and $25,000 from the President's Enhancement Fund at the Graduate School of the University of Massachusetts Amherst.

Sela believes that there is stronger motivation for both researchers and consumers in studying prebiotics than probiotics. "With probiotics, we are taking extra doses of beneficial bacteria that may or may not help our gut health," he explains. "But with prebiotics, we already know that we have the beneficial guys in our guts, so let's feed them! Let's give them more nutrients and things that they like."

"They make molecules and compounds that help us, or they make it to help some of the hundreds of other kinds of beneficial members of the community. They are consuming things we can't digest, or they are helping other beneficial microbes that we find it hard to introduce as probiotics, or their presence can help keep pathogens away," he adds.

"Prebiotics and probiotics might interact with our own physiology to help balance the microbiome, and we already know that when things are not in balance you can get problems like inflammation. Underlying chronic inflammation can lead to or worsen many different medical conditions. That's the health side of this kind of study of microbiology, food and health."

He suggests that their next series of studies might look at the interaction of cranberry xyloglucans with other bacterial species and strains. Sela is also interested in other cranberry molecules interacting with bifidobacteria and other members of the gut microbiome. "We also found certain genes turned on that are consistent with xyloglucan metabolism," Sela notes. "This is another good place to pursue our findings further."

Provided by University of Massachusetts Amherst