

Scientists discover more about the battle in your belly

There's a complex ecosystem deep inside your gut, home to trillions of bacteria armed with the power to help – or harm – you.

By **ALLIE SHAH** Star Tribune | JULY 30, 2014 – 2:26PM

Kathleen Pender knew her gut was trying to tell her something. She just wasn't sure what it was.

The 23-year-old Minneapolis woman had recently returned from a stay in Ghana, where she took antibiotics to treat a bout of food poisoning. Back in Minnesota, she soon developed severe, chronic diarrhea and abdominal pain.

A gut analysis performed by her doctor revealed the source of her problem: She was very low on “good bacteria.”

Trillions of microscopic bacteria live inside our intestinal tract, forming an elaborate network now believed to play a major role in combating disease, affecting metabolism and weight and even regulating mood.

The bacteria swimming around in our stomachs have the power to help or harm us, depending on how we treat them, explained Dr. Greg Plotnikoff, a physician at the Penny George Institute for Health and Healing in Minneapolis and author of “Trust Your Gut,” a book about how to deal with digestive problems.

“The gut is much more of a garden than a gutter,” he said. “Our mission is to be good gardeners.”

But scientists have only begun to understand the complicated ecosystem in our stomachs. Like the human genome and the brain before it, new technology is allowing medical experts to look inside our guts like never before. The National Institutes of Health funded a \$173 million project in 2008 to map the “human microbiome.”

The Human Genome Project was complicated — after a decade of work, scientists were able to identify all the genes present in humans. But the microbes in our intestines are much more complex. These tiny organisms have 100 times more genes than we do.

“They are an integral part of our body,” said Dr. Alexander Khoruts, a gastroenterologist at the University of Minnesota. “They do all kinds of things in physiology and we're just starting to understand this.”

Friends with benefits

Our bodies are covered — inside and out — with bacteria.

Some bacteria are out to hurt us, causing infections. Good bacteria, however, serve as bouncers that keep the bad ones in check.

For the most part, gut bacteria have a mutually beneficial relationship with their human hosts, explained Khoruts. “We give them a home and they, in turn, help digest foods.”

The foods we eat are broken down by enzymes produced by the bacteria. But many doctors say the kinds of food we eat can promote or stifle a diverse bacteria ecosystem in our guts.

For example, refined sugars are digested quickly in the small intestine and never reach the lower intestine, so the bacteria living there do not get fed.



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“When the food industry processes foods for us, and predigests it for us and infuses it with simple metabolites like fructose and sugar, there’s nothing left for bacteria to do,” Khoruts said. “It’s all absorbed early on in the intestinal tract.”

Starved, the bacteria then either die or turn hostile, upsetting the balance of good and bad microbes. Doctors think that imbalance can leave us vulnerable to certain diseases.

Complex carbohydrates such as leafy vegetables and whole grains do not break down easily without help from bacteria in the lower gut. By consuming certain foods, we can help maintain a rich gut bacteria ecosystem, Plotnikoff said.

Studies have found that some 70 percent of our immune system is tied to the bacteria in our gut. The composition of gut bacteria in the body has been linked to cancer, depression, rheumatoid arthritis and even autism, although doctors caution that the research is preliminary and more studies are needed.

“We are coming to terms with the fact that gut bacteria form an additional, really important factor when we think about how people get disease and how treatment affects them,” said Dr. Purna Kashyap, associate program director of the Mayo Clinic’s Microbiome Program.

Before, Khoruts said, our view of microbes was defined only in terms of which ones caused infectious diseases. Scientists such as Louis Pasteur were able to nail down specific micro-organisms linked to disease.

“From then on, medicine [has] only looked at microbes as something that can cause disease. Pure evil,” Khoruts said.

With the first phase of the government’s Human Microbiome Project complete, scientists are gaining a better understanding of what some call our “hidden organ.” Improved technology has made it possible to study the deeper connection between good bacteria and our health. The food we eat, to a large extent, dictates what bacteria are present in our stomachs.

“We’ve always known that there are bacteria in our gut,” Kashyap said. “But there were two problems: One, we didn’t actually have the capability to study them. Two, we never realized how much they could actually be contributing to disease.”

Probiotics debate

The quest for better health has led many to the drugstore for probiotics. Essentially, probiotics are live “good” bacteria that people ingest in a capsule or liquid.

“You’re hoping that by giving a bacteria to an individual, that bacteria can make a home in the gut and benefit the host,” Kashyap explained.

While it sounds good, he questions its effectiveness for treating or preventing gut-related problems.

“Think of this: How well does a new kid who joins a high school of 200 other kids do? [He’s] totally out of place. Some make it, and some don’t. It’s that kind of an environment,” he said.

Khoruts, too, said he is skeptical about the growing multibillion-dollar probiotics industry.

“With probiotics the way they are now, you don’t have to prove that they help any disease. Nobody knows what it means to ‘benefit health,’” he said, referring to the message that typically appears on product labels. “It’s a pretty massive industry altogether. They’ve got a good story that sounds believable and it drives itself.”

Karen Maney, for one, is a true believer in the healing power of gut bacteria. The 56-year-old says it has helped manage her multiple sclerosis.

Having read about possible connections between gut bacteria and M.S., she went to Plotnikoff, who performed a gut analysis. The lab report showed that she had a high amount of candida yeast in her gut.

“It did prove that my gut was just a mess,” she said.

She cut out dairy, sugar, wheat, gluten and alcohol from her diet. Those changes have left her feeling energized. Fatigue, a common M.S. symptom, was gone, she said.

Before her diagnosis, she said, “I hadn’t given thought to my digestive system at all. I don’t think I’d even heard about gut bacteria.”

Some doctors are slow to make direct connections between bacteria and certain diseases. But Kashyap said the science is only getting stronger. He and his colleagues are now able to characterize what the bacteria in diseased people look like and they know what kind of bacteria are seen in different disease states.

“The next step along the journey is trying to link the two: How do bacteria cause disease?” Kashyap said. “This is an area where we’re just starting to scratch the surface.”

For now, elimination diets seem to be working for people like Pender, who cut out corn, gluten and other foods disturbing her digestive ecosystem. Today, her abdominal pain is gone and she has learned to listen to her gut. She’s noticed that it is sensitive to changes she makes in her diet and will always let her know about it.

“My gut has something to say every day,” she said.