What Your Microbiome Really Needs Is Fiber, Not Kombucha

Some microbes reside permanently in our guts. Others are just passing through.

by Katherine Harmon Courage for Health/Medium
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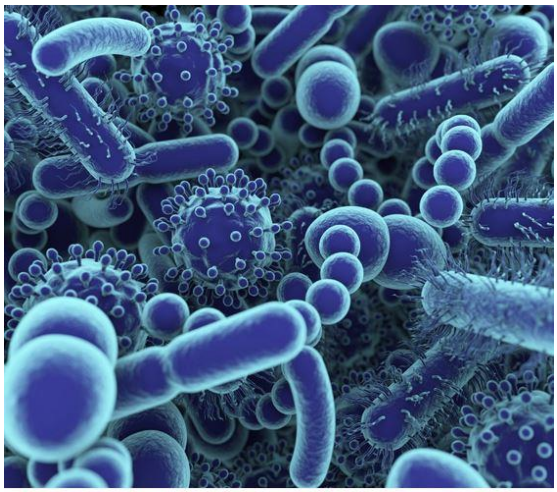

In recent years, we've begun to learn that most everything we eat — from probiotic yogurt to a serving of asparagus to a fatty pork chop — has an effect on the microbes that live in our bodies, which, in turn, have an effect on us. And rapidly. What you eat for one meal can change your microbiome composition within 24 hours. Not only that, but it is also becoming clear that these microbes, in turn, play a key role in translating our diet to health outcomes — good and bad. But in many cases, our focus on which foods to eat to benefit the microbiome has been misplaced.

When it comes to our biomes, we can break microbes into two key categories: those that live permanently in the human gut and those that are just passing through. It is simplistic and not exactly how the microbes would see it, but it is a key distinction that is too often left out of conversations about our gut microbiota — especially as it relates to food. And it is one that leads to a lot of confusion about just what we should do with all the new information we're gleaning about our important inhabitants.

This difference is usually glossed over or omitted entirely amid the surging enthusiasm for live fermented probiotic foods, which are those that contain strains of bacteria or fungi that have been shown to have a beneficial effect on health. Instead, we get distracted by the most inventive new kombucha flavor, the best kale kimchi, or the most local goat milk kefir. And who can blame us? These are interesting, live, effervescent cultured foods. But the microbes in our probiotic foods don't actually take up residence in our guts. They can be valuable for health, but they are not, generally speaking, replenishing an anemic microbiome.

By focusing solely on these trendy products, we are neglecting the upkeep of our full-time microbes. And what our native microbes need is fiber. Complex, rustic, now-elusive fiber.

The microbes that reside more permanently in our guts, day in and day out, did not come from yogurt or kimchi. They are our native microbes. These microbes are acquired at birth, throughout infancy, and in early childhood — with a few picked up here and there later in life.

These gut microbes are essential to our health and survival. They help train our immune system. They are in constant conversation with our nervous system. And they help keep the delicate balance of our guts. "These microbes evolve to their environment," says Justin Sonnenburg, a microbiologist and immunologist at Stanford University. And we may have evolved to them. "We don't just have a random collection of microbes that we pick up," Sonnenburg notes. "We're passing microbes to each other and through generations." Through millennia of adaptive evolution, these humble intestinal microbes have come to be some of our best allies.

Who are these unseen friends? Our guts are usually dominated by bacteria from the Bacteroidetes and Firmicutes phyla, which together make up about 80 percent of our microbes (though there are at least 10 other phyla that make appearances). These groups of microbes are not exclusive to the human gut, but some species of them can live *only* there. Our guts are their planet Earth.

Within the gut, these populations are dynamic. Most individual microbes have very short lives. So you will wake up with entirely new generations of them each morning. Some, such as members of the genus *Lactobacilli*, cycle through their whole lives in as little as 25 minutes. Others even more rapidly. So, while you were dreaming about that talking corn dog last night, your gut populations of *Lactobacilli* could already be 20 generations beyond those you fell asleep with. That's the relative time scale between you and your ancestors who lived in the 1500s.

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A lot of changes can happen in those generations of microbes, especially if something in the environment shifts, such as an increase in pH (a drop in acidity), an introduction of a new food, a lack of the microbes' preferred fiber, or an atomic bomb of antibiotics.

Generally speaking, the gut isn't a naturally friendly place to microbes. Our digestive tract is a hostile environment by design. An acidic stomach helps break down food for easier digestion, but it also disarms many of the foreign organisms — from viruses to bacteria — that we come across every day. Additionally, the gut is, ideally, a crowded microbial metropolis, and most outsiders just can't cut it. As fermentation guru Sandor Katz puts it, the intestine "is a competitive environment. The bacteria that are there don't just move over and say, 'Oh yeah! Come on! Welcome, neighbor!'" It's a microbe-eat-microbe world in there. All of this is a good thing for us. Only rarely does a

microbe — harmful or otherwise — actually manage to endure digestion and multiply in our system.

There are, however, some microbes that can survive the harsh journey. A handful of these cause illness, such as certain strains of *Escherichia coli*. Most are probably nominally neutral, and a small fraction are actually beneficial. Good, bad, or innocuous, however, none of these microbes is truly in our guts to stay.

I do hate to burst your highly cultured bubble, but with a spoonful (or crate-full) of yogurt, you have not actually reestablished your native gut bacteria, restoring you to peak ancestral intestinal health, no matter what the marketing will have you believe — and no matter how many live and active bacteria or strains are included. These microbes are perfectly happy biding their time in an aqueous world of lactose-filled yogurt. And they can, astoundingly, persevere through the acid-filled digestion process. But they are just not as well suited to long-term life in the human intestine.

What is the best way to feed our microbes? In one word: fiber. We have long known that fiber is good for us. It helps reduce caloric intake and maintain regularity. But it is also perhaps the most powerful tool we have to help our native microbes. It is their bread and butter, so to speak.

Fiber is made up of long chains of carbohydrates. Because these carbohydrates are connected by complicated bonds, these molecules are difficult — and sometimes impossible — for us to digest. We humans simply don't have the enzymes necessary to break down many types of fiber. And that means these compounds end up, intact, down in the lower intestine, where helpful microbes can feast on these cast-offs. When these compounds encourage the growth and health of beneficial microbes, they are known as prebiotic.

In recent years and decades, we haven't been very good at providing this expected fodder to our native microbes. And without fiber to nourish them, their populations take a dive, leaving us without their many benefits.

The average American now consumes about 15 grams of fiber per day, roughly half of what the U.S. government recommends. Those 30 or so recommended grams of fiber are likely about a third (or less) of what a more traditional diet might offer. Even the high end of this range is a fraction of what our ancestors probably ate every day. All of that means we're eating just 10 to 15 percent of what our microbes would have expected. And they seem to be feeling the deficiency — as are we.

For example, one archaeological study of cave sites in the Chihuahuan Desert inhabited by humans for some 10,000 years found evidence of "intensive utilization" of local plants high in prebiotic fibers. Clues gathered from cooking materials, human skeletons, and coprolites (fossilized excrement) suggest that the inhabitants were eating some 135 grams of a specific type of microbe-feeding fiber (inulin) each day. The ancient desert dwellers might have been an exceptional case, but we know that through history, as a rule, humans had much more fibrous meals. Study after study points to the diversity of Paleolithic diets. An investigation of a 23,000-year-old site in Israel uncovered that the local cuisine included more than 142 different species of plants (including seeds, nuts, fruits, and cereals). Although the work didn't specifically investigate the fiber content of the residents' diet, the impressive diversity of plants at the site suggests meals rich in fiber — and many different forms of it at that.

When we do eat food that contains prebiotic fibers, gut microbes in turn repay us by making compounds that can help quell inflammation or defend us against infection. These compounds, known as metabolites, are microbial byproducts, expelled during microbes' metabolic process of digesting food that comes their way. Fortunately, these byproducts just happen to be beneficial for us.

Beyond these health links, early studies in animals show another reason to feed microbes the foods they need: protection from food allergies. Our large intestine has just a thin barrier separating its contents from the rest of our bodies. When our resident microbes go hungry for too long, they start to eat through the better part of that barrier, opening up holes for all kinds of material to escape into the bloodstream, a condition known, unappealingly, as leaky gut. The body will spot this material as foreign and send the immune system into attack mode. This is certainly good if the escaped material is a harmful microbe, but if it is, say, a food particle, it could trigger or exacerbate food allergies.

Adding in more prebiotic food also means, simply, more helpful microbes. Some research has suggested that for every 10 grams of prebiotic carbohydrates that reach the gut microbiota, about three grams of additional bacteria blossom into life. That's roughly 3 trillion new organisms for just adding those 10 grams of microbe fodder each day. Not a bad tradeoff for eating some extra whole grains — and cold potato salad.

So, when it comes to prebiotics, instead of "build it and they will come," think "eat it and they will multiply" — and possibly even help protect you from a myriad of increasingly common health concerns. All it takes is paying a little more attention to what you're feeding your microbes.

Katherine Harmon Courage, Science writer + editor. Author of CULTURED and OCTOPUS! (available on Amazon) . General nerd. www.katherinecourage.com