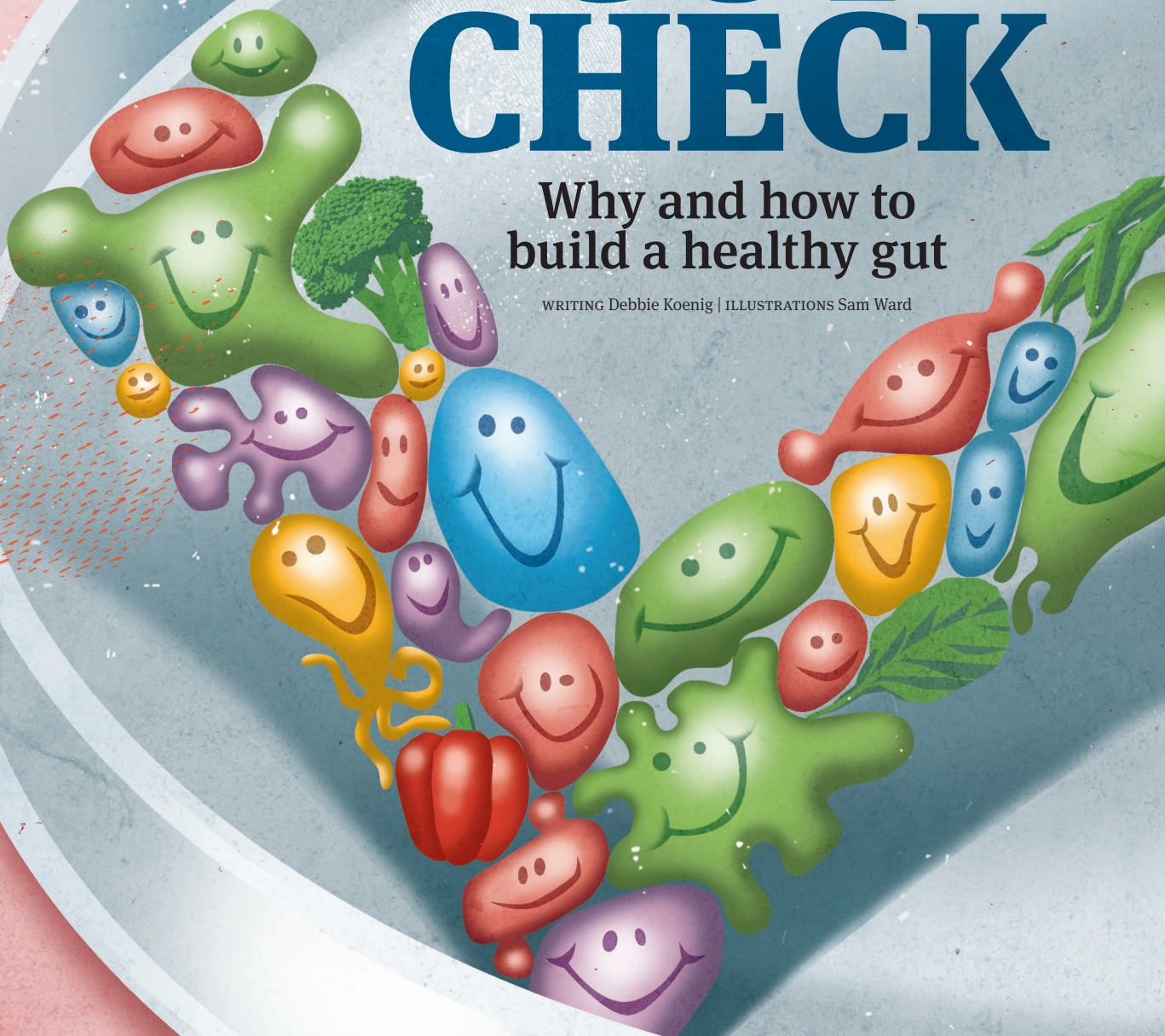


GUT CHECK

Why and how to
build a healthy gut

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Research suggests that when it comes to diabetes, two types of bacteria that live in your gut play key roles. Scientists are looking for ways to use this information to treat or even prevent diabetes.

Even when you're sitting alone in a room, you're completely outnumbered.

Inside your body is a microbiome of living organisms—trillions of them—that help you fight disease, process nutrients, and sometimes make you sick.

These little critters live all over your body, but the largest microscopic world is in your gut. Researchers are working feverishly on new discoveries that may uncover the secrets of the gut microbiome, which offer promising new treatments for diabetes.

What makes a healthy gut?

We're all born with a clean slate, gutwise, and start acquiring microbes at birth.

Everyone's belly contains a unique combination of organisms, carrying a few hundred out of the roughly 1,000 known to exist.

That variation makes it tough to define a healthy gut, says Robert Karp, Ph.D., program director for genomic and microbiome studies in the Division of Digestive Diseases and Nutrition at the NIH's NIDDK. "There isn't just one healthy version," Karp says, "and there are many different ways to get there."

But research points to diversity as a crucial component of good health. "The general idea is that a diseased microbiome is relatively depleted," Karp says. "It doesn't have as great a variety of



microbes as a healthy microbiome does.”

One danger to your gut seems certain: antibiotics. They appear to change your gut’s composition, and some people never recover from that—scientists can’t yet predict who will be permanently affected. “Don’t use them unless you absolutely have to,” Karp says. (See “Action Steps,” page 51.)

The gut-brain connection

Research suggests that variety matters because these belly bacteria perform so many functions, which they coordinate with the brain.

“They process the things we have in our bodies, then send signals back to us,” says Betül Hatipoğlu, M.D., an endocrinologist at the Cleveland Clinic.

As the gut microbiome changes—due to diet, antibiotics use, even sleep disturbances—so do those signals. “When we start growing more of the bad bacteria for whatever reason, they work against us,” Hatipoğlu says. “They produce chemicals that go to our liver and then to our blood, causing changes in our system. They make us more insulin-resistant, encourage inflammation, and even cause our blood sugar to go up.”

Your gut and diabetes

Along with the insulin connection, your gut is related to diabetes in other ways.

When it comes to obesity and type 2, research strongly suggests that two groups of bacteria play the largest roles: Bacteroidetes and Firmicutes. Though

not all studies agree, multiple studies comparing the gut flora of lean and obese people found a higher proportion of Bacteroidetes in lean participants.

“The **Bacteroidetes group are involved in protein and carbohydrate digestion**,” Hatipoğlu says. “**Firmicutes are involved more in fat processing**. People who had more of the Firmicutes seem to have an increased risk of obesity and type 2 diabetes.”

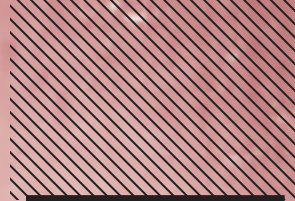
Today scientists are examining the roles those two bacteria groups play to determine whether it’s the amount of each that matters most or the ratio. They’re also looking for ways to use these new discoveries to treat or even prevent all types of diabetes.

Some doctors are exploring customized dietary plans based on each person’s unique gut microbiome. Others are examining the potential for treatments using fecal transplants from nondiabetic donors. (Yes, we mean poop—that’s where your gut bacteria ends up eventually, so transplanting it is a relatively straightforward process.)

Because the science is still so new here, our experts recommend caution before jumping on any fast-fix bandwagons.

“We’re just on the cusp of understanding this,” says David A. Johnson, M.D., professor of medicine at Eastern Virginia Medical School and editor of the textbook *The Gut Microbiome*.

“We’re just starting to get into the evidence that meaningful differences can come from simple things—maybe just from changing your diet.”



TINY MICROBES, BIG NAMES— AND BIG QUESTIONS

Research suggests that when it comes to diabetes, two types of bacteria matter more than most: Bacteroidetes and Firmicutes.

◆ **We know:** Multiple studies have shown that the proportion of these two groups is different in people with diabetes and obese people compared with healthy people.

◆ **We don't know:** Those studies haven't reached consensus on how or why those bacteria matter. The bacteria groups each contain numerous strains, and scientists haven't yet drilled down far enough to distinguish among them. At this point, they can't tell which specific strains to focus on. "It's like looking at a fuzzy picture," Karp says. "We can't exactly tell what's going on."

ACTION STEPS

So what can you do today to improve your gut microbiome?

While scientists don't know exactly which bacteria—or how much of each—our bodies need, our experts agree that certain behaviors can throw off the balance in our bellies.

"It's like buying a plant," Hatipoglu says. "If you don't give it sun and water, it's going to die. You have to give the right environment to those good bacteria so they'll keep growing and help you."

To give those bacteria what they need:

◆ **Eat more fiber.** Bacteroidetes, which several studies have found to be the "good guys," thrive on a plant-heavy diet.

◆ **Try kimchi.** Scientists don't know exactly why yet, but fermented foods act like a natural probiotic in our bellies, supporting the growth of healthy bacteria. Naturally fermented foods include kefir, yogurt with live and active cultures, kimchi, kombucha, and homemade sauerkraut and pickles (store-bought are sterilized and lose the probiotic effect).

◆ **Get more sleep.** Studies in mice and humans have shown that a disruption in your circadian rhythm (such as from insomnia or jet lag) can affect the mix of bacteria in your gut.

◆ **Skip probiotic supplements.**

"When you take these, you're changing whatever your basic bacteria is—you're preselecting an organism that maybe didn't have as strong a presence before," Johnson says. "We don't know yet which probiotic for which patient."

◆ **Be sure about antibiotics.** Avoid using them unless your doctor thinks you won't recover without them.

"Regardless of which antibiotic you take, it's changing out some bacteria," Johnson says. "These are major, profound changes that may not be good—and they're certainly long-lasting."

If you need antibiotics, support your belly with a diet rich in fiber.

