

Good Bacteria Welcome

By Catherine Guthrie

Find out why some internal bacteria are our pals — and why providing a happy, well-balanced home for them is essential to our vitality and well-being.

Ever get the feeling you're not alone? Maybe it's because you're not. Your body is a walking repository for microorganisms, and their cells outnumber yours 10 to 1. Some of us have herds of mites grazing on our eyebrows. Others have fungi meandering between our toes. No one is immune. Everyone's skin swarms with an invisible smorgasbord of bacteria, and the mouth is a microbial wonderland. But it's the 500 or so species of bacteria residing in our gastrointestinal (GI) tracts that really make us tick.

Yep, bacteria, such as those from the genera *Bifido-bacterium* and *Lactobacillus*, account for a large majority of the 100 trillion creepy crawlies that call your body home (random parasites, yeast and fungi make up a much smaller portion; see "Little Bugs, Big Trouble" in the May 2007 archives). They flourish in the dark, dank folds of the GI tract.

Good bacteria spend their days destroying their harmful cousins, picking through undigested leftovers and micromanaging calories. When stress, medications or a poor diet — among other factors — decimate their numbers, bad bacteria rush in to fill the void. And when bad bacteria prevail, illness strikes. A short-term imbalance can lead to diarrhea, bloating and gas. Over the long haul, the disparity may possibly contribute to inflammatory bowel disease and irritable bowel syndrome.

To balance the scales, healthcare practitioners are turning to probiotics, infusions of good bacteria from yogurt, kefir, miso, tempeh and other foods, or via supplements. (See "Putting Probiotics on Your Side.") But just as planting seedlings won't rejuvenate a deforested landscape overnight, probiotics aren't a quick fix for a lifestyle that denudes the gut. Here's what you need to know to keep your little buggers happy and healthy.

Gut Ecology 101

The relationship between the gut and well-behaved bacteria is mutually beneficial. Because the gut is porous (it needs to be to absorb nutrients from food), it's vulnerable to invasion. Over a person's lifetime, the GI tract handles roughly 60 tons of food. While food brings needed nourishment, it can also be a

Trojan horse for disease. That was the case late last summer when an *E. coli* outbreak traced to spinach fields in California sickened 199 people and caused three deaths.

Acting as microscopic bouncers for the bowels, good bacteria wave in desirable nutrients and slam the door on ? some viruses and killer bugs. They do this with some help from the mucosal barrier, which coats every inch of the gut's 1,000-square-foot surface to form a slippery, protective layer. But even so, it's a job that requires mind-boggling numbers.

One hundred *trillion* bacteria cram inside the average Joe. Scoop them up and they would weigh 2 to 3 pounds. Linked end-to-end, they would circle the globe two and a half times. Without them, you couldn't digest any food. But digestion is only part of what these multitaskers accomplish. Thanks to their residence in the almighty intestines, they also help power 60 percent of the body's immune system.

So when it comes to getting and staying healthy, balancing our intestinal microflora should be a top priority. The good news is, we've got a well-established and synergetic partnership going. The oldest microorganisms on Earth, bacteria have carved an elaborate evolutionary niche for themselves inside our bodies. What's important to remember is that we need them every bit as much as they need us.

"The bottom line is we would be dead without them," says Gregor Reid, PhD, a professor of microbiology, immunology and surgery at the University of Western Ontario in Canada and president of the International Scientific Association for Probiotics and Prebiotics. (Prebiotics are nutrients that help probiotics and other beneficial bacteria to multiply.) Then again, he notes, "bacteria are benefiting from the relationship, too; otherwise they wouldn't have let us get this far." Several of the bacteria residing in the gut could easily kill us, he explains — but then who would feed them?

He's got a point. Although bacteria inhabit all of the 30-odd feet of your gastrointestinal plumbing, they cluster in the dining hall that is your colon. There, they spend their days awash in waste — the bacterial equivalent of manna from heaven.

A meal may linger in the colon for more than two days before being jettisoned. (Poop, by the way, is roughly 60 percent bacteria.) Meanwhile, like happy vultures clambering to a carcass, bacteria see what nutrient castoffs they can claim. They break down otherwise indigestible plant fibers, forage for carbohydrates and salvage calories.

"A healthy body will recycle every single molecule it can from the bowel," says Georgianna Donadio, PhD, nutritionist and founder of the National Institute of

Whole Health, a Wellesley, Mass.–based school that provides professional, continuing education to healthcare providers. “Essentially the gut is a huge metabolic furnace.”

Of course, for that furnace to operate efficiently, all of its parts must be present and in working order. Ideally, they come custom-delivered right when we are — at birth.

Babies descend from the germ-free womb into a virtual bubble bath of bacteria. It starts with the birth canal, where mothers bequeath a starter-kit of good, colonizing bacteria to their newborns. More bacteria make their way into baby intestines via people they touch, toys they mouth and, of course, breastfeeding. (Babies born via cesarean section or fed formula imbibe a different bacterial brew. Whether or not this puts them at a health disadvantage is a subject of much debate.) Regardless of where your bacterial birthday presents originate, the first that stake a claim on your gut are yours for life.

Silent Enemies

’Til death do you part? Yes and no. Outside forces also hold sway over gut ecology. Antibiotics can pose a major threat to our microbial balance, because they destroy all kinds of bacteria indiscriminately. Once the good bacteria are pushed aside, there’s an opportunity for bad bacteria to move in and start colonizing.

How widespread the resulting damage might be depends on the antibiotic drug’s strength, formulation, absorbability and how long you take it. Recent studies show that just one round of antibiotics can suppress beneficial bacteria for up to 16 months.

“Antibiotics can decimate life as we know it in the gut,” says Patricia Raymond, MD, gastroenterologist and assistant professor of clinical internal medicine at Eastern Virginia Medical School in Norfolk. “It’s like setting off an atomic bomb in the intestines.”

Still, under some circumstances, antibiotics are essential to fending off a dangerous or even life-threatening infection. If you do need to take antibiotics, the key is to use them wisely, carefully following your doctor’s dosing instructions, and then to follow up with good-bacteria-rebuilding strategies (see “7 Steps,” below) that help keep opportunistic bad bacteria from taking over.

Keep in mind, too, that antibiotics aren’t the only threat to your good bacteria’s quality of life. Take your stress level, for example. Stress can damage the gut’s flora in a couple of ways. For starters, stress slows the body’s ability to heal tiny fissures in the intestinal lining. Bacteria sneak through the openings and nestle inside the gut’s walls where they cause inflammation.

Second, stress can speed up or slow down the contractions in the small intestine, affecting the rate food moves through your system. To study the effect of stress on beneficial bacteria, scientists looked at the GI tracts of stressed-out college students, as well as angry and fearful people. Across the board, stress threw open the door to disease-causing thugs. “The more stressed you are, the more suppressed your immune system gets, which gives bad bacteria an opportunity to proliferate,” says Donadio. “It’s a vicious cycle.”

OK, so you shun antibiotics, chill out regularly, but still feel bloated, constipated and gassy? Take a good, hard look inside your refrigerator. Everything you eat either feeds the good guys or nourishes the bad. For gut health, experts preach the importance of whole foods.

“A healthy bowel is designed for the high-water, high-fiber and high-nutrient-content foods found in the plant world,” says Donadio. “You need to be mindful of the amount of meat and saturated fat you eat.”

Diets high in animal protein, processed foods and simple sugars can raise the numbers of potentially harmful bacteria. “The problem is that the human digestive system hasn’t changed in thousands of years, but our diet has shifted dramatically,” says Reid.

Our ancestors filled up on plants and roots, all brimming with good bacteria, but the modern American’s diet overflows with sugar, salt and fat. In the struggle to break down these substances, the gut produces toxic byproducts that can make us sick.

Bacteria Gone Awry

Regardless of where the imbalance originates — a pill bottle, the office or the kitchen — one thing is undisputed: An unhealthy gut spells trouble for the body. The deeper researchers delve into the inner workings of the gut’s ecology, the more parallels they find between bacterial imbalance and gastrointestinal disease.

Some of the best proof tying bacterial malfunction to GI distress focuses on inflammatory bowel disease (IBD). An umbrella term covering both Crohn’s disease and ulcerative colitis, IBD is an autoimmune disease that triggers inflammation in the gut’s lining and afflicts more than a million Americans. Symptoms of IBD include abdominal pain and cramping, diarrhea, bleeding, weight loss, and anemia. With much of IBD a mystery, treatments have focused on managing symptoms. But recent studies point to a disruption in the gut’s flora as a possible cause. The news has doctors reaching for probiotics. “For IBD, the drugs are good, but the drugs plus probiotics are much better,” says Raymond. “The results are startling.”

Solid science also backs probiotics in the treatment of diarrhea and irritable bowel syndrome, and probiotics' benefits may ripple well beyond the bowel. Researchers are trying probiotics to treat eczema and rheumatoid arthritis, and to prevent vaginal and urinary tract infections.

“There isn't a drug on the market that can match bacteria for its far-reaching implications on health,” says Reid, who predicts people will eventually swallow probiotics custom-made to meet their body's needs.

Indeed, bacteria may be recruited to help solve one of America's most serious epidemics — obesity.

In an article published last December in *Nature*, scientists at Washington University in St. Louis's School of Medicine found big differences between the collections of gut bacteria in heavy people and their lithe peers. The roles of heredity, diet and exercise notwithstanding, researchers suspect some people's bacteria are simply better at helping them stash away calories.

“Differences in our gut microbial ecology may determine how many calories we are able to extract and absorb from our diet and deposit in our fat cells,” says Jeffrey Gordon, MD, the study's lead author and the director of the University's Center for Genome Sciences. “Even if the differences aren't great, over the course of a year or more, the effects could add up.”

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Putting Probiotics on Your Side

Probiotics aren't a surefire cure-all for a troubled gut, but they do deliver salubrious bugs right where you need them and can therefore be a step in the right direction.

If you're otherwise healthy, save your money and stick to probiotic-laden foods, like a yogurt with live cultures, says Patricia Raymond, MD, a gastroenterologist and assistant professor of clinical internal medicine at Eastern Virginia Medical School in Norfolk.

A daily probiotic is often a good idea for chronic gastric complaints, such as diarrhea, inflammatory bowel disease and irritable bowel syndrome. It's also a worthy addition if you're on an antibiotic or have taken antibiotics in the past. (Consider a yeast-based probiotic, since the antibiotic won't affect it.)

If you need a probiotic pick-me-up, be ready to stock up. Although a week or two of probiotics can be a quick fix for an acute problem, like traveler's diarrhea,

those with a chronic illness may need probiotics for the duration. That's because these bacteria don't stay inside us for long. "You can't just take one dose, sit back and say 'that's great,'" says Gregor Reid, PhD, a professor of microbiology, immunology and surgery at the University of Western Ontario in Canada and president of the International Scientific Association for Probiotics and Prebiotics. "Health is a continuum, so you have to take probiotics on a regular basis to retain their benefits."

To boost your flora with probiotics, take one or two capsules daily, which typically amounts to 3 to 5 billion live organisms. Probiotics are living, so they are vulnerable to heat, cold and moisture. Store them in a cool, dry place. (Also take care with probiotics in food. Freezing live-cultured yogurt or boiling miso soup nukes the bugs.) Lastly, Reid recommends buying only products that have been clinically tested. "Too many are not tested," he says, "and just because the contents of one product sound like those of another doesn't mean it will work." In fact, ConsumerLab.com, an independent watchdog group, recently vetted 22 probiotic products and found several that didn't deliver.

7 Steps to Helping Good Bacteria Feel at Home

Maintaining a healthy gut isn't as easy as popping a magic pill. It requires an integrated holistic approach. "If you're going to use probiotics and drink, smoke or eat too much fat, that's not going to cut it," says Georgianna Donadio, PhD. "The entire system must be in sync; the flora is just the tip of the iceberg." To take a big-picture approach to your gut, consider these steps:

- **Eat several small meals** during the day instead of pigging out at dinner. "Cramming in all your food at the end of the day stresses the gut by giving it too much food at once," says Leslie Bonci, a registered dietitian and assistant professor of nutrition at the School of Health and Rehabilitation Sciences at the University of Pittsburgh. And don't forget to drink plenty of water to keep the food moving.
- **Prioritize whole foods.** That means stocking up on fruits, vegetables, nuts and legumes. If the food on your plate looks like food in the wild (e.g., grapes, not grape roll-ups), you're off to a good start. "The best way to restore your gut is to stop assaulting it [with processed food] all the time," says Patricia Raymond, MD.
- **Shoot for at least one** daily serving of a food with probiotic (also called "live") cultures. Try yogurt, kefir (a fermented dairy drink), miso or tempeh. Look for the phrase "contains live cultures" or "active cultures" on the label.
- **Bulk up on fiber.** The more fiber you have in your diet, the more diversity you'll have in your ecosystem. Aim for 25 to 38 grams of fiber a day, says Bonci. "Most people are still shy on their fiber intake."

- **Cut back on sugar.** Diets rich in refined sugars acidify the system and prompt the body to make more bile — and some types of bad bacteria feast on sugar and bile acids. Therefore, too much sugar may tip the bacterial balance toward the dark side. “With all the sugar we throw down these days, it’s no wonder our bacteria colonies are out of whack,” says Bonci.
- **Relax.** In a 1999 study published in the international journal *Gut*, people in gastrointestinal clinics cited severe life stress as a precursor to their gastrointestinal problems. Although the connection isn’t clear, scientists do know that stress upsets the parasympathetic nervous system, which controls the contractions of the intestine, thereby changing the speed at which food moves through you. Stress also affects our biochemistry at many levels.
- **Get seven to eight hours of sleep** every night. Sleep not only regulates hormones in the gut that contribute to feelings of hunger and satiety, it also shores up the immune system. When the body is deprived of sleep, even for one night, the immune system suffers, says Bonci.

Like tending a vegetable patch, maintaining a balanced microflora environment requires daily attention. Need more good reason to give your bacteria the respect they deserve? Consider this: “If a freeze, flood or nuclear explosion destroyed all the humans on Earth, bacteria would survive,” says Gregor Reid, PhD. “They are definitely going to have the last laugh.”