

Who Knew?

MICROBIOLOGY

Growing on You

Our bodies are crawling with microbes

Science is always trying to cut human beings down to size, either by reminding us of how small and ephemeral we are in the grand cosmic mind-jangling scheme of things, or by describing us as essentially no more than the life-support machinery for a gaggle of genes that have their own selfish needs. So here's yet another humbling thought: Most of our cells aren't even human.

If you had to count all the cells in your body, the vast majority—by a factor of ten—would be microbes. They're everywhere. They're on your eyeballs, in your mouth, nose, and ears, and all over your skin. They include microscopic creatures that, magnified, look like horror-movie monsters. These nonhuman organisms are particularly abundant in your guts. There are up to a hundred trillion microorganisms in the human intestine.

"We're really a composite of species. We have human cells, but there are ten times more microbial cells," says Jeffrey Gordon, who researches intestinal microbial communities at Washington University in St. Louis.

It raises an interesting question, Gordon says, about what it means to be "human." Certainly the water molecules in our bodies are not, in and of themselves, human. You might argue that our DNA is human, but that gets into another humbling area, as we have many of the same genes as other animals. Factoring in the microbes, we see that most of the genetic information carried in and around our bodies is nonhuman.

Strangely enough, we don't know the identities of most of these microbes. We haven't figured out how to culture them. Instead, scientists "grow" snippets of DNA, and have come to the conclusion that each one of us hosts somewhere between 500 and 1,000 species of microbes,

representing about 8,000 subspecies. Stanford University microbiologist David Relman says this internal multitude varies so distinctly from person to person that it can serve as a kind of fingerprint of an individual. (Or, as he and other scientists said in a recent paper, "We discovered significant intersubject variability and differences between stool and mucosa community composition.")

What's clear is that the microbes are not a bunch of invaders. Rather, we co-evolved. A human body is like a complex ecosystem—a biosphere, almost. Different species follow their own agendas, but collectively they advance the cause of the whole. Gut microbes perform some indispensable functions: They help us digest food, produce vitamins, and ward off disease. This is, as Gordon puts it, a "strategic alliance," a symbiosis between mammals and microbes that goes back millions of years.

"So can we optimize the performance of our microbial society—learn from the microbes?" wonders Gordon.

What if we discovered that our entire evolution is essentially a side effect of the requirements of the microbes in our guts? Maybe those organisms needed to modify their hosts to be more efficient at finding certain kinds of food for them. If so, it's about time we turned the tables. From now on, by gosh, they work for us.

—Joel Achenbach

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