

Edwin the *E. coli* Explains: What is a Germ?

The following conversation takes place inside the intestine of a healthy human being. It can even be your intestine if you'd like, assuming you're willing to accept that there are talking bacteria in there. Before we begin, let me tell you a little about who these talking bacteria are and where they live.

*Edwin the *E. coli* is a bacterium. Like most bacteria, he is so tiny that you can't normally see him. But if you look under a microscope, you'll notice that he is long and skinny - kind of like a hot dog - and he has many long, wavy "tails" coming out from all over his body. The tails are called flagella, and they snap like whips to help him move around. Unlike most bacteria, Edwin thinks a lot about the world, and he talks.*

*Dr. Dexter *B. fragilis* is another type of bacterium. His body is also hot-dog-shaped, although he's a bit smaller than Edwin. Unlike Edwin, he doesn't have any flagella, but his body is covered in short "hairs." These hairs are called fimbriae, and they help him stick to surfaces. He earned his degree in psychiatry from Colonell University, and he also talks.*

Edwin and Dexter both live inside the large intestine of a human, which is where our food goes when we're almost done digesting it and it's turning into, well, poop. That is where this conversation takes place.

Edwin the *E. coli* glides into the office of Dr. Dexter *B. fragilis* ("Dr. B.," for short) for his weekly psychotherapy appointment. He plops his long, thin body into a small, mucus-lined pocket that serves as a couch, his wavy flagella draped over the side of the couch like wet noodles.

"What's on your mind this week, Edwin?" Dr. B. asks in his usual patient and gentle manner, his small body anchored into the slimy intestinal wall just to the side of Edwin's couch.

"I don't know. I just feel so ... misunderstood," complains Edwin.

"Why do you feel misunderstood?" Dr. B. asks.

"Well, for one thing, people keep mistaking me for a germ," Edwin says.

"A germ?" asks Dr. B.

"Yeah, well you know. People hear the term '*E. coli*,' and they immediately jump

to the conclusion that I'm some sort of nasty germ - like the ones that get into food and make people sick," Edwin complains.

"Why do you think they would do that?" Dr. B. inquires.

"I suppose people may not realize what a germ actually is," replies Edwin.

"So, what is a germ, Edwin?" Dr. B. asks.

"Well, it's hard to describe what a germ is because they come in so many shapes and sizes. Some germs are made of one cell, and some are made of many cells, and some germs, like viruses, aren't even cells at all," Edwin explains excitedly. "And germs can be round like a ball, or long and skinny like a submarine, or even spiral like a corkscrew."

Dr. B. gives Edwin a quizzical look. "What you're describing sounds quite fantastical, Edwin. Are you sure you aren't hallucinating? Perhaps you've been having strange dreams."

"I promise I'm not imagining this, Dr. B.!" Edwin exclaims, his flagella flapping so wildly that they begin to tangle. He composes himself and continues. "I'd better take a step back and put things into perspective. You see, humans are made up of lots and lots of cells - let's say 50 trillion - and these cells come together to make up every part of the human body: the skin, the eyes, the internal organs - even the cells in here that make up the intestine," Edwin says, using his tail-like flagellum to knock on the mucus-covered intestinal wall. "Now, we bacteria are made of just one cell, and it's even simpler and smaller than human cells."

"I suppose we are quite small," Dr. B. remarks, looking down at his tiny, hairy body.

"But here's the thing," Edwin continues. "Viruses, like the ones that cause colds and the flu, are even smaller than us bacteria! And they're not cells at all! They're just these cute little balls filled with some type of genetic material, like DNA. And they seem really harmless because they can't survive on their own. But don't be fooled. When viruses get inside cells, they become big bullies, forcing the cell to make many, many copies of the virus, sometimes until it explodes!"

"Viruses do sound pretty awful," says Dr. B. "But they aren't the only type of germ, are they?"

"Well, no," replies Edwin. "Germs can be anything that's microscopic and causes

disease.”

“Like bacteria, Edwin?” Dr. B. asks, his eyebrow raised.

“Well, yes,” Edwin replies in an irritated tone, his body beginning to tense up. “Bacteria *can* be germs. We all know about those nasty bacteria that cause things like ear infections and strep throat. And, of course, the bacteria that cause food poisoning are germs, like salmonella and *some* types of *E. coli*.”

“But, Edwin, how can you be an *E. coli* and not be a germ?” Dr. B. asks. “I suspect you may be having an identity crisis.”

“But I'm not crazy, Dr. B.!” Edwin exclaims excitedly. “The thing is that there are *some* types of *E. coli* that are harmful to people. I'll admit that I have some pretty nasty cousins that like to hang out on raw meat and make people sick. But *I'm* not that kind of *E. coli*. In fact, I'm actually *helpful* to people, and you are, too, Dr. B.”

“And how do we help people, Edwin?” Dr. B. inquires.

“Well, for one, we help people digest their food. I mean, sure, their teeth and stomachs start to break down the food they eat, but we bacteria take it a step further and break down the really tough bits,” Edwin explains. “And another thing we do is we actually protect humans from bad bacteria and other germs. Because there are so many of us good bacteria, we can team up and fight off the bad guys. But we all go unnoticed because we don't make people sick!”

“How does that make you feel?” Dr. B. inquires.

“It makes me feel, well, invisible,” Edwin replies, slumping down a little lower into the couch.

“It occurs to me that you might actually envy some of those germs,” Dr. B. suggests insightfully.

“Well, maybe a little,” Edwin replies. “Their lives are just so much more *exciting* than mine. And all the while, I'm stuck in this intestine with all these boring, smelly bacteria.”

“Ahem,” Dr. B. grunts, looking slightly agitated.

“Sorry, Dr. B. I didn't mean to call you boring,” Edwin says. “Although, let's face it. We're all pretty smelly in here.”

“Apology accepted,” Dr. B. replies, relaxing back into the intestinal mucus.

“I just wish I could get the same respect that germs get,” Edwin says.

“Do I hear you saying that you'd rather harm humans than help them?” Dr. B. inquires.

“No,” Edwin sighs. “I like that I help humans, even if they can't see me and never realize I'm there.”

“Well, Edwin,” Dr. B. says, looking at his watch, “it looks like our time is up for this week. I think you're making some good progress.”

“Thanks, Dr. B.,” Edwin says as he swims away, tumbling and gliding through the intestinal tract.