Uninvited Guests

By Kirsten Weir

Meet the parasites, microbes, and creepy-crawlies in (and on) you.

You're Never Alone. Sleeping in your bedroom. Taking a shower. No matter where you go, you have company. A lot of company, in fact: wriggling parasites, a bounty of bacteria, and other assorted stowaways that call your body home sweet home.

You've spent your whole life with those miniature minions hiding inside you. Isn't it time you got to know them?

Wild and Woolly

Most of the organisms that live on you are too small to see. But you can smell them. "Almost all of the odors your body has are microbial," says Rob Dunn, a biologist at North Carolina State University and author of the book *The Wild Life of Our Bodies*. (In other words, the smells come from microbes, microscopic organisms such as bacteria.) Bacteria on your feet and in your armpits feed on compounds found in sweat—and emit stinky-smelling gas in the process. Bacterial waste products are also to blame for morning breath and for the smell of unwashed hair.

Just how many bacteria are you harboring? "For every cell you have, you probably have ten times as many microbial cells," Dunn says. Your body contains about ten trillion human cells, by some estimates, and approximately one hundred trillion microbial cells. To put it another way: there are more of them than there are of us.

Many of those bacteria hang out on your skin. Dunn and his fellow researchers recently looked in belly buttons to see what kinds of microbes were living there. They stuck cotton swabs into 90 people's navels and found around 1,400 species—many of which had never been seen before. "Something like 600 of those species are new to science," Dunn says.

As many bacteria as there are in your belly button, there are a lot more inside your belly. Of all the places where bacteria hide, your gut "is the most wild and woolly," Dunn says. Along the walls of your intestines, bacteria form thick mats called biofilms. Those bacterial colonies help you digest food. Some gut bacteria even produce vitamins that keep you healthy.

Just as there are four major blood types, there seem to be three (or maybe more) different "gut types." In 2011, scientists studied people from a number of ethnic backgrounds and found they each had one of three different bacterial ecosystems in their bellies. Scientists aren't sure what determines a person's gut type; it doesn't seem linked to ethnicity or gender, for instance. But, they say, your microbe mix might affect

your health. Some gut types could make a person more or less likely to become overweight or develop colon cancer. Some day, doctors may even prescribe particular drugs or recommend certain diets based on an individual's personal gut type.

Creepy-Crawlies

Bacteria aren't the only organisms using your body as a jungle gym. Humans often host tiny parasites such as lice, speck-sized insects that hide in your hair and feed on your blood. Lice spread from person to person, but it's a myth that they're linked to bad hygiene. The bloodsucking bugs are equally happy in clean or dirty hair.

You can spot lice—you'd probably need a magnifying glass—but microscopic *Demodex* mites are invisible to the naked eye. "The majority of people have mites living in their eyelash follicles," says entomologist William Krinsky of the Yale Peabody Museum of Natural History. Those microscopic cousins of spiders live in the eyelashes and eyebrows of up to 80 percent of people, he says.

Plenty of people also host itty-bitty worms. Kids in North America are commonly infected with pinworms, which live in the intestines. If an infected person doesn't wash his or her hands well after going to the bathroom, microscopic worm eggs can wind up on the hands. From there it's easy for the eggs to find their way onto other people's fingers, and from there into their bellies. The worms often cause no symptoms, but some people experience itching or mild stomach pain. Luckily for them, the worms are easily killed with medication.

For most of human history, people were home to all kinds of worms. Today, though, worm infections are relatively rare in the developed world. In fact, some researchers argue that our sanitary, worm-free existence could be making us sick. Rates of allergies and autoimmune diseases have skyrocketed in recent years. (Autoimmune diseases occur when the immune system attacks the body's own tissues.) Some experts think that without worms (and many other organisms) to fight, our immune systems have gotten confused and turned on our bodies instead. That idea is known as the hygiene hypothesis.

A few desperate people have put the worm theory to the test. They've swallowed hundreds of worm eggs—on purpose—in hopes of curing their autoimmune diseases. Some say their symptoms have disappeared thanks to their squirmy new friends. But scientists are just beginning to study whether worm infections truly help. Until they've researched the theory, swallowing parasites is probably not the brightest idea.

The Good Guys

You've gotten to know just a handful of the thousands of species that live inside (and on) you. Are you freaked out yet? Don't be. "Most of the species you have are good," says Dunn. Bacteria on your skin and inside your gut prevent other, more harmful bacteria from moving in and making you sick. Besides, you couldn't get rid of your

stowaways if you wanted to. “Every time you shake someone’s hand, touch a desk, or climb a tree, you pick up new species,” he says.

Scientists are still figuring out what most of those species do. Many of them can survive only inside the human body, so researchers haven’t been able to study them in the lab. But the fact that so little is known about the microbes is good news for anyone interested in becoming a scientist, Dunn says. “You don’t have to study the Amazon to discover new things,” he explains. “You can just study your cousin!”

Mind Control

Could a single-celled creature control your behavior? *Toxoplasma gondii* is a parasite that infects mice, but to complete its life cycle, it must get into the gut of a cat. To do that, *Toxoplasma* changes a mouse’s brain chemistry. The infected mouse craves danger and loses all fear of felines.

Predictably, the fearless mouse is eaten, the cat is infected, and *Toxoplasma* goes home happy. End of story? Not quite. *Toxoplasma* infects humans too. It usually has no symptoms—but one study found people infected with *Toxoplasma* were more likely to get in car crashes. Scientists are still sorting out the details, but it seems possible that the parasite could be playing a cat-and-mouse game with the human brain.

Washing Up

If you’re constantly covered in bacteria, is there any point to washing your hands? Absolutely, says biologist Rob Dunn. It’s important to wash away bad bacteria and keep the good. Germs that cause illnesses such as colds and the flu can be wiped out with a good soap-and-water scrubbing. “Washing hands reduces the chance of cold and flu,” Dunn says.

However, antibiotic gels, wipes, and soaps are a bad idea, he says. Many contain a compound that kills some bacteria but not others. It can wipe out the helpful bacteria on your skin, making room for harmful bacteria to thrive. “Scrubbing everyone with antibacterial wipes is far more likely to make us sick than healthy,” Dunn says. So skip the hand sanitizer and go for simple suds (with regular soap) instead. “Washing hands with soap and water saves millions of lives a year,” he says. “That’s hygiene we should be more serious about.”

Name: _____ Date: _____

1. What is one type of tiny organism that calls your body home sweet home?

A mice
B bacteria
C cats
D eggs

2. What does the author describe in this text?

A the effects of microscopic organisms living on the body
B the effects of certain diets on developing cancer
C the effects of illnesses such as colds and the flu
D the effects of practicing bad hygiene

3. Bacteria can be good for the body. What evidence from the text supports this statement?

A Just as there are four major blood types, there are three (or maybe more) different "gut types."
B Bacteria on your skin and inside your gut prevent other, more harmful bacteria from moving in and making you sick.
C Some experts think that without worms to fight, our immune systems have gotten confused and turned on our bodies instead.
D Many antibacterial soaps contain a compound that kills some bacteria but not others.

4. Based on the information in the text, what can you infer about a person living with a parasite in his or her body?

A A person can feel the parasite crawling on or in his or her body.
B A person may be infected with a parasite without even knowing it.
C A person will never be able to tell if he or she is infected with a parasite.
D A person will only know if he or she was infected with a parasite after the parasite is dead.

5. What is the main idea of this text?

A Rates of allergies and autoimmune diseases have skyrocketed.
B Scientists believe there are three or more different "gut types."
C Our immune systems have gotten confused and turned on our bodies.
D The human body is home to many tiny organisms.

6. Read these sentences from the text.

"You've gotten to know just a handful of the thousands of species that live inside (and on) you. Are you freaked out yet? Don't be."

Why might the author have used the phrase "freaked out" here?

A to frighten readers about the thousands of species living in the body
B to comfort readers by using familiar and funny language
C to make fun of readers who may be disgusted by bacteria
D to emphasize to readers how serious a topic this is

7. Choose the answer that best completes the sentence.

For most of human history, people were home to all kinds of worms. _____, worm infections are relatively rare in the developed world today.

A However
B As a result
C Specifically
D Consequently

8. Bacteria form thick mats called biofilms along the walls of your intestines. What do biofilms help you do?

_____

_____

_____

_____

9. What is one example of an effect a parasite has on humans? Support your answer with evidence from the text.

_____

_____

_____

_____

10. Contrast the effects bacteria have on the body to the effects that parasites have. Support your answer with evidence from the text.

_____

_____

_____

_____