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Going into the gut!

Learn about the tiny microbes that live inside animals—and us!

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The world of microbes!

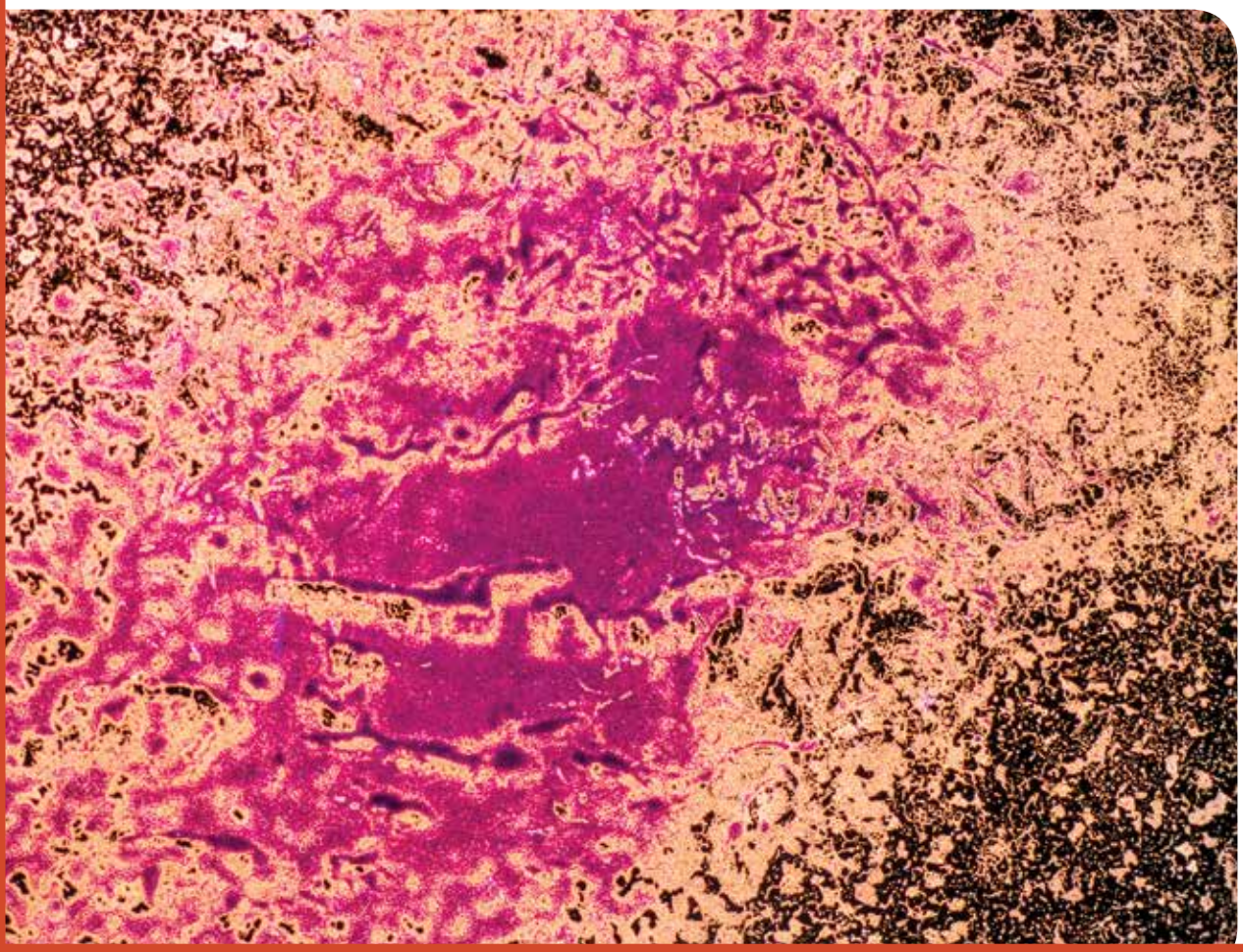
We call them germs or pathogens. These are the very, very tiny viruses and bacteria that make us sick. Another word for these small organisms is microbe. You'll notice that the word includes "micro," which means very small.

We have to take care not to get these bad microbes in our stomach or intestines. To stop the bad microbes, we wash our hands well, wash our vegetables and cook our meat!

But not all microbes are bad! Your body is home to many good microbes. They live on your skin and in your mouth. They aren't hurting you or making you sick. In fact, as these microbes live their lives, they can help keep the bad microbes away.

Many microbes also live in your intestines! Scientists call these gut microbes. Your body makes a nice, warm home for these microbes, and they help you in return. Gut microbes help you digest food, and gut microbes produce chemicals that can make your body even healthier. Gut microbes can even help make vitamins for your body!

Animals have gut microbes too! Animal scientists are working to understand how these microbes are important in animal health. They've even discovered that certain animal feeds can help gut microbes do their jobs even better!



Staphylococcus aureus **is a species of bacteria that can live in the body. It is just one of the many species of bacteria that calls the human body home, and it normally causes no problems!**

Photo: iStock / Micro Organism

WORD WATCH

Look for these terms in this issue of *Jr. Animal Scientist:*

Gut: Another word for the gastrointestinal tract. This is part of the body we call the digestive system. Food that you eat goes through the gut and comes out as waste.

Cellulose: A compound in plants. Cellulose helps plants stand up tall, which means it is a very tough compound. It is tough for animals to digest, so many plant-eating animals rely on gut microbes that can break down cellulose for them.

Microbe: A tiny organism. Most microbes that live on and in the body are bacteria. Microbes called fungi and protists can also live on people and animals.

Microbiome: A name for the whole group of microbes that lives on the surface of the body and inside it.

Symbiotic: When two organisms live near or on each other and help each other survive. Humans and microbes are an example of a symbiotic relationship.

FUN FACT:

Your body is home to more than 100 thousand billion microbes! You carry these microbes on and inside you everywhere you go. Most of these are good microbes that don't hurt you. In a way, your body is like a whole city for microbes. Scientists call the microbes that live together on your body your **microbiome**.

Scientists can take samples of microbes and grow them in Petri dishes in a laboratory. This is an interesting way to learn more about which kinds of microbes live in the gut.

Photo: iStock / Manjurul

Why do animals need gut microbes?

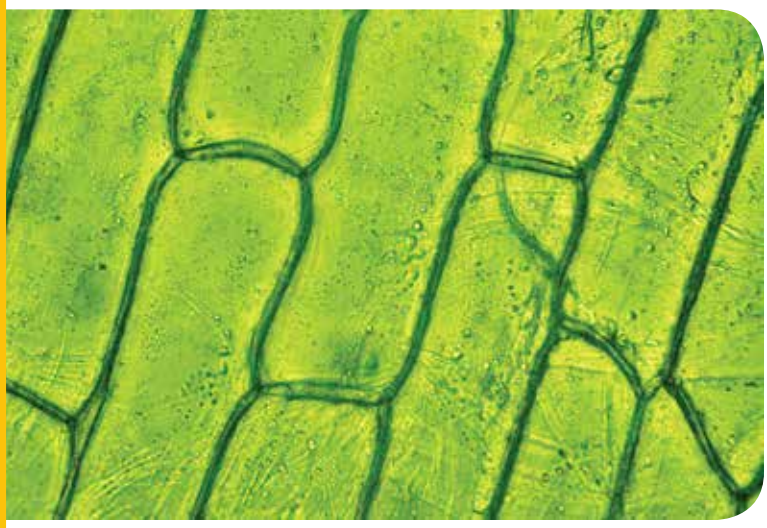


Photo: iStock / barbol88

By using a microscope to zoom into a plant, you can see dark lines. These are the cell walls! These walls have cellulose in them. Cellulose is a very rigid molecule. That means cellulose keeps the cell walls sturdy. Thanks to cellulose, plants like corn and grass can grow tall!

Photo: iStock / anjajuli

Just like you, horses need to get a mixture of foods to stay healthy. But for horses, all those foods are plants!

Gut microbes do a lot! One important job for gut microbes is to break down foods! Digestive juices in the stomach and intestine do a lot to turn food into the nutrients that animals need. Yet gut microbes help animals get the extra energy and nutrients they need. Animals can also get really sick if they don't have good gut microbes.

Microbes help animals make the most of meals

Cattle are big animals! Yet all they eat are plants. Not every animal can grow so big on an all-plant diet. So how do cattle do it? Microbes are part of the answer.

Cattle, goats and sheep rely on microbes to help them digest the plants they eat. Plants contain a molecule called **cellulose**, which is very difficult to digest. Microbes in a cow's digest system can break down cellulose for the cow. The microbes let the cow get all the nutrients and energy it can from the plants they eat. At the same time, the microbes get the energy they need from the cellulose. This is an example of a **symbiotic** relationship.

Humans don't have the gut microbes or digestive systems to get much nutrition from cellulose, but we still need to eat plant material! Our gut microbes like that fiber too!

Microbes help animals fight disease!

Microbes are important for more than digestion! Gut microbes can also produce chemicals that help boost the immune system—the cells in the body that fight disease.

For horses, a healthy group of microbes in the gut can actually keep their feet healthy! Some horses develop a disease called laminitis. This disease causes a lot of pain in a horse's foot, and makes it hard for it to walk. Animal scientists have discovered that horses with laminitis have different kinds of microbes in their gut. These other microbes seem to make it harder for the body to fight disease.

Luckily, animal scientists have figured out that changing a horse's diet can help lower the risk of laminitis. The key seems to be to avoid high-sugar or high-starch diets and lush green pastures!

Meet the microbes!

You could think of the gut as a zoo! There are so many different species of microbes that live there. Here are just a few of the common microbes that call the gut home.

Bifidobacteria

(pronounced bye-fi-doe-back-tear-ree-ah)

These gut bacteria help animals digest food. They are also really important for keeping away bad bacteria! When Bifidobacteria are around, the bad guys can't take over!

Firmicutes

(pronounced fur-mik-you-tees)

This group of bacteria (called a phylum) has members that look round and members that look like little rods. These bacteria are especially good at getting the nutrients out of food. Once Firmicutes get to work, a person can get a lot more energy from the food they eat.

Bacteroidetes

(pronounced back-tear-oyd-a-tees)

These bacteria really like it when a person's meals include a lot of plant material! They are fans of cellulose!

Candida albicans

(pronounced can-dee-dah al-buh-cans)

These are not bacteria! This is actually a kind of fungus, which means it is related to organisms like mushrooms). But this fungus doesn't grow into mushrooms in the gut. Instead, *Candida albicans* looks like little white balls and can only be seen under a microscope.

Candida albicans normally just lives its life in the gut, not bothering you at all. But sometimes the "zoo" of the gut can get all mixed up. If good bacteria die, *Candida albicans* will try to take over the gut and can make a person really sick!

Photo: iStock / CIPhotos

Bacillus bacteria are a kind of Firmicutes

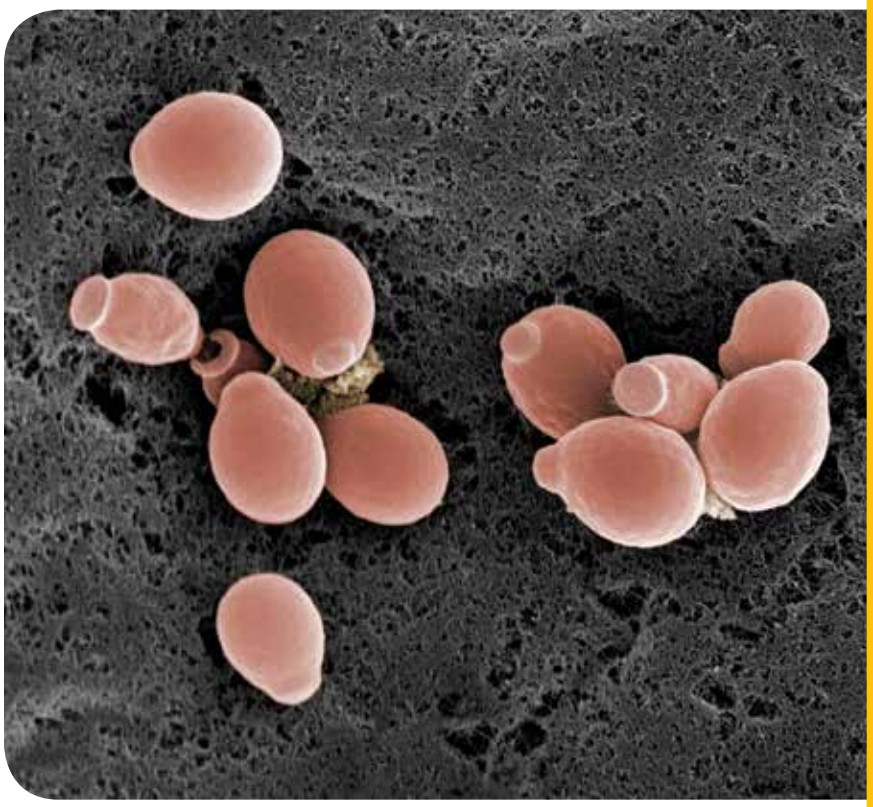


Photo: iStock / Jannicke Wilk-Nielsen

***Candida albicans* is mostly harmless! It is usually part of the large ecosystem of the gut, which we call the microbiome.**

Photo: iStock / skynesher

Microbes in pets!

Dogs and cats need microbes too! Dogs and cats eat different foods than farm animals though. They mostly eat meat, so they don't need as many of the microbes that usually help break down cellulose. Overall, the gut microbiome for dogs and cats has fewer kinds of microbes.

The interesting thing about pet microbes is that they tend to share microbes with their human caregivers! When you share your home with an animal, you tend to pick up some of their microbes when you eat or touch things they may have been around (or if your dog has ever licked you!) Just as you may think of your pet as a member of your family, your gut microbes are like family too!

FUN FACT: Using waste to track down microbes

But how do you study a dog's microbiome? Animals scientists can learn a lot about an animal's microbiome by studying its feces, or poop. As food travels through the body, the microbes in the gut pass through the gut as well, and many end up in an animal's waste.

At the University of Illinois, there is actually a team of scientists focused on studying fecal samples from dogs and cats. Once they've collected a piece of animal waste, the researchers use tools to look for DNA in the waste. When they find DNA, they can sequence it, meaning they can see the genetic code and know if the DNA belongs to a microbe. Then they can study what that microbe does!

ACTIVITY:

Make your own stethoscope!

Animal scientists get to learn a lot about anatomy! Anatomy is the study of the body and how the parts of the body work together. Cattle, horses, pigs and other animals all have differences in their anatomy. They have different body parts—in different places! For example, cattle have a stomach compartment called a rumen. Pigs don't have a rumen!

You can learn about anatomy by building your own stethoscope!

You will need:

- 1 empty cardboard paper towel or toilet paper roll
- 2 plastic or paper cups (Funnels work great too, but don't cut them)
- Scissors (use with a grown-up's help)
- Tape

Step 1: Use the scissors to cut a hole in the very bottom of each plastic cup. The hole should be just big enough to fit the cardboard roll inside.

Step 2: Use tape to secure the cardboard to the cup. This might take a lot of tape!

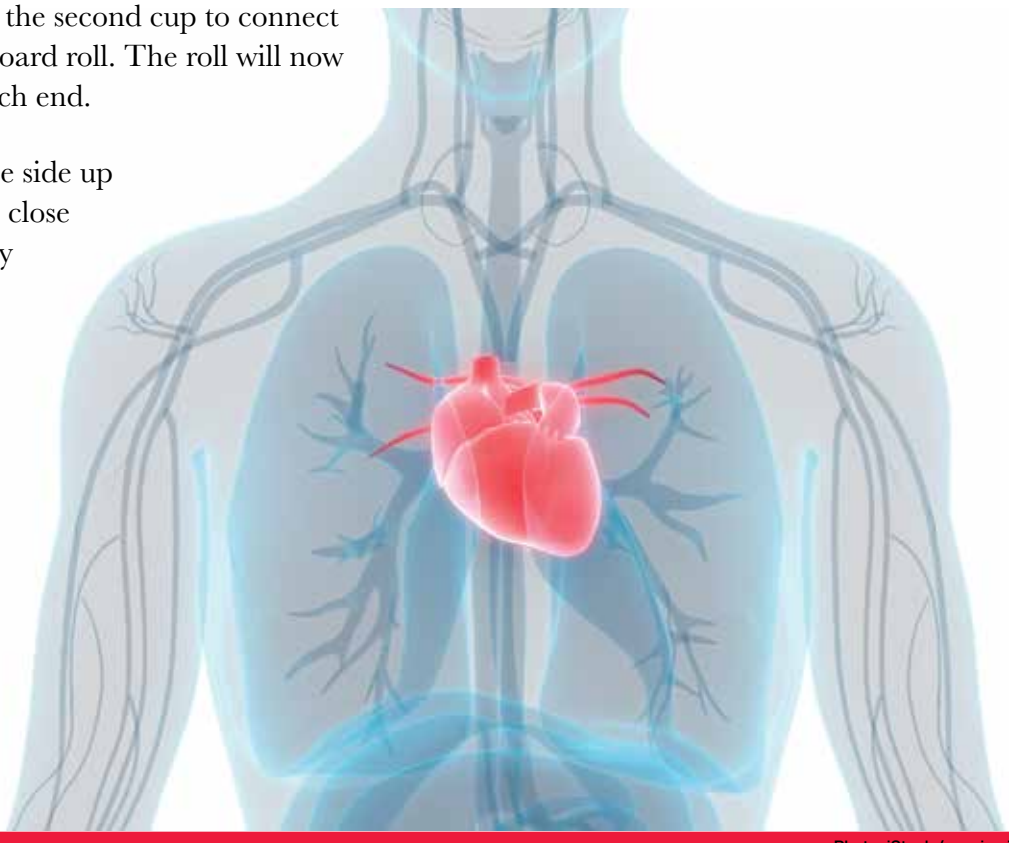
Step 3: Do the same thing with the second cup to connect it to the other side of the cardboard roll. The roll will now have a cup sticking out from each end.

Now hold the plastic cup on one side up to your ear. Hold the other side close to the chest of a friend or family member.

Can you hear their heart beating?

Can you hear their stomach growling or the food moving through their intestines?

Listen close and enjoy this "window" into the human body!



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CONTRIBUTORS: ASAS staff.

DESIGN: Jody Boles

CONTACT: jranimalscientist@asas.org

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