

SPIES



INTO THE SYSTEM

Peppi and Bollo are ready for their first investigation. It's noon. Time for lunch. They hop aboard a slice of pizza (topped with mushrooms, sausage, and green pepper) and enter a human mouth.

"Who's our host?" says Bollo.

"Her name is Joanne. She's 18— an adult as far as human digestive systems are concerned. She's healthy, too. No digestive problems. If we can discover what's going on in Joanne's digestive tract, we'll have a good idea about human digestive activity," replies Peppi.

"Wow, it's dark," says Bollo. "And wet and slippery, too. Watch out for those huge white blades!"

"The liquid is spit," says Peppi. "Its formal name is 'saliva.' Saliva is produced by three pairs of glands in the sides and the back of the human

mouth. The salivary glands go to work whenever a human smells, sees, or even thinks about food. Once food is in the mouth, the saliva moistens it and makes it easier to handle. The salivary glands produce about 1.5 liters of saliva each day.

"And those 'blades,'" Peppi goes on, "are teeth. Adult humans usually have 32 of them."

Peppi and Bollo take a look around. It's a busy scene. The front teeth, or incisors, go to work first. These sharp teeth act like scissors. The canine teeth, at the sides of the mouth, are pointy. They cut up the food some more.

The tongue is muscular. It helps move food around. It moves the pizza to the back of the mouth, where the heavy-duty work of chewing goes on. The broad, flat bicuspid and molars grind the food and make it soft. Meanwhile, the saliva is doing its thing. It moistens the food and makes it easier to chew.

"This tearing, grinding, and mixing," Peppi says, "is called mechanical digestion. And although we can't see it, it's important to know that saliva contains an enzyme called amylase. The enzyme activity marks the beginning of chemical digestion."

"Hold on a minute. You're going too fast," says Bollo. "What's an enzyme?"

"An enzyme is a special protein produced by the body. Digestive enzymes help the body break down nutrients into forms that the body can use. Amylase, for example, helps break down the starch in pizza to simple sugar. As we continue, we'll see other enzymes that help digest other types of nutrients."

"The human mouth is efficient," notes Bollo. "It's only been a few seconds, and I can't even recognize that bite of pizza. It looks like a big, soggy ball."

"You're right. That ball of food is called a bolus," says Peppi. "And if I took out my testing equipment, I could show you that the pizza crust is already starting to be digested—because of the action of amylase."



Watch out, Joanne! You are about to be invaded by aliens!

Down the Tubes

“Eeeeeeee!” shrieks Bollo. Before he can say more, he and Peppi are pushed up against the roof of the mouth. It’s a tight squeeze. Then they start moving backward. The bolus has triggered a swallowing reflex. Goodbye, mouth!

Looking down, they see something close over one of the two tubes below them.

“The epiglottis,” says Peppi. “Each time a human swallows, it closes over the windpipe to make sure that food goes to the stomach. The windpipe leads to the lungs, and you don’t want any food in there!”

“One tube for air, one for food. The human body is specialized,” says Bollo.

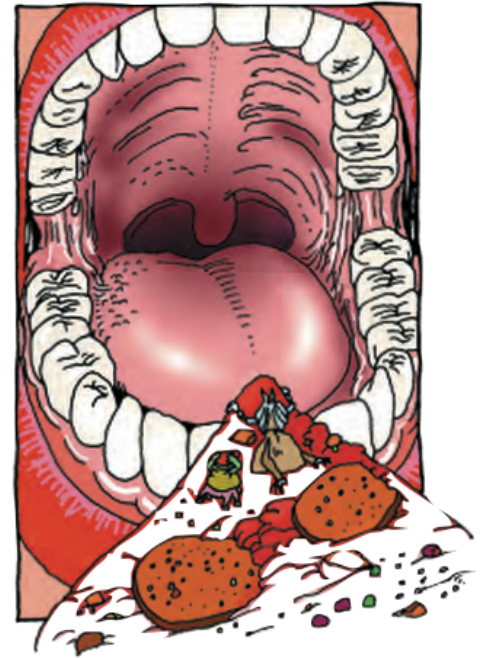
“You’re right,” says Peppi. “You’re also going to find out that these specialized organs and systems need each other. They work together to help keep the body in balance. Now keep your eyes open. We’re traveling through the second organ of the digestive system, the esophagus.”

Down and down they go, squeezed by muscular contractions of the walls of this dark pink tube. Then all of a sudden, another tight squeeze, and pop!

The spies arrive in the stomach. They have passed through the last gatepost on the road to the stomach, the lower esophageal sphincter. The sphincter is a ring of muscle that helps keep food that has been swallowed where it should be—in the stomach.

“What happens now?” asks Bollo.

“I like your curiosity, Bollo. Stay posted. Our journey will soon continue,” Peppi replies



Peppi and Bollo are off to a scary start.

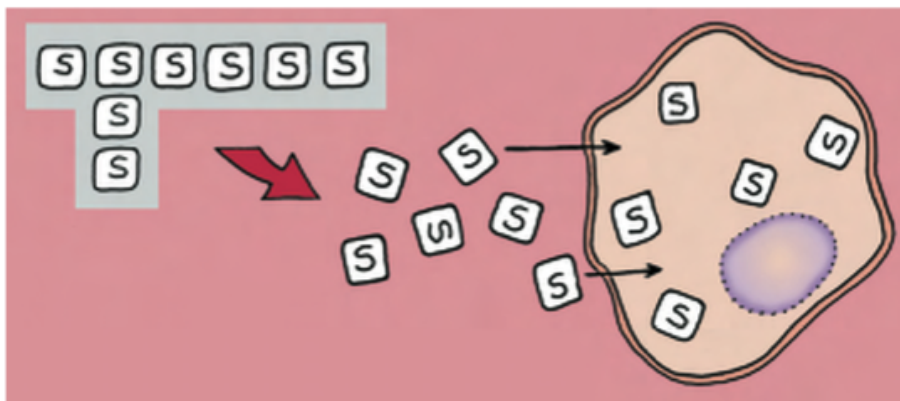
Making It Simple

Why does your body need to break down starch into sugar?

The reason is that the body cannot use carbohydrates until they are in a form that is simple enough to dissolve in water and pass through cell membranes into the blood and, ultimately, to the body’s cells.

Starches are made up of chains of simple sugar particles that are held together by chemical bonds. But once the starch is chewed and acted on by digestive enzymes in the mouth and small intestine, the bonds that hold the links of the starch chain together break apart. The result is simple sugar particles. These particles are small enough to move through the body and enter the cells. They provide cells with nutrients they need to do their jobs.

Simple sugars. A simple story. Do you agree?



After the chemical bonds of the starch chains are broken, the smaller sugar particles can pass through the cell membrane.