

# SPIES



## INTO THE BLENDER

Peppi and Bollo find themselves in a large, hollow area that looks like a J-shaped balloon.

“Just like folds of pink velvet,” says Bollo. “What’s going to happen here?”

“First of all, we’re in for a bath,” says Peppi.

“You’re right. What’s all this liquid sloshing around?” asks

Bollo.

“The digestive juices,” says Peppi. “One of them is an acid, called hydrochloric acid. The other juice is an enzyme called pepsin. Together, these juices are called gastric juices. They begin the digestion of protein.”

“Hydrochloric acid. That’s pretty strong stuff, isn’t it?” asks Bollo.

“Yes. Pure hydrochloric acid is extremely strong. But the hydrochloric acid in the stomach is weaker. In fact, in the stomach, it’s actually the pepsin that does most of the work of digestion. The hydrochloric acid just gets things going.”

### Three Types of Muscles

“The churning of the stomach helps the digestive juices do their job even better,” Peppi continues. “It’s caused by muscles. How many can you see?”

“There’s one type of muscle that runs at an angle,” says Bollo. “But where are the others?” “Good for you, Bollo. That’s one of the three. But there are two more layers of muscle on top of that one. One layer circles the stomach, and another runs from one end of the stomach to the other. All this action helps move the food around and helps break it into tiny pieces.”

“It was about 12:30 P.M. when we arrived,” says Bollo. “That pizza was part of Joanne’s lunch. But her stomach wasn’t empty. Was that her breakfast?”

“Yes, there are still some small pieces of food in here. Some things take longer for the stomach to process than others. But Joanne’s breakfast is already well on its way to becoming digested. It has turned into a thick, creamy liquid called chyme. Chyme is spelled c-h-y-m-e. But remember, it rhymes with ‘dime.’”

Peppi and Bollo keep an eye on the action. More food, as well as some liquid, enters. The stomach gradually expands. The thick folds that Peppi and Bollo saw when they entered the stomach are flattening out.

As time passes, the pieces of food get smaller and smaller. The sloshing continues.



*Peppi and Bollo explore the stomach. What do you think is dripping from the top?*

## Slippery Stuff

“That gastric juice must be strong,” says Bollo. “But why doesn’t the juice attack the stomach itself? How does it know what’s ‘off limits’?”

“The stomach is protected by an inner wall that is covered with a thick liquid called mucus,” replies Peppi. “The stomach generally doesn’t start producing digestive juices until food is present and the mucus is in place.

“As long as the stomach is coated with mucus, the gastric juice usually cannot do any harm. But if the juice finds a spot where there is no mucus, it can penetrate the stomach wall. It makes a small hole, called an ulcer.”

“So here’s a potential problem with this marvelous organ called the stomach,” says Bollo, perking up his ears. “It can get ulcers. Something to report to our leader.” He jots this down in his notebook.

“Yes. Ulcers have many causes. Scientists recently learned, for example, that they can be caused by certain bacteria as well as by too much gastric juice or too little mucus. But once a doctor has diagnosed an ulcer, it’s pretty easy to treat.

“And while we’re on the topic, there’s another type of discomfort that’s caused by gastric juice. The pain develops in the lower esophagus, just around the entrance to the stomach. It’s called heartburn. It has nothing to do with the heart; the pain just happens to develop in the same area where the heart is located. Gastric juice backs up into the lower esophagus from the stomach and causes a burning sensation.”

“Heartburn,” writes Bollo.

“But don’t get carried away thinking about the problems that can arise in the stomach. It’s a very efficient organ. It even has a way of getting rid of things that don’t agree with it. It reverses the normal digestive process, opens that sphincter between the esophagus and stomach, and sends them right back up and out! That action is called vomiting. It is not very pleasant, but absolutely necessary. Vomiting can be triggered by bad food, by some medications, or by poisons.”

“I have another question,” says Bollo. “Some of the foods seem to be disappearing faster than others. I don’t see much pizza crust around here anymore, but there’s lots of sausage.”

“Remember that there are three major food types—carbohydrates, fats, and proteins. Pizza contains all of them. The crust is mostly carbohydrate, and the sausage is fat and protein. All three food types undergo mechanical digestion in the mouth, but only carbohydrates begin to undergo chemical digestion in the mouth.”

“So that’s why I see less crust and more sausage in the stomach!” says Bollo.

“Right,” Peppi replies. “Proteins begin to undergo chemical digestion in the stomach. The chemical digestion of carbohydrates continues for a short time in the stomach as well. Fats, on the other hand, are not chemically digested in the stomach at all. It all depends on enzymes. There is even a special enzyme called rennin that begins the digestion of milk. That is important, because when humans are born, that’s all they eat for a while.”

“But what happens now?” says Bollo. “We’ve been here for almost 4 hours!”

“Be patient, Bollo. Like the pizza that Joanne ate, we still have a long way to go!”



*Why does mucus have to be so slimy? Bollo knows. Do you?*