

8. What are the digestive contributions of the liver and pancreas?
9. When does the excretory system join forces with the digestive system?
10. What body parts are involved in the excretion of waste products?
11. Explain the connection between the colon and the excretion of both liquid and solid wastes.
12. What is urine made of? What is its source?
13. What is the role of the kidneys?
14. What can be done if kidneys fail to function properly?

Follow-up Discussion

Research indicates that students will retain their previous misconceptions about a topic, in preference to new information, until they actively recognize and correct their own errors. Therefore, it is important to have your students re-examine the facts/beliefs they put on their "Everything We Think We Know About..." list. It might also be helpful to review the list by marking each entry with a "+" or "-" to show which facts were correct and which were incorrect.

Thought-provoking discussions provide a good way to assess the overall depth of student understanding. The following are some suggested discussion topics.

- Describe the importance of the healthy functioning of the kidneys to human survival. How are the kidneys involved with both the digestive and excretory systems?
- Explain how the digestive and excretory systems overlap and connect.

Follow-up Activities

- Have students investigate the process of kidney dialysis on the Internet or with print resources.
- Have students replicate the experiment from the show, and extend it by observing the different amounts of time required to digest various protein substances.
- Have students create an illustration that demonstrates the sequence of steps taken by food in its journey through the digestive system.

Suggested Internet Resources

Periodically, Internet Resources are updated on our web site at www.LibraryVideo.com

- www.biologyinmotion.com/index.html
"Biology in Motion" provides animated explanations and interactive activities that help to explain some of the body processes associated with the digestive system.

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- www.kidshealth.org/kid/body/mybody.html

The "KidsHealth" Web site developed by the Nemours foundation is an interactive journey through the human body.

Suggested Print Resources

- Ferguson, Beth. *Digestion*. Benchmark Books, New York, NY; 2003.
- Gray, Susan Heinrichs. *Digestive System*. Child's World, Chanhassen, MN; 2003.
- Simon, Seymour. *Guts*. Harper Collins Children's Books, New York, NY; 2005.

TEACHER'S GUIDE CONSULTANT

Conrad M. Follmer

25 years as a K-5 Science & Math Coordinator for a Pennsylvania public school system, currently an independent consultant to elementary schools.

TITLES

- THE BRAIN & THE NERVOUS SYSTEM
- CELLS
- CIRCULATORY & RESPIRATORY SYSTEMS
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Digestive & Excretory Systems

Grades 5-8

Students in grade 5-8 classrooms possess a wide range of background knowledge. Student response to this video program is sure to be varied, so the teachers at these grades need all the help they can get! This guide has been designed to help the 5-8 science teacher by providing a brief synopsis of the program, previewing and followup questions, activities, vocabulary and additional resources.

Before Viewing: Extensive research tells how important it is for the teacher to discover what the students know — or think they know — about a topic, before actually starting a new unit. Therefore, after prompting discussion with the pre-viewing questions, lead your class to create an "Everything We Think We Know About..." list. You may also wish to preview key vocabulary words, and have students raise additional questions they hope will be answered.

After Viewing: Have your students share video excerpts that fascinated or surprised them, then challenge your students to prove or disprove the accuracy of the facts they put on their "Everything We Think We Know About..." list. Discuss what else they learned and use the followup questions and activities to inspire further discussion. Encourage students to research the topic further with the Internet and reading resources provided.



Program Summary

The food we eat is fuel for the human body, and it is the job of the digestive system to transform food into usable fuel. A series of connected organs, the digestive system breaks food down into small molecules that can be absorbed into the bloodstream. The molecules then travel through the bloodstream to all of the body's cells, which use them for growth, repair and energy.

Even before the first bite, the digestive system starts working. Salivary glands in the mouth release a mix of water and chemicals called saliva, which start to break down the food. Our teeth and tongue also work to break the food down through a process called mastication. Once chewed, a wave-like muscular action called peristalsis carries the paste-like food mixture down through the esophagus tube to the stomach. The chemical mixture awaiting the food in the stomach, called gastric juice, is so acidic that the lining of the stomach has to be protected by a thick layer of mucus. As the muscles of the stomach churn the food, mixing it with the gastric juices, the food is broken down into tiny pieces. Once the stomach finishes its job, the soupy food mixture passes into the small intestine. The small intestine has three sections: the duodenum, the jejunum and the ileum. The food passes first into the duodenum, where it triggers the release of a special substance called bile. Bile, a yellow-green liquid made in the liver, works to break down fats. Enzymes made by the pancreas are also added to the mixture, which reduces the food to molecules. The watery mixture moves next into the jejunum. The lining of the jejunum is covered with microscopic finger-like projections called villi. The tiny blood vessels in the villi soak up the nutrients from the food mixture and carry them away in the bloodstream. The blood first goes through the liver, which filters toxins and permits nutrients to continue their journey through the body. Whatever is not soaked up in the jejunum travels on to the ileum, where it is prepared to move on to the large intestine. The job of the large intestine is to absorb most of the liquid that is left over and to prepare the solid wastes for elimination.

When the remains of the food reach the large intestine, the excretory system takes over. Vegetable fibers that cannot be further digested remain in the solid waste, and helpful bacteria continue to break down the remaining substances. Solid wastes are sent to the rectum and then out of the body opening called the anus. The liquids are sent on to the kidneys to be filtered and redistributed. Microscopic filters called nephrons that are located in the two kidneys recycle most of the fluid back into the bloodstream to keep us from becoming dehydrated; however, some of the liquid is combined with a chemical from the liver called urea. The combination of water, urea and excess salts is called urine, which is sent on to the bladder for storage until it leaves the body through the urethra.

The skin is also an organ of the excretory system through which we sweat out excess salts and chemicals. In addition, the lungs are part of the excretory system. Every time we exhale, the body is excreting unneeded gases, particularly carbon dioxide. The more we think about the complexity of the human body and the cooperation among body systems, the more fantastic it becomes!

Vocabulary

The following words are included for teacher reference or for use with students. They are listed in the order in which they appear in the video.

digestive system — A series of connected organs that is responsible for breaking down the foods we eat into small molecules so that all of the cells of the body can absorb and use them for energy, growth and repair. This system involves the mouth, teeth, salivary glands, esophagus, stomach, small intestine, large intestine, gallbladder, liver and pancreas.

excretory system — The organs responsible for eliminating waste products from the human body. This system involves the kidneys, skin, lungs, bladder, large intestine and rectum.

saliva — A watery mixture of secretions from the salivary glands that lubricates the mouth and starts the digestion process.

mastication — The process involving the grinding action of the teeth and the stirring action of the tongue, breaking down foods into smaller pieces and mixing it with saliva.

esophagus — The tube that carries our masticated food from the mouth down to the stomach.

peristalsis — Wave-like muscular contractions that help to move food through the digestive system.

hydrochloric acid — The harsh liquid acid that mixes with enzymes to create gastric juice. Hydrochloric acid collects in the stomach to further break down the foods arriving in the stomach.

William Beaumont — (1785-1853) The U.S. Army surgeon, who, in 1822, studied and learned about the functioning of the human stomach by treating a patient who had been shot, leaving his stomach open.

villi — The microscopic, finger-like projections in the walls of the small intestine that contain tiny blood vessels, which absorb nutrients into the bloodstream.

bile — A fluid that is secreted by the liver and stored in the gallbladder; used in the digestion and absorption of fat.

small intestine — The longest organ of the digestive system that connects the stomach to the large intestine. The small intestine is approximately 18 feet in length and is composed of three sections: the duodenum, jejunum and ileum.

duodenum — The first part of the small intestine where digestive juices from the liver and pancreas continue the work of breaking down remaining food particles.

jejunum — The middle part of the small intestine where villi absorb nutrients into the bloodstream.

ileum — The last part of the small intestine where liquid and solid waste products are sent on to the large intestine.

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large intestine — Also called the colon, the place where the liquid remaining in the waste products is reabsorbed into the bloodstream. The large intestine is three times the width of the small intestine. The drier, solid waste leaving the large intestine for the rectum contains indigestible vegetable fiber. The large intestine also contains harmless bacteria, which produce methane gas, hydrogen and carbon dioxide.

rectum — The part of the body where solid waste sent from the colon is stored, waiting to be eliminated through the anus.

kidneys — The two fist-sized organs of excretion that are responsible for filtering out and concentrating waste products from the bloodstream. Millions of microscopic filters called nephrons remove dissolved nutrients for the body and send urine on to the bladder, where it awaits excretion.

bladder — A stretchy organ with a muscular wall that collects and stores urine.

urethra — The tube that runs from the bladder and carries urine out of the body.

dialysis — A medical process that is used to help filter the blood when kidneys do not function properly.

Pre-viewing Discussion

Before students generate their list of "Everything We Think We Know About..." for this topic, stimulate and focus their thinking by raising these questions so that their list will better reflect the key ideas in this show:

- How does the food we eat get turned into energy our bodies can use?
- How do our bodies rid themselves of wastes?
- How are the digestive and excretory systems related?

After the class has completed their "Everything We Think We Know About..." list, ask them what other questions they have that they hope will be answered during this program. Have students listen closely to learn if everything on their class list is accurate and to hear if any of their own questions are answered.

Focus Questions

1. Name the body parts involved in the digestive process.
2. What is saliva? What is its purpose?
3. What is mastication? What body parts are involved in this process?
4. How does the process of peristalsis act to aid digestion?
5. What are the ingredients of gastric juice? Where is it found and what does it do?
6. What happens to food when it reaches the stomach?
7. What is the digestive function of each of the three sections of the small intestine?

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