

# Digestion

## Overview

Students design the digestive system and modify their design as they learn more about how the process of digestion works.

## Background

Eating and digesting food is a process we mostly take for granted. It is, in fact, an amazingly orchestrated process involving many systems (including the brain and nervous system) and organs coupled with a vast array of feedback loops. In short, there is a lot that happens to the burger before it comes out the other end. A detailed version of the process is covered in the Wikipedia article on “Digestion” found at:

<<http://en.wikipedia.org/wiki/Digestion>>.

There are some pertinent facts related to this activity listed in the *Digestion Diagram Cheat Sheet*.

## Materials

### Materials for the whole class

- Burger model
- “Poop” model

### Materials for small groups

- Tape
- Adding machine tape (1 roll/pair)
- Index cards
- Colored pencils
- 1 measuring tape
- 1 *Digestive System Terms* (blackline master below)
- 1 *Digestion Diagram Cheat Sheet*

## Preparation

- Use the *Digestion Diagram Cheat Sheet* to prepare a model digestive system to use as a display for the final discussion of this project.

## Procedure

- Start by showing the burger model and remind students that we have talked about the nutritional content of foods. The next question is, “How do we get the nutrients out of our food?” How does this (hold up the burger) turn into this (hold up the poop in a bag), and what happens to allow us to get the nutrients out of the food?
- The *Here Are the Answers—Digestive System* activity at the beginning of this manual can also be used as an introduction to kick off this activity.
- Assign the students the task of mapping the travels of the burger from start to excrement. They should use the adding machine tape and make it life size and

mark off all of the different parts of the digestive system that they know or have heard about. They can use the index cards to add details or describe pieces of the digestive system. Students are first asked to do this with no prior instruction as a start-up activity. The point of this activity is to get students thinking about what has to happen to digest the food they eat.

- When students have finished, discuss the parts that they have listed and have them compare each other's digestive maps.
- Pass out photocopies of the *Digestive System Terms*—the list of terms that *must* be placed on their digestive maps. Allow students to use their books and other reference materials to modify their current maps. They should include all terms on the list and splice in any extra adding machine tape they need to make their maps to actual life size scale.
- **AFTER** the students have constructed their digestive maps, hand out the *Digestion Diagram Cheat Sheet*. Allow students to compare their map with the cheat sheet information and allow them to modify their map if necessary.
- Discuss the final maps with the students and ask them for any surprises they had about the digestive system.

## **Assessment**

Ask students to write a paragraph explaining the digestive process in as much detail as possible.

Ask students to make up a ten-question quiz about the digestive system and process. Select the best questions from all of the classes and give the quiz

## Digestion Diagram Cheat Sheet

### Some Helpful Facts

**Sight and thought**—trigger the digestive process.

**Mouth:** length—8cm, passage time—5-30 seconds

- **Taste** is another trigger that sends signals to release digestive juices.
- **Teeth** begin mechanical digestion.
- **Saliva** contains enzymes that start the chemical digestion of starch as well as providing lubrication for swallowing.
- **Tongue** mixes and pushes back food at swallowing which triggers peristalsis in the muscles of the esophagus.
- **Epiglottis** covers the windpipe to prevent aspiration of food into the lungs.
- **Bolus** is a wad of chewed food starting down the esophagus.

**Esophagus:** length—26 cm, passage time—10 seconds

- This is a muscular tube with muscle door (sphincter) at the bottom to keep stuff in stomach.
- The muscles contract in a wave-like motion (peristalsis) so food will be pushed into the stomach even if you are standing on your head while eating.

**Stomach:** length—16cm, passage time—2-3 hours

- A folded muscular pouch that can stretch. It holds 1 to 1.5 liters, has a mucus lining, and produces acid and other digestive enzymes that chemically break down food. Movement of the muscles mixes the contents and furthers mechanical breakdown. The bolus of food is turned to chyme (liquid). Some absorption of smaller food molecules into the blood occurs here.

**Duodenum**

- Another muscle door and space at the opening of the small intestine where pancreatic juices and bile (from the liver via the gall bladder) are added to the chyme to neutralize the stomach acid and aid the digestion of fats.

**Small Intestine:** length—4.75 m, passage time—3 hours

- Lined with villi and microvilli, small projections that increase the surface area. Absorption of nutrients occurs here.
- **Appendix** is located near the junction of the small and large intestines. Or may be vestigial, or it may play a role in recovery from diarrhea.

**Large Intestine (Colon):** length—1.25 m, passage time—2-3 days

- Responsible for water balance.
- Full of bacteria.

**Rectum**

- Storage space for solid waste at the end of large intestine.

**Anus**

- The other opening of the digestive system tube.

## Digestive System Terms

Use your textbook and any other resources you can find to fill out your digestive system map. The system should be to scale in terms of length, and you may add the amount of time it takes for food to pass through each part of the system. Each of the terms listed below must be included in your diagram with a short explanation of its importance to the process.

**Anus**  
**Appendix**  
**Esophagus**  
**Gall bladder**  
**Large intestine**

**Liver**  
**Mouth**  
**Pancreas**  
**Rectum**  
**Saliva**

**Small intestine**  
**Stomach**  
**Teeth**  
**Tongue**

Challenge: See if you can find the meaning of these terms and include them in your map.

**Bile**  
**Bolus**  
**Chyme**

**Duodenum**  
**Epiglottis**  
**Gastric juices**