

### Digestive System Information for Patient Diagnoses

Name \_\_\_\_\_ **KEY**

Using Chapter 14 of your text book and the Internet for help (if needed), fill in the table below with basic information about the chemical (enzymes, secretions) impact (if any) and physical/mechanical impact (if any) each of the digestive organs has on food as it passes through our digestive system.

Organ	Chemical Impact	Physical Impact
Mouth	<p><b>Saliva</b> – starts digestion of carbohydrates with <b>amylase</b> enzyme; saliva contains <b>lysozyme</b> to break down bacteria in food, also moistens food to prepare to be swallowed.</p>	<p><b>Teeth</b> – grind, chew, bite off food and physically change the size of food (mastication).</p> <p><b>Tongue</b> – manipulates food and helps form a bolus (food ball) and initiates swallowing.</p>
Esophagus	N/A	<p>The smooth muscle layer of the esophagus helps propel food along by squeezing it down through a process called <b>peristalsis</b>.</p> <p>Mucous from esophageal lining helps to moisten food to keep it moving along.</p>
Stomach	<p><b>Hydrochloric Acid (HCl)</b> – makes stomach acidic for food breakdown and enzyme activation</p> <p><b>Pepsinogen</b> → <b>Pepsin</b> – enzyme that breaks down proteins</p> <p><b>Intrinsic Factor</b> – secreted to allow vitamin B12 absorption</p>	Longitudinal, circular, and oblique muscle layers of the stomach churn, mix, and pummel food into smaller fragments.
Duodenum (1 <sup>st</sup> part of Small Intestine)	<p>Bile duct from liver/gall bladder links into duodenum and secretes <b>bile</b> for fat/lipid breakdown.</p> <p>Pancreatic duct links into duodenum and secretes <b>proteases</b> (protein digesting enzymes) and <b>lipases</b> (lipid digesting enzymes).</p> <p>Intestinal walls of duodenum also secrete enzymes for all sorts of digestion as well.</p>	<b>Peristalsis</b> moves food along the intestines; the intestinal walls are lined with <b>circular folds, microvilli, and villi</b> which <b>increase</b> the <b>surface area</b> for absorption of nutrients.
Jejunum and ileum (remainder of the small Intestine)	Enzymes from duodenal secretions continue to further digest proteins, carbohydrates, and lipids.	SAME AS ABOVE— <b>Peristalsis</b> moves food along the intestines; the intestinal walls are lined with circular folds, microvilli, and villi which increase the surface area for absorption of nutrients.

Large Intestine	N/A	<p>Food is dehydrated because water is absorbed through the walls of the large intestine. Solid stool is made and prepared for excretion.</p> <p>Some vitamin absorption also occurs.</p> <p>Abundant goblet cells produce mucous to lubricate digested material and move it along.</p>
Rectum/Anus	N/A	<p>Goblet cells produce mucous for lubricating the passage of feces out of the body.</p> <p>Solid stool is stored and collected in the rectum, excreted through the anus.</p> <p>Intestinal wall contains some degree of tone which causes the walls to pucker a bit into haustra to help move waste out of the body.</p>
Appendix	Does not have a real effect on digestion; scientists hypothesize now that the appendix may play a small role in the immunity of the organism	Same as chemical.

1. Explain the role of saliva in digestion.

**Saliva contains two important compounds that help digestion along. The first compound is called salivary amylase which initiates the digestion of carbohydrates such as complex sugars and starches. The second compound is called lysozyme which has an enzymatic function to help attack and break down bacteria and other foreign substances often found in our daily foods.**

2. What compounds are found in the stomach that aid in digestion? List each one mentioned in your book and what molecules it helps to digest.

**The collective fluids released in the stomach are referred to as gastric juices. This includes Hydrochloric Acid produced by the parietal cells helps make the stomach more acidic to break down molecules into smaller molecules. HCl also activates many enzymes in the stomach as well. Chief cells produce pepsinogen that turns into pepsin in the presence of HCl, and is a protein digesting enzyme that converts larger proteins into smaller ones or amino acids for later absorption through the intestinal walls. Some cells produce intrinsic factor to increase the absorption of vitamin B12 and some cells produce a hormone called gastrin which helps the stomach regulate digestive processes.**

3. Secretions from the liver and the pancreas play a crucial role in insuring the complete breakdown of organic macromolecules. Summarize the roles of each of these organs, what molecules they help digest, and identify key components that they add to food passing through the small intestine.
  - a. **Liver** – The liver produces a compound called bile which is essential for the digestion of lipids/fats. It emulsifies fat/lipid globules into smaller ones, thus providing more surface area for the fat digesting enzymes (lipases) in the small intestine to work on. The bile also contains bilirubin which gives the overall brown coloration to our feces upon excretion.
  - b. **Pancreas** – The pancreas produces a gamut of enzymes that are secreted into the small intestine. These enzymes include proteases (protein-digesting enzymes) such as trypsin, chymotrypsin, carboxypeptidase, and others. The pancreas also secretes lipases (lipid-digesting enzymes), nucleases (nucleic acid-digesting enzymes), and pancreatic amylase (a starch digesting enzyme).
4. Throughout the digestive system, there is a system of folds and finger-like projections called villi. Explain the role of these anatomical parts in digestion and their importance to human health.

**The circular folds, microvilli, and villi of the intestines have the primary role of increasing the surface area for nutrient absorption. It is no secret that nutrients are essential for survival. By having extra surface area where nutrients can be absorbed contributes to better digestive efficiency and more nutrients from the food that is absorbed.**

5. In humans, where in the digestive system does most of the nutrient absorption take place?

**Small intestine**

6. In humans, where in the digestive system does most of the water absorption take place?

**Large intestine**

7. What major concerns, primary or secondary, would you as a physician have with a patient who has chronic diarrhea? In other words, what conditions might it lead to or make worse?

**Chronic diarrhea causes dehydration. Fluids are used to flush the intestines of waste not giving any time for absorption. Organism becomes dehydrated and loses essential electrolytes as well during a bout of diarrhea.**

8. What major concerns, primary or secondary, would you as a physician have with a patient who exhibits chronic vomiting? In other words, what conditions might it lead to or make worse?

**A physician would be concerned with improper nutrient absorption or lack thereof because no nutrients are making it to the intestines to be absorbed. This could lead to malnutrition of the person. Furthermore, stomach ulcers, esophageal ulcers, and acid-reflux would be other areas for concern because the person would be vomiting gastric juices which are highly acidic. The increased acidity might also counteract the alkalinity of the mucous and allow acids to attack the lining of the esophagus and stomach.**

9. It is said that a good majority of your immune system rests within the confines of your digestive system. Explain why a person with HIV might exhibit problems with digestion. Think about what the virus does to humans.

**The HIV virus (that causes AIDS) destroys the immune cells of the body. If there are no immune cells, then fighting infection becomes virtually impossible and this is the major reason patients with AIDS die from secondary infections. If a good majority of the immune cells reside within the intestine, but are subsequently destroyed by the HIV virus, then infections of the digestive system and the presence of foreign invaders dramatically increases causing severe digestive issues overall.**

10. What are some of the digestive issues that typical HIV patients exhibit in regards to digestive system?

**Frequent and persistent diarrhea, vomiting, dehydration, digestive infections, reduced nutrient absorption.**

11. What is BMI and why is it an important tool in a physician's diagnostic arsenal? How does a doctor calculate a BMI?

**BMI stands for Body Mass Index. This indicator tool is used to calculate percentage of fat in terms of body mass based on height and overall weight. It can indicate proper nutritive habits, malnutrition, and BMI can be used to indicate if you are overweight, obese, underweight, or normal. Doctors use this tool in diagnosing eating and digestive disorders and the risk for weight related disorders or the risk of disease/death.**