The Digestive System After Swallowing

**Question 1:** What happens when you swallow?

**Answer 1:** Initially, a bolus of food is moved by the tongue from the oral cavity to the pharynx. The epiglottis is forced over the opening of the larynx, and the bolus of food is forced posterior into the esophagus. The soft palate also closes the nasopharynx during this process to prevent entry of food into the nasopharynx. Wave-like contractions of the smooth muscular layers of the gastrointestinal wall, known as *peristalsis*, move the food to the stomach and eventually throughout the rest of the system.

**Question 2:** Does the stomach do all of the digestion?

**Answer 2:** No, the stomach serves as a functional storage chamber, but does carry on both mechanical and chemical digestion. The stomach begins at the gastroesophageal junction and terminates at the beginning of the small intestine, an area known as the *pylorus*. This pylorus leads to the first part of the small intestine, the duodenum, and is guarded by a sphincter of smooth muscle known as the *pyloric sphincter*. The stomach has a number of anatomical regions, which are as follows:

- **Cardiac region:** The area just inferior to the esophageal connection
- **Fundus:** The region of the stomach anatomically superior to the esophageal entry
- **Body:** Also called corpus, the main region of the stomach
- **Pyloric region:** Continuous with the duodenum through the pyloric sphincter
- **Lesser and greater curvatures:** The concavity and convexity of the borders of the stomach

The stomach has mucous cells that produce an alkaline mucous with bicarbonate, which coats and protects the stomach lining from chemical digestion. The internal lining of the stomach has ridges, known as *rugae*. Within the lining of the stomach are a number of cells and structures. Small depressions with deep channels found in this surface are known as the *gastric pits*, with gastric glands that produce gastric juice. These gastric juices, when mixed with food, produce what is known as *chyme*.

The gastric glands contain the following four secretory cells:

- Mucous neck cells
- Parietal cells
- Chief cells
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- Enteroendocrine cells

Mucous neck cells secrete acid mucus; the parietal cells secrete hydrogen and chloride ions that form HCl; and these also secrete intrinsic factor, which is required for the absorption of vitamin B12. Interestingly, without intrinsic factor, a deficiency of B12 develops, and the patient will suffer from a form of anemia known as *pernicious anemia*. The red blood cells in this condition are too large because they lack enough B12 to complete mitotic divisions.

Also, chief cells produce *pepsinogen*, which is inactive, but is activated to pepsin by the presence of HCl in the stomach and pepsin itself via a positive feedback mechanism. Also, the enteroendocrine cells produce regulatory hormones, which include gastrin, histamine, endorphins, serotonin, cholecystokinin (CCK), and somatostatin. The role of gastrin and histamine is to regulate stomach secretions and secretions from other glands.

**Question 3:** What other organs help out in the digestive process?

**Answer 3:** The small intestine consists of three sections: from proximal to distal, these are the duodenum, jejunum, and the ileum. These are the body’s major digestive organs where digestion is completed and most absorption occurs. The small intestine has an increased surface area because of the circular folds, which are deep folds of the mucosa and submucosa; the villi (finger-like projections of the mucosa); and the presence of microvilli, tiny projections from the villi.

The epithelium of the mucosa of the small intestine is designed for digestion and absorption. It contains absorptive cells that produce digestive enzymes, goblet cells that produce mucous, and even enteroendocrine cells that produce regulatory hormones. These microvilli of the small intestine also have enzymes that chyme must come in contact with to be fully digested. These are known as *brush border enzymes*, and are essential for normal function, digestion, and absorption of food.

**Question 4:** Does the liver participate in the digestive process?

**Answer 4:** The liver acts as an accessory digestive organ. This is mainly through the production of bile and other products that aid in chemical digestion of foodstuffs. Anatomically, the liver has four lobes: right, left, caudate, and quadrate. These are external lobes, and internally, the liver is designed to process absorbed nutrients. Hexagonal-shaped liver lobules are found internally
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and are made up of hepatocytes, or liver cells.

The liver produces bile, which is used to emulsify, or break down, fats. As you already know, portions of degraded erythrocytes are also discarded in the bile. This bile is produced in the liver and stored in a small sac on the inferior surface of the liver known as the gallbladder. The gallbladder stores and concentrates bile. It is very common for patients to suffer from inflammation of the gallbladder, a condition that is termed cholecystitis. This condition is often seen in females that are in their fifth decade of life, premenopausal, and somewhat obese. Treatment of this condition includes removal of the gallbladder, a procedure known as a cholecystectomy, as well as dietary and other lifestyle changes.

Bile is a yellow-green, alkaline solution containing bile salts, bile pigments, cholesterol, neutral fats, phospholipids, and electrolytes, and it helps to make cholesterol soluble, especially given the fact that blood is mainly water.

Acidic and fatty chyme in the duodenum causes the release of cholecystokinin (CCK) and secretin into the bloodstream. These substances have multiple effects on organs such as the production and release of bile and pancreatic juices, among others.

**Question 5:** Where is the pancreas, and what does it do?

**Answer 5:** The pancreas is an organ that releases enzymes that break down all categories of foodstuffs. It lies deep to the greater curvature of the stomach. The pancreas is activated by the presence of fatty chyme in the duodenum. The secretions of the pancreas neutralize acidic chyme, as well as provide the optimal environment for pancreatic enzymes to carry out chemical digestion.

The large intestine extends from the ileocecal valve, at the terminal portion of the small intestine, to the anus. The main function of the large intestine is to absorb water and eliminate the waste via feces. It is often believed that the large intestine and the colon are the same anatomic structure, but this is not truly accurate. The colon is a portion of the large intestine, and the parts of the large intestine are as follows:

- The cecum is a small pouch at the junction of the small and large intestines, which has extending from it the vermiform appendix.
- The actual colon is made of the ascending colon, transverse colon, descending colon, and sigmoid colon.
- The sigmoid colon joins the rectum and then becomes the anal canal—
The last segment of the large intestine.

This anal canal opens to the exterior at the anus. The anal canal contains two sphincters to allow the movement of feces from the intestine to the external environment at the appropriate time. The wall of the intestine is smooth muscle; however, the sphincters are of skeletal muscle.