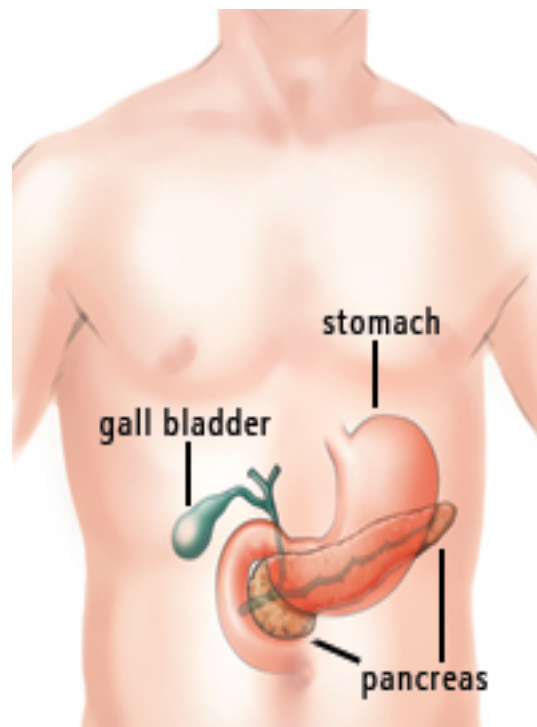


The Pancreas and Its Functions

The **pancreas** is an organ located in the abdomen. It plays an essential role in converting the food we eat into fuel for the body's cells. The pancreas has two main functions: an **exocrine** function that helps in digestion and an **endocrine** function that regulates blood sugar.

Basic Anatomy: The pancreas is located behind the stomach and is surrounded by other organs including the small intestine, liver, and spleen. It is about six inches long and is shaped like a flat pear. The wide part, called the head of the pancreas, is positioned toward the center of the abdomen; the middle section is called the neck and the body of the pancreas; the thin end is called the tail and extends to the left side. Several major blood vessels surround the pancreas, the superior mesenteric artery, the superior mesenteric vein, the portal vein and the celiac axis, supplying blood to the pancreas and other abdominal organs.



Exocrine Function: The pancreas contains exocrine glands that produce **enzymes** important to digestion. When food enters the stomach, these pancreatic juices are released into a system of ducts that culminate in the main **pancreatic duct**. The pancreatic duct joins the **common bile duct** to form the **ampulla of Vater** which is located at the first portion of the small intestine, called the **duodenum**. The common bile duct originates in the liver and the **gallbladder** and produces another important digestive juice called **bile** (*Bile contains mostly cholesterol, bile acids (also called bile salts), and bilirubin (a breakdown product of red blood cells). It also contains water and body salts (potassium and sodium), as well as very small amounts of copper and other metals.*). The pancreatic juices and bile that are released into the duodenum, help the body to digest fats, carbohydrates, and proteins.

Endocrine Function: The endocrine component of the pancreas consists of islet cells that create and release important **hormones** directly into the bloodstream. Two of the main pancreatic hormones are **insulin**, which acts to lower blood sugar, and **glucagon**, which acts to raise blood sugar. Maintaining proper blood sugar levels is crucial to the functioning of key organs including the brain, liver, and kidneys.

As food travels into your stomach then passes through to your small intestine it is greeted by a group of enzymes and zymogens that break it down. These are three classification of enzymes secreted by the pancreas that work to digest carbohydrates, fats and proteins.

Lipase

Lipase is an enzyme that the body uses to break down fats in food so they can be absorbed in the intestines. Lipase is primarily produced in the pancreas but is also in the mouth and stomach. Most people produce enough pancreatic lipase, but people with cystic fibrosis, Crohn's disease, and celiac disease (*a condition in which gluten (a protein found in grains) damages the intestinal tract. Symptoms include abdominal pain, bloating, weight loss, and fatigue. People with celiac disease must follow a strict diet that includes no gluten*) may not have enough lipase to get the nutrition they need from food.

Along with lipase, the pancreas secretes insulin and glucagon, hormones the body needs to break down sugar in the bloodstream. Other pancreatic enzymes include amylase, which breaks down a kind of starch into its sugar building blocks, and protease, which breaks down protein into single amino acids.

- **A shortage may cause**
 - Lack of needed fats and fat-soluble vitamins.
 - Diarrhea and/or fatty stools.

Amylase

Pancreatic amylase is another enzyme found in pancreatic juice. Amylase is released into the small intestine to break down starch. Although starch digestion begins inside the mouth, through salivary amylase, it ceases inside the stomach, so it must continue in the small intestine. With the help of pancreatic amylase, starch is fully digested and can be absorbed for use as energy.

- **A shortage may cause**
 - Diarrhea due to the effects of undigested starch in the colon.

Zymogens

Inside the pancreatic juice are also substances known as zymogens. These are the precursors to the enzymes that break down protein. When the zymogens enter your pancreas, an enzyme known as enterokinase, which is excreted by the brush border cells of the small intestine, converts the zymogens into their usable enzymatic form.

- **A shortage may cause**
 - Allergies or the formation of toxic substances due to incomplete digestion of proteins.
 - Increased risk for intestinal infections.