

What Are the Functions of Amylase, Protease and Lipase Digestive Enzymes

by Joanne Marie, Demand Media

Your digestive system breaks down nutrients you consume in food, converting them into small molecules that your cells, tissues and organs use as fuel and for hundreds of metabolic functions. It takes hours to complete this complex process, which results in simple sugars, fatty acids, glycerol and amino acids. After you break food into small pieces by chewing it, specialized enzymes made in different parts of your digestive tract act on it to finalize the process.

Amylase

Amylase is a digestive enzyme that acts on starch in food, breaking it down into smaller carbohydrate molecules. The enzyme is made in two places. First, salivary glands in your mouth make salivary amylase, which begins the digestive process by breaking down starch when you chew your food, converting it into maltose, a smaller carbohydrate. When starchy foods like rice or potatoes begin to break down in your mouth, you might detect a slightly sweet taste as maltose is released. Cells in your pancreas make another type of amylase, called pancreatic amylase, which passes through a duct to reach your small intestine. Pancreatic amylase completes digestion of carbohydrate, producing glucose, a small molecule that is absorbed into your blood and carried throughout your body.

Protease

Any enzyme that breaks down protein into its building blocks, amino acids, is called a protease, which is a general term. Your digestive tract produces a number of these enzymes, but the three main proteases are pepsin, trypsin and chymotrypsin. Special cells in your stomach produce an inactive enzyme, pepsinogen, which changes into pepsin when it contacts the acid environment in your stomach. Pepsin breaks certain chemical bonds in proteins, producing smaller molecules called peptides and beginning protein digestion. Your pancreas makes trypsin and chymotrypsin, enzymes that are released into your small intestine through the pancreatic duct. When partially digested food moves from your stomach into your intestine, trypsin and chymotrypsin complete protein digestion, producing simple amino acids that are absorbed into your circulation.

Lipase

Lipase is an enzyme that breaks down dietary fats into smaller molecules called fatty acids and glycerol. A small amount of lipase, called gastric lipase, is made by cells in your stomach. This enzyme specifically digests butter fat in your food. The main source of lipase in your digestive tract is your pancreas, which makes pancreatic lipase that acts in your small intestine. First, bile made in your liver and released into your intestine converts dietary fat into small fatty globules. Pancreatic lipase, also called steapsin, acts on these fat globules, converting them into fatty acids and glycerol, which are small, energy-dense molecules used by all your cells. Fatty acids and glycerol travel in blood and your lymph vessels to reach all parts of your body.

Other Enzymes

Although amylase, protease and lipase are the three main enzymes your body uses to digest food, many other specialized enzymes also help in the process. Cells that line your intestines make enzymes called maltase, sucrase and lactase, each able to convert a specific type of sugar into glucose. Similarly, special cells in your stomach secrete two other enzymes -- renin and gelatinase. Renin acts on proteins in milk, converting them into smaller molecules called peptides, which are then fully digested by pepsin. Gelatinase digests gelatin and collagen, two large proteins in meat, into moderately-sized compounds whose digestion is then completed by pepsin, trypsin and chymotrypsin, producing amino acids.

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Amylase, protease and lipase are proteins secreted by organs in the gastrointestinal tract to help in the process of digestion. The pancreas produces the bulk of these proteins, while the glands that produce saliva in the mouth also secrete amylase. From the pancreas, the enzymes travel to the duodenum portion of the small intestine to help in the breakdown of food.

The Pancreas

The pancreas is the main source of [digestive](#) enzymes. According to the Merck Manual, these enzymes travel from the pancreas to the small intestine in inactive form and become active only when they enter the gastrointestinal tract. Inflammation or damage to the pancreas, also known as pancreatitis, releases high levels of these enzymes into the bloodstream. These levels can then be used to diagnose pancreatic conditions, and to monitor the recovery of the pancreas. Common causes of pancreatitis include chronic alcoholism, gallstones, viruses and medications.

Amylase

Amylase is a protein that helps break down complex carbohydrates into simple sugars. This is necessary for the body to be able to absorb sugars and use them for energy. Amylase also helps break down starch, the main storage form of sugar in the plants we ingest, and allows for its digestion. Amylase can be detected in the blood in small amounts, but high levels of amylase can help in the diagnosis and monitoring of pancreatitis, an inflammation of the pancreas. According to [Lab Tests](#) Online, the amylase level can be four to six times higher than normal during acute pancreatitis.

Lipase

Lipase is another pancreatic enzyme. Its main function is to help [digest](#) fats. Dietary fats are composed mainly of triglycerides, which cannot be absorbed by the intestine in their natural form. Lipase helps in the absorption of fats by breaking down triglycerides into fatty acids, which can be easily absorbed by the intestinal surface. Lipase levels also increase during pancreatitis. According to Lab Tests Online, lipase levels go up within a day or two after the onset of acute pancreatitis and stay elevated for five to seven days.

Protease

The pancreas secretes several proteases, including trypsin and chymotrypsin, to aid in the digestion of proteins. Although the stomach starts the breakdown of proteins with another digestive enzyme called pepsin, the bulk of the process takes place in the intestine, with the help of proteases. Proteases could auto-digest the pancreas if active, so they are produced in an inactive form until released into the intestine, where they become active.