Small Intestine Digestion

Small intestine digestion occurs in the duodenum, the first section of the small intestine. The epithelial cells are lined with microvilli, which is called the "brush border" region. There are many enzymes there that assist with digestion, and the brush border is a region of absorption later in the small intestine. The pancreas exocrine cells release enzymes that help with digestion through a duct that connects the pancreas and gallbladder to the duodenum. The pancreas also releases bicarbonate through the duct that helps neutralize the acidic chyme entering from the stomach. In addition, the small intestine Goblet cells secrete mucus into the duodenum which helps protect the endothelial cells from that acidic environment. Some of the enzymes located in the brush border help activate pancreatic and intestinal enzymes. One of the brush border enzymes, enterokinase, activates pancreatic trypsin. Trypsin then activates chymotrypsin and other pancreatic digestive enzymes. Trypsin and chymotrypsin digest proteins. The gallbladder release bile, which is made in the liver, through a duct into the duodenum. Bile emulsifies fats and makes them soluble which allows fat-digesting enzymes to function. One fat-digesting enzyme is pancreatic lipase, which breaks down lipids into free fatty acids. The other pancreatic enzymes are amylase, which breaks down carbohydrates into simple sugars (a process beginning in the mouth), and pancreatic nucleases which break down DNA/RNA into sugar, phosphate, and the bases.

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Brush border enzymes
Enzyme-Brushes on Border
Brush border enzymes are the digestive enzymes sitting on the microvilli-covered epithelial cells lining the small intestine. They are the terminal sites of carbohydrate digestion and also assist in absorption.

Pancreatic Enzymes are secreted via a Duct
Lip-laser leaving Duck-mouth coming from Pancreas
A pancreatic duct is the part of the pancreas that connects to the small intestine and carries pancreatic secretions to the duodenum.

Pancreas secretes bicarbonate
Bi-car-bombs coming out of Pancreas
The pancreas secretes bicarbonate through the duct to neutralize the acidic chyme entering from the stomach.

Brush Border activates Pancreatic Trypsin
Brush Border Trips-sun
The brush border enzymes activate pancreatic trypsin. Specifically, enterokinase (enteropeptidase) activates trypsin.

Trypsin activates Chymotrypsin
Tripped-sun trips Kite-trip-sun
Once activated, trypsin activates chymotrypsin and other pancreatic enzymes.

Trypsin and Chymotrypsin digest Proteins
Kite-trip-sun holding Steak
Trypsin and chymotrypsin are proteases that digest proteins and break them down into amino acids.

Gallbladder Releases Bile
Gull with Rolling Tile-pin
The gallbladder stores bile synthesized in the liver and releases it into the duodenum to emulsify fats. This allows for the fat-digesting enzymes to access the fat molecules by keeping fats in solution.

Pancreatic Lipase breaks down Lipids
Lips-laser Blasting bacon into small Lips
Lipase released from the pancreas breaks lipids down into free fatty acids.

Goblet cells secrete mucus
Goblin's nose spewing Mucus
Goblet cells in the duodenum secrete mucus that buffers the acidic chyme coming in and protects the walls of the duodenum.

Pancreatic Amylase breaks down Carbohydrates

Animal-Cracker with Laser blasting Bread

Amylase released from the pancreas continues the breakdown of carbohydrates into simple sugars that began in the mouth.

Pancreatic Nucleases breakdown DNA/RNA

Nuclear-guy Breaking DNA-strand with laser

Nucleases released from the pancreas break down DNA and RNA molecules which are absorbed in the ileum as sugar, base, and phosphate.

Digestion occurs in the Duodenum

Duet-demons

All of the digestive functions of the small intestine occur in the duodenum, which is the first part of the small intestine. An easy way to remember this is that duodenum and digestion both start with "D". The other two parts are the ileum and jejunum.