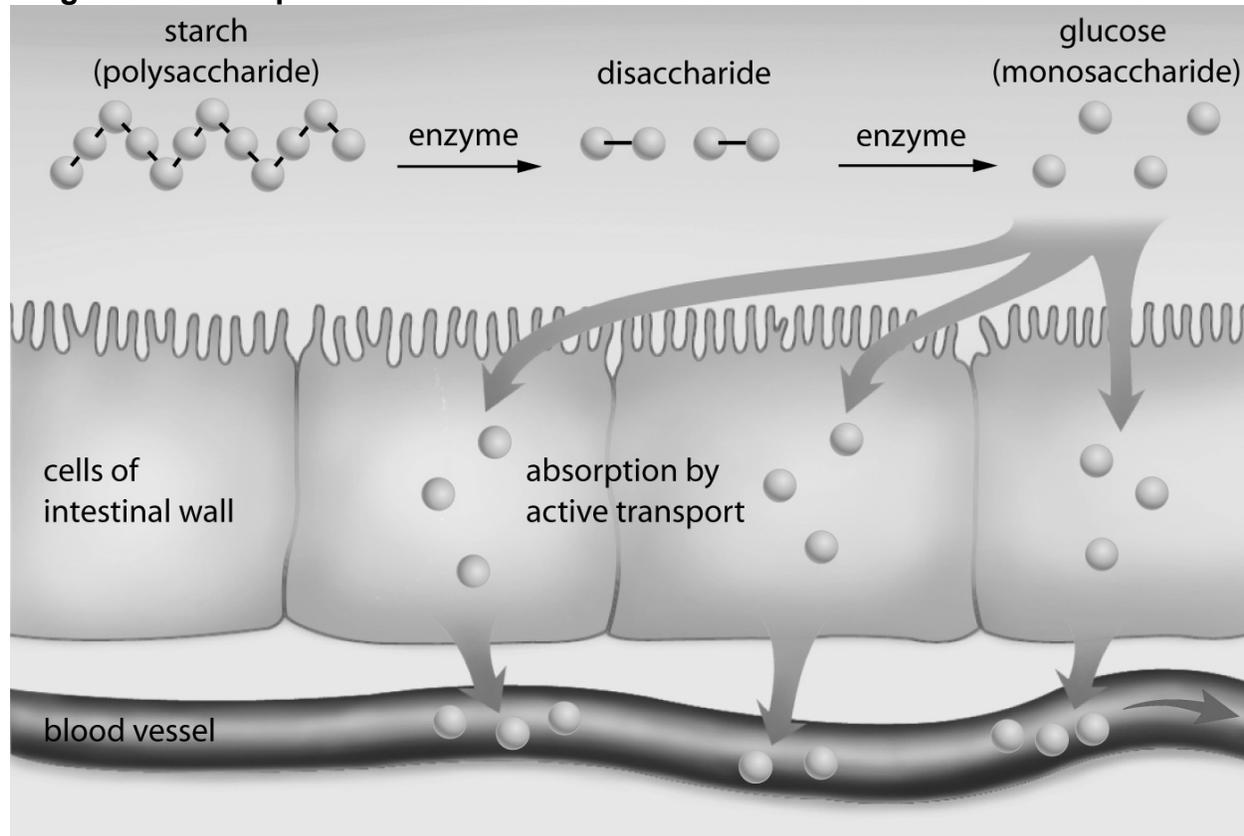
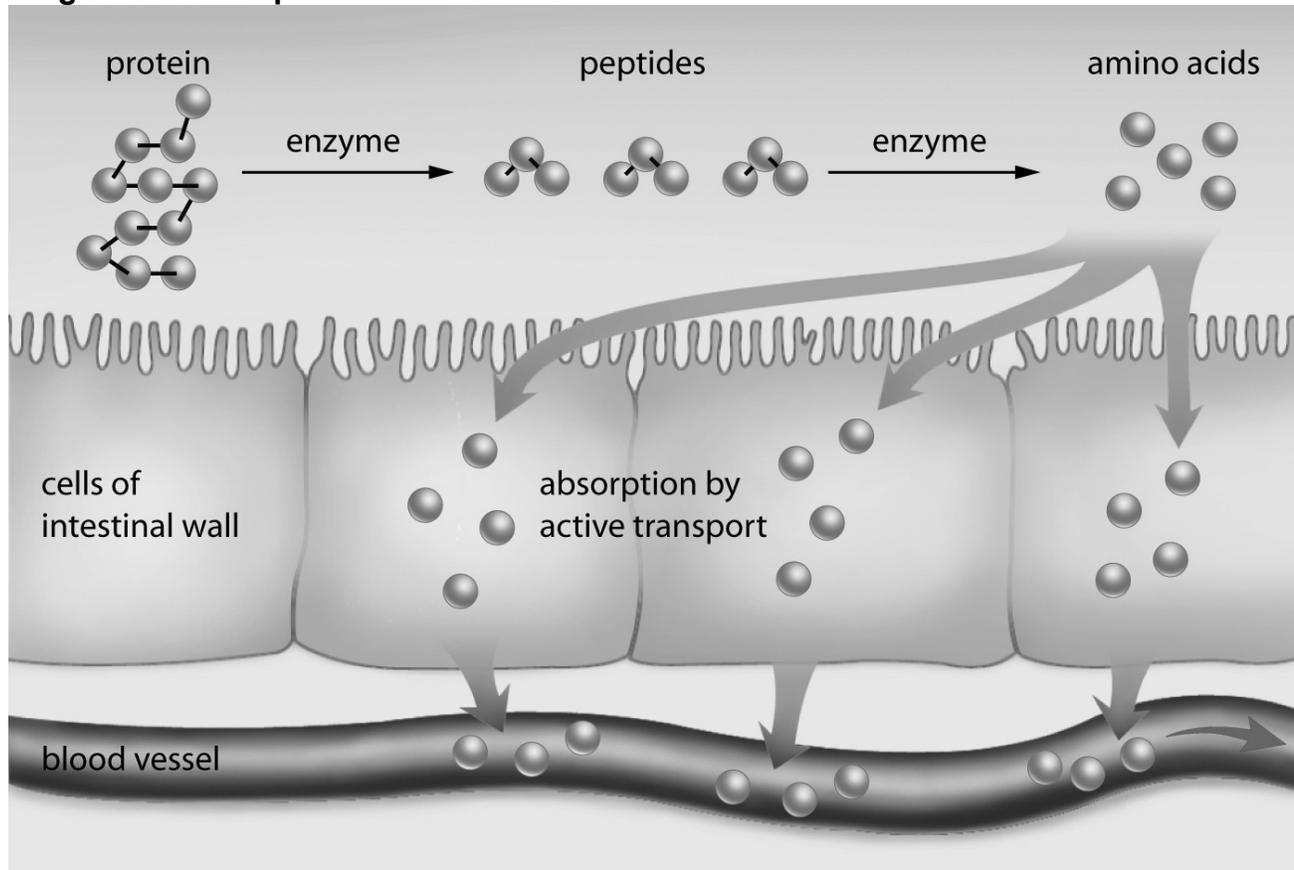


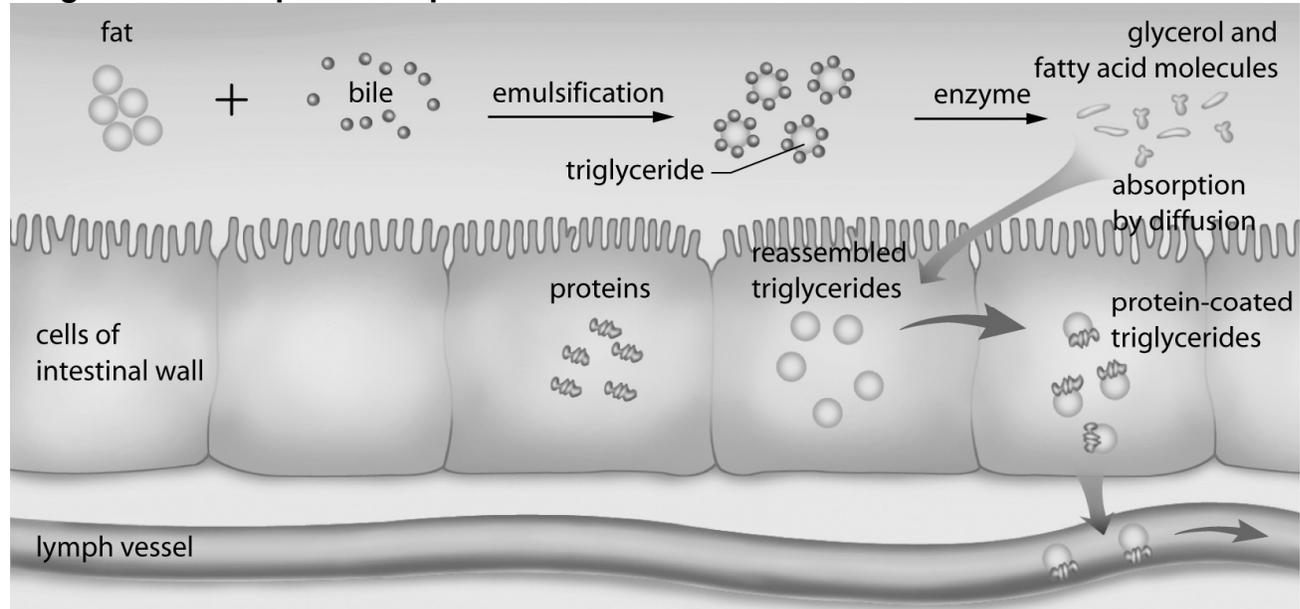
Diagram 1: Absorption of Glucose

1. The digestion of starch:

- The digestion of starch begins in the mouth with salivary amylase.
- In the stomach, hydrochloric acid (acidic pH) denatures the salivary amylase so starch digestion is stopped.
- Chyme enters the duodenum; the pH rises to pH of 8.
- Pancreatic amylase completes the digestion of starch to disaccharides.
- Other carbohydrases hydrolyze the disaccharides into monosaccharides such as glucose.
- Monosaccharides are absorbed by active transport (requires ATP) into the intestinal villi.
- From the cells of the intestinal lining, the monosaccharides enter the bloodstream and are transported directly to the liver.
- Monosaccharides other than glucose are converted into glucose by the liver.
- Glucose is circulated from the liver by the bloodstream to all the body cells where it is used as a source of energy.

Diagram 2: Absorption of Amino Acids


2. The digestion of proteins:

- The polypeptides that are produced by the action of pepsin are further digested in the small intestine by two proteases secreted by the pancreas.
- These proteases, trypsin and chymotrypsin, are secreted as inactive enzymes and then activated by a different enzyme secreted in the small intestine.
- Both trypsin and chymotrypsin hydrolyze the peptide bonds between specific but different amino acids, resulting in the formation of short peptide chains.
- Different peptidases split the short peptide chains into single amino acids.
- The amino acids are then absorbed by active transport into the villi of the small intestine.
- From there, the amino acids diffuse into the blood capillaries and are carried, like the sugars, directly to the liver.

Diagram 3: Absorption of Lipids


3. The digestion of fats:

- The arrival of fats in the duodenum stimulates the secretion of bile, which emulsifies the fat droplets into a fine suspension.
- Emulsification is a physical process, not a chemical process. The bonds that join the glycerol and fatty acids in fats are not hydrolyzed by emulsification.
- The breakdown of fats by hydrolysis is carried out by lipase secreted in the duodenum.
- The resulting glycerol and fatty acids are absorbed into the cells of the villi by simple diffusion.
- Inside the cells of the intestinal lining, the fat subunits are reassembled into triglycerides and then coated with proteins to make them soluble before they enter the lymph vessels in the villi.
- The lymph vessels carry the coated triglycerides to the chest region, where they join the bloodstream.
- Once in the bloodstream, the protein coating is removed by lipase in the lining of the blood vessels. Lipase hydrolyzes the triglycerides, making free fatty acids and glycerol available for use by the body cells.