

Small Intestine Absorption

Absorption in the small intestine occurs in all three of its sections; the duodenum, jejunum and ileum. Three groups of nutrients undergo similar paths into the bloodstream. Carbohydrates and amino acids undergo active transport through the membrane into the epithelial cells because of size and charge. However, small lipids can passively diffuse into the epithelial cells because of the small size and similar composition to membranes. From the epithelial cells, these molecules travel to the intestinal capillaries and travel to the hepatic portal system, and to the liver for processing. Unlike these smaller molecules, large lipids must first be broken down for transport. They are broken into triglycerides, reformed as chylomicrons, and are transported by the lacteals through the lymphatic system.



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Characteristics

Carbohydrates Undergo Active Transport

Bread on ATP conveyor-belt

Carbohydrates must undergo active transport to be absorbed into the epithelial cells of the small intestine, because they cannot passively pass through the membrane.

Amino Acids Undergo Active Transport

Amigo-lemon on ATP conveyor-belt

Amino acids also must undergo active transport into the epithelial cells of the small intestine because many of them are charged. This is important, because they cannot passively be absorbed as many amino acids go against an electrochemical gradient.

Small Lipids Undergo Passive Diffusion

Small Lips slipping through membrane

Small lipids can passively diffuse through the membrane into intestinal cells because they are small and nonpolar.

Epithelial Cells

E-pick Cells

The epithelial cells of the small intestine are the first layer of cells that absorb nutrients. They must pass the absorbed nutrients through to intestinal capillaries.

Intestinal Capillaries

Caterpillars

The intestinal capillaries bring oxygenated blood to the small intestine, but also carry away the nutrients absorbed. Because blood entering the small intestine through these capillaries have low concentrations of nutrients, a concentration gradient is established that facilitates the movement and absorption of these nutrients into the blood.

Hepatic Portal Transports Nutrients

Happy-face Portal to Liver

Hepatic portal circulation is used to transport nutrients to the liver for processing.

Liver

Liver

The liver is the processing center for many nutrients, except for most fats. Most fats bypass first-pass metabolism in the liver and enter the circulation.

Large Lipids Transported as Chylomicrons

Large Lips attached to Kite-mic

Larger lipids cannot diffuse through the membrane into the intestinal cells, so they are broken down into triglycerides and form chylomicrons for transport.

Lacteals Transport Chylomicrons

Locked-eel eating large Lips tied to Kite-mic

The lacteals are lymphatic capillaries that absorb dietary fats in the villi of the small intestine. These lacteals transport chylomicrons through the lymphatic system into blood circulation.