DIGESTION and ABSORPTION

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I. DEFINITIONS

1) **Digestion** : it is the mechanical and chemical breaking down of food into smaller components, to a form that can be easily absorbed.
2) **Absorption**: is the net passage of a substance from the lumen of the gut across the epithelium to the interstitial fluid.

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II. Mechanisms involved in the digestive process in various parts of the digestive system

Mouth and Esophagus

1) **Deglutition** or **act of swallowing** is a mechanism that moves food from the mouth into the stomach. it occurs in 3 stages namely:
a) **Voluntary stage** in which the bolus moves into the oropharynx

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b) **The involuntary pharyngeal stage** in which the bolus stimulates receptors in the oropharynx which send impulses to the deglutition center in the medulla oblongata and the lower pons of the brain stem. the returning impulses cause the larynx to be raised upward , and the epiglottis prevents food from entering the larynx. at the same time, respiration ceases temporally as the bolus passes down the pharynx to the esophagus. once inside the esophagus, breathing resumes. the esophageal stage in which the bolus is pushed through the esophagus into the stomach by another mechanism called the peristalsis

c) **the esophageal stage** in which the bolus is pushed through the esophagus into the stomach by another mechanism called the peristalsis.

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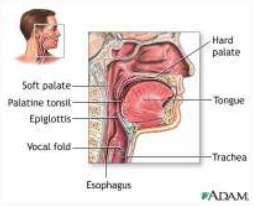
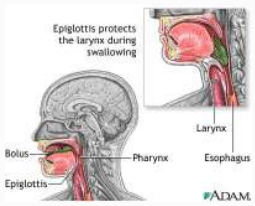
THE DEGLUTITION PROCESS





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2) Peristalsis

It is the mechanism by which food is moved along the digestive system. It consists of a wave of contraction of the muscle coat which is usually proceeded by a wave of relaxation. The bolus is forced onward by the contraction into the segment ahead.

This mechanism will ensure the movement of the bolus from the esophagus into the stomach

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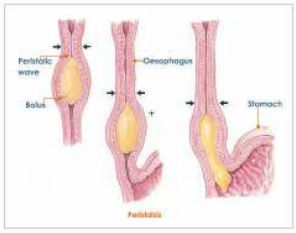
THE PERISTALSIS PROCESS



Stomach and Intestines

The mechanism involved at these levels is **peristalsis**.

When food get into the stomach, gentle contraction of the stomach wall mix the bolus with the gastric juice forming a thin fluid called the **chyme.** The muscular wall of the stomach is stronger in the pyloric region, and the peristalsis waves here force several milliliters of chyme into the duodenum through the pyloric sphincter. The later opens to permit the passage of chyme into the duodenum.

In the duodenum, the chyme comes into contact with the pancreatic juice and bile from the pancreas and liver respectively.

In the small intestine, the chyme is propelled along by a series of short peristaltic waves. The unabsorbed residue of the food passes through the ileocaecal valve from the small intestine to the large

Digestion and absorption of carbohydrates

Digestion

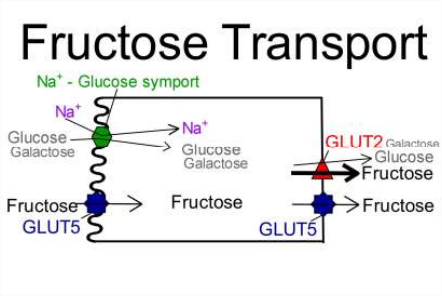
Dietary lactose, sucrose and maltose derived from the digestion of starch diffuse in the small intestine lumen, and come in contact with the surface of absorptive epithelial cells covering the villi where they engage with brush border hydrolases:

-Maltose will be broken down into 2 molecules of glucose.

-lactose will be broken down into glucose and galactose

-sucrose will be broken down into glucose and fructose

Absorption of fructose, glucose and galactose

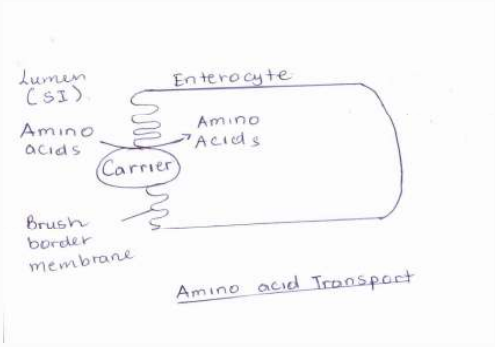


Digestion and absorption of proteins

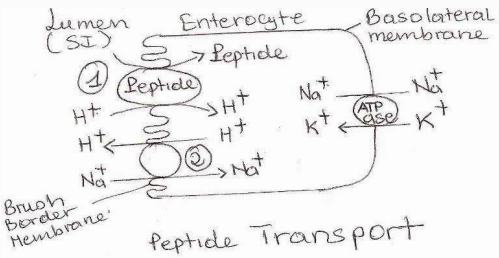
Digestion of proteins

Proteins are broken down by pepsin in the stomach, and by pancreatic trypsin and chymotrypsin in the small intestine. The fragments are then digested to free amino acids by carboxypeptidase from the pancreas and aminopeptidase from the intestinal epithelium.

Absorption of amino acids



Absorption of peptides



Digestion and absorption of fats

Digestion of fats

The bile salts from the liver convert the fat into micelles which form a clear suspension with water.

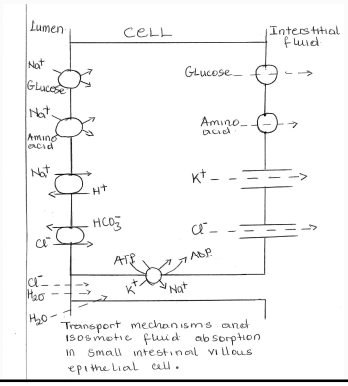
The action of bile salts is aided by lipase which splits some of the fat into mono and diglycerides and free fatty acids.

Absorption of fats

The fat is absorbed into the intestinal lymphatics. These are known as lacteals because of the milk-like appearance of their contents due to minute fat droplets (chylomicrons). These droplets of neutral fats pass to the fat depots of the body situated under the skin and in the abdomen.

Some of the fat split by lipase is absorbed into the blood and reaches the liver via the portal vein where it is reconstituted into

Ionic equilibrium



THANKS FOR LISTENING