Biology Presentation for olevel's

Topic: "Digestion"

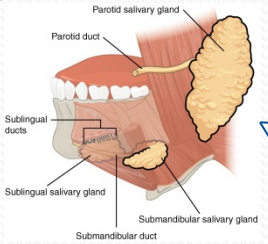
Digestion is the breakdown of large, insoluble food molecules into small, water-soluble molecules using mechanical and chemical processes.

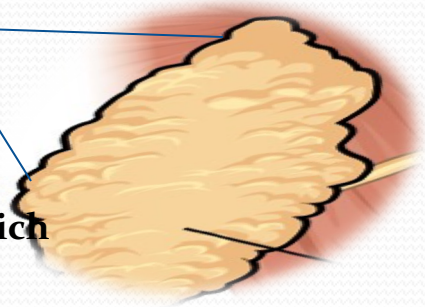
Learning Outcomes:

.Mechanical And Chemical Digestion
.peristalsis
.digestion in stomach
.digestion in duodenum
.absorption in ileum and jejunum (parts of small intestine)
.adaptations of villi
. functions of large intestine
.fate of the products of digestion

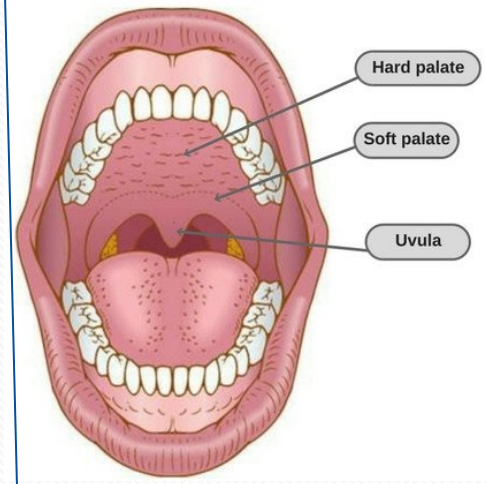
MOUTH/ BUCCAL CAVITY: (Ingestion occurs in mouth)

.Mechanical And Chemical Digestion :-





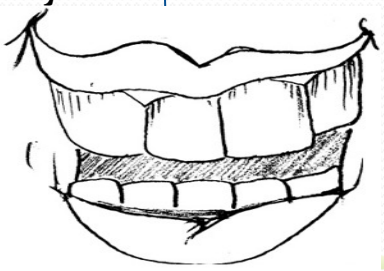
Salivary gland:
Produces saliva which is 98% water and has mucus and amylase enzyme

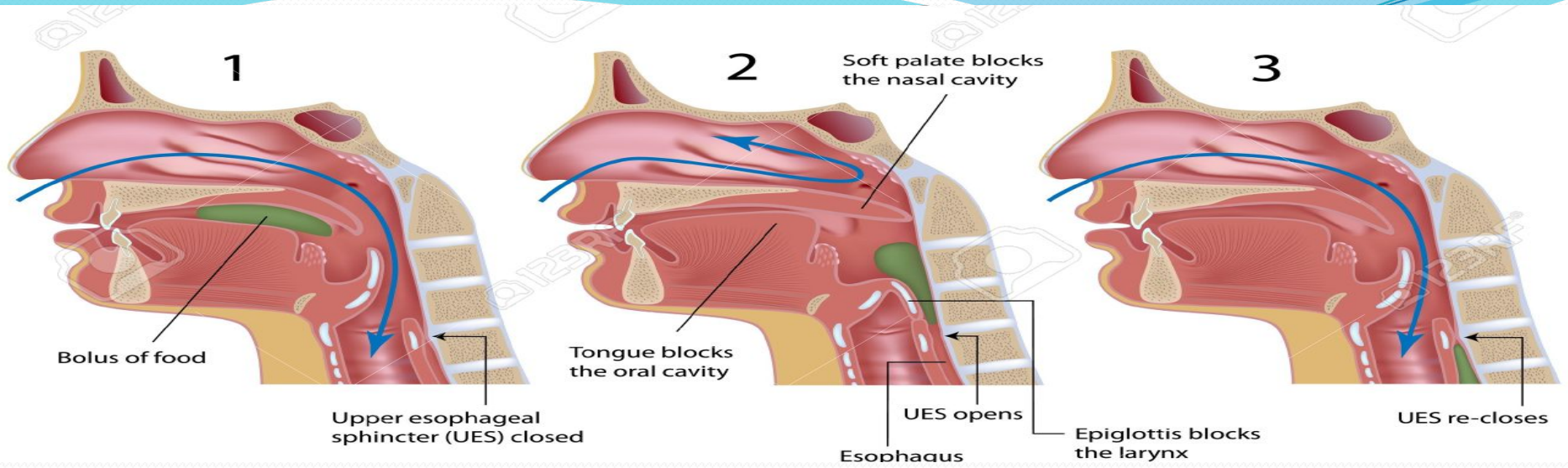


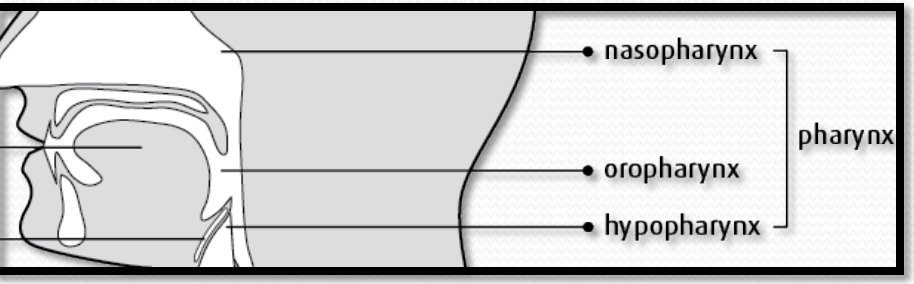
The soft palate and the **uvula** move together to close off the nasopharynx, and prevent food from entering the nasal cavity.

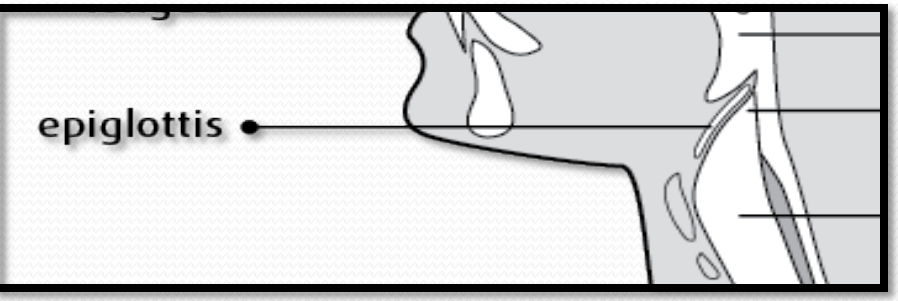
>The digestive functions of saliva include moistening **food**, amylase that breaks some starches down into maltose
and helping to create a **food bolus**, so it can be swallowed easily. The pH is maintained near neutrality (**6.7-7.3**) by saliva.

>Teeth help in mechanical digestion by method of chewing which results in
***Prevention of dental diseases**
***Healthy stomach and intestines**









Pharynx:
Pharynx is the next destination for food you've eaten. From here, food travels to the esophagus or swallowing tube.

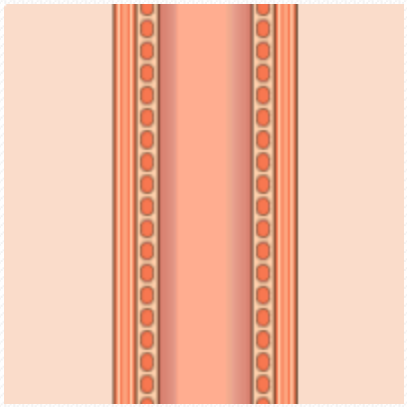
The **epiglottis** is a flap in the throat that keeps food from entering the windpipe and the lungs.

Peristalsis:

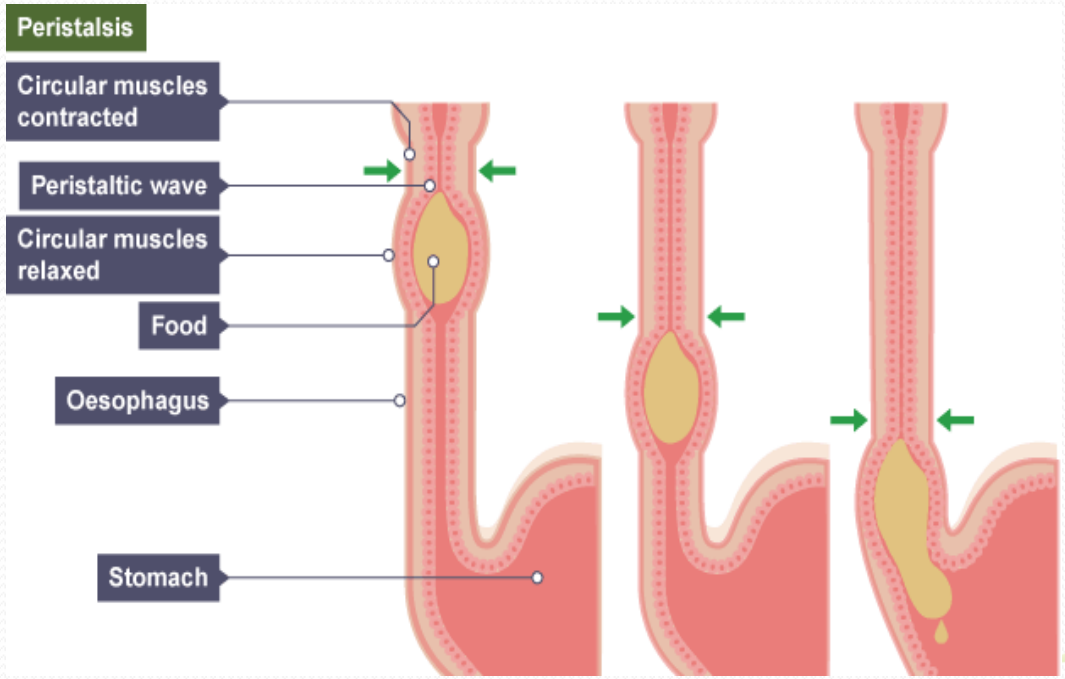
Peristalsis is a series of wave-like muscle contractions to physically breakdown food and propel it forward. Food is moved distally along the tract. Two sets of muscles in the gut wall are involved:

.>circular muscles - which reduce the diameter of the gut when they contract

.>longitudinal muscles - which reduce the length of the gut when they contract



This shows movement of peristalsis



STOMACH:

The internal organ in which the major part of the digestion of food occurs, being (in humans and many mammals) a pear-shaped enlargement of the alimentary canal linking the oesophagus to the small intestine.

•Mechanical and chemical digestion in stomach

•Adaptations/Functions of stomach

.Mucus lining wall

.Low PH

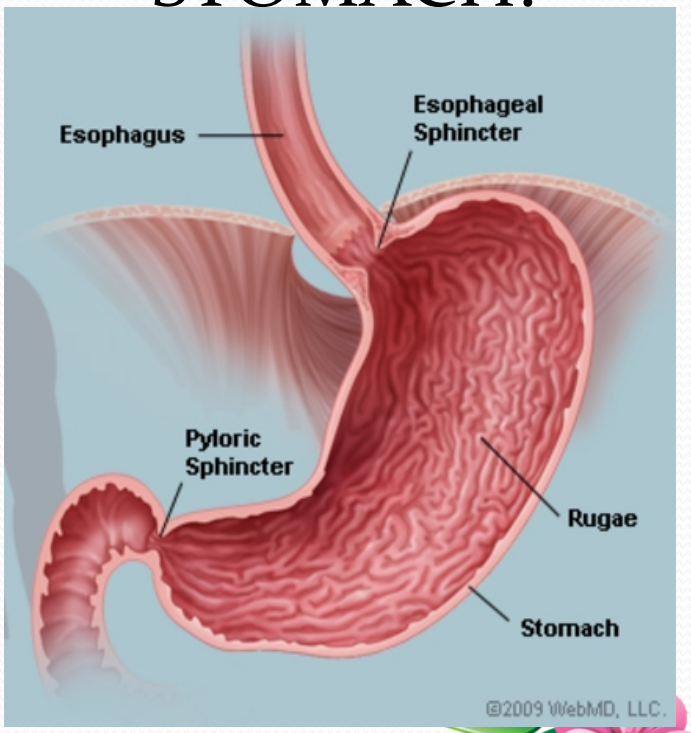
.Sac like organ

.Production of HCl provides the acidic PH.

.Activates Pepsinogen into Pepsin

. Prorenin is converted into Renin by HCl.(curdles milk)

.Casein (milk protein) converts in to peptides or peptones



•This mass of food that is semi-digested, acidic and pulpy is called the chyme.

•Some stomach conditions and diseases

. Peptic Ulcers

. Gerd (symptom is heart burn)

. Dyspepsia(nausea and vomiting)

•Healthy habit for healthy stomach

. Limit junk food

. If you experience bouts of acidity, consider food items that are alkaline in nature.

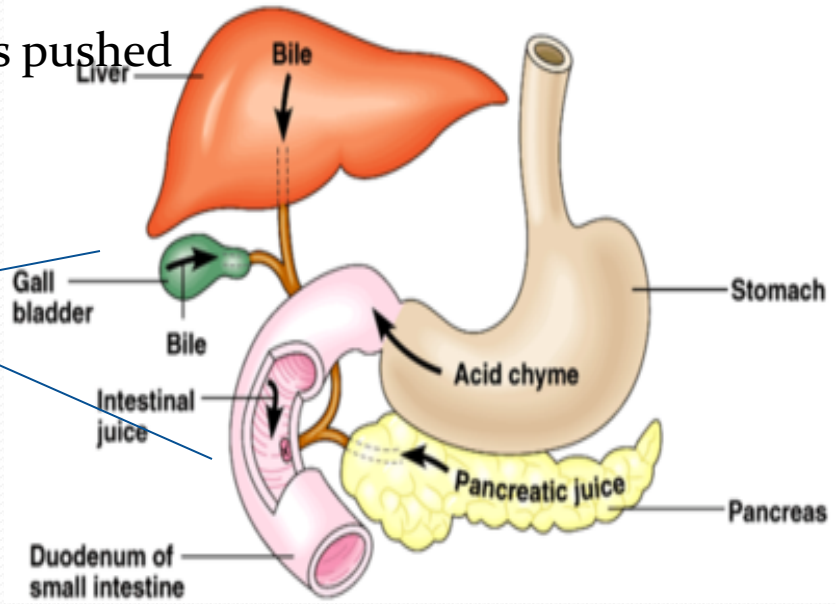
. Take walks, it aids digestion, will help you shed calories.

.No exercise contributes to stomach-related problems.

. Certain food types do not agree with you, try to keep away from them.

Duodenum:

After digestion pyloric sphincter opens and chyme is pushed to a C-shaped **structure** lying adjacent to the stomach, and first part of small intestine leading to jejunum is known as duodenum



•**Gallbladder** is a four-inch, pear-shaped organ. It's positioned under your liver in the upper-right section of your abdomen. The **gallbladder** stores bile, a combination of fluids, fat, and cholesterol. Bile helps break down fat from food in your intestine. It also helps to change acidic chyme to alkaline chyme .

•**Bile Juice** is a dark green to yellowish brown fluid, produced by the liver of most vertebrates, that aids the digestion of lipids (fat) in the small intestine, this stored bile is discharged into the duodenum. About 400 to 800 ml of bile is produced per day in adult human beings.

•The biomacromolecules are broken down in the duodenum region.

This table shows secretions in duodenum and their products.

SECRETION	ACTS UPON	PRODUCTS	RELEASED FROM
Maltase	Maltose	Glucose	Intestinal glands
Sucrase	Sucrose	Glucose, fructose	Intestinal glands
Erepsin	Peptones/ peptides	Amino acid	Intestinal glands
Amylase	Starch	Maltose	Pancreas
Trypsinogen, inactive (activated by enterokinase in to trypsin)	Peptones/ peptides	Amino acid	Pancreas
Bile juice	Fats	Emulsifies it	Liver gall bladder
Pancreatic lipase	Fats	Fatty acid and glycerol	Pancrea

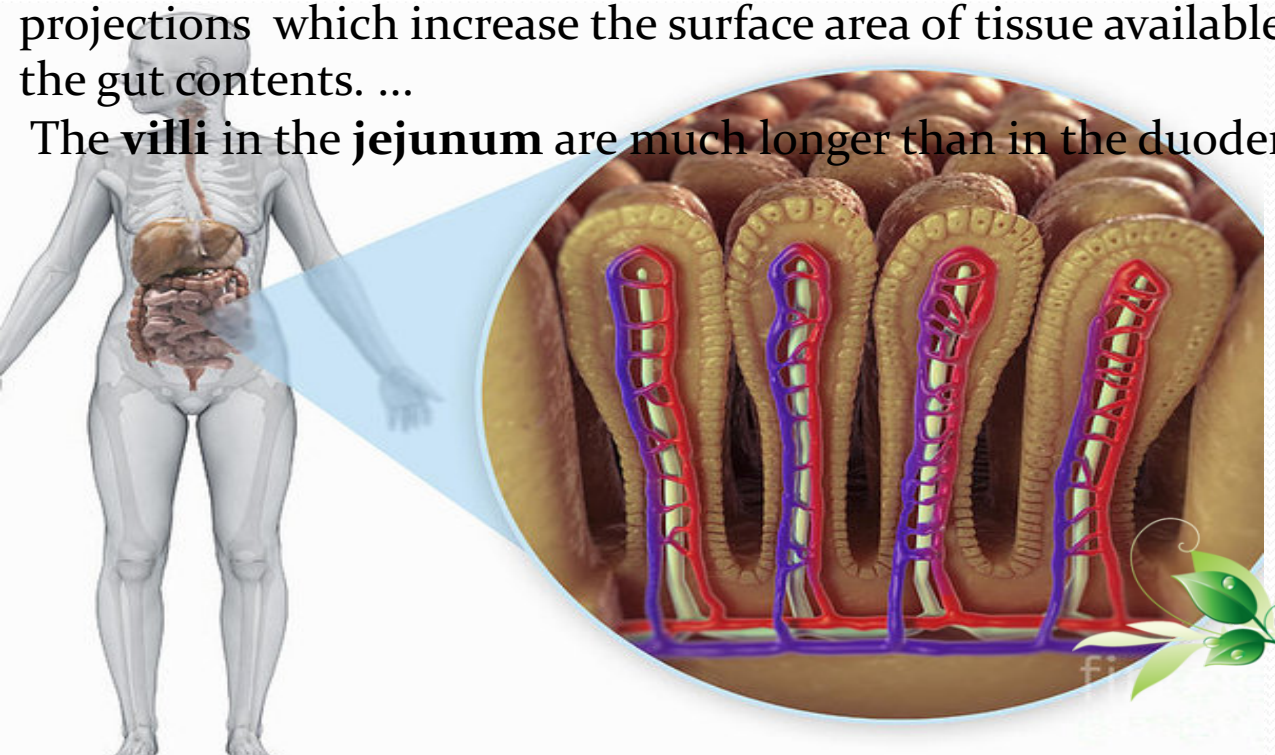
JEJUNUM:

The jejunum is one of three sections that make up the small intestine. The jejunum makes up about two-fifths of the small intestine.

The main function of the jejunum is absorption of important nutrients such as sugars, fatty acids, and amino acids. Nutrients absorbed by the jejunum enter the bloodstream, where they can then be distributed to the organs of the body.

Most of the nutrients are absorbed from the small intestine and moved into the blood stream via a system of small folds, called villi. The inner surface of the **jejunum**, it's mucous membrane, is covered in projections called **villi,** which are tiny finger like-projections which increase the surface area of tissue available to absorb nutrients from the gut contents. ...

The **villi** in the **jejunum** are much longer than in the duodenum or **ileum**.



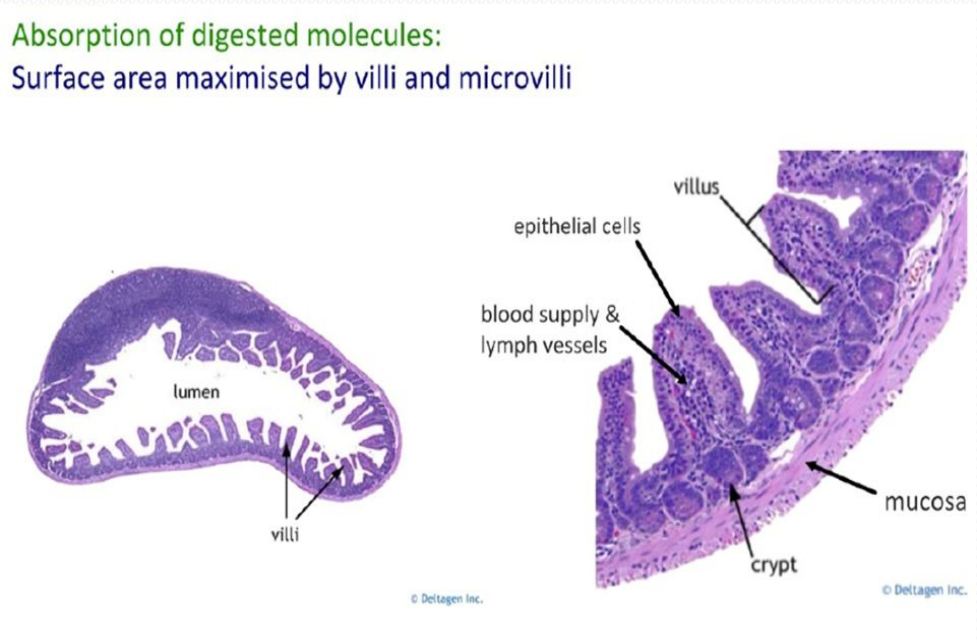
Following are the salient adaptations of villi that make them good absorbers:

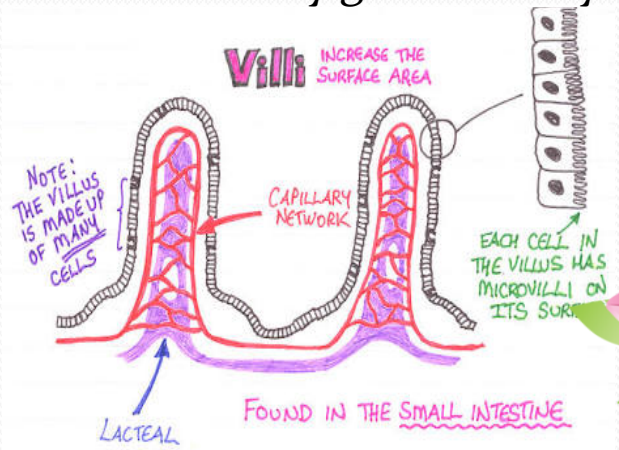
.Villi are **single cell thick.** Thus nutrients don't have to travel longer distance in order to diffuse into bloodstream. This increase the rate of diffusion. Hence absorption rate is also increased.

.Villi have **rich network of blood capillaries** . Thus a steep concentration gradient is maintained between inside of small intestine and blood.

.Most important is: Apical membranes of Villi further form many finger-like projections called **microvilli or brush borders**. Villi together with it's microvilli tremendously increase surface area of absorption. And hence supports effective absorption of nutrients into blood.

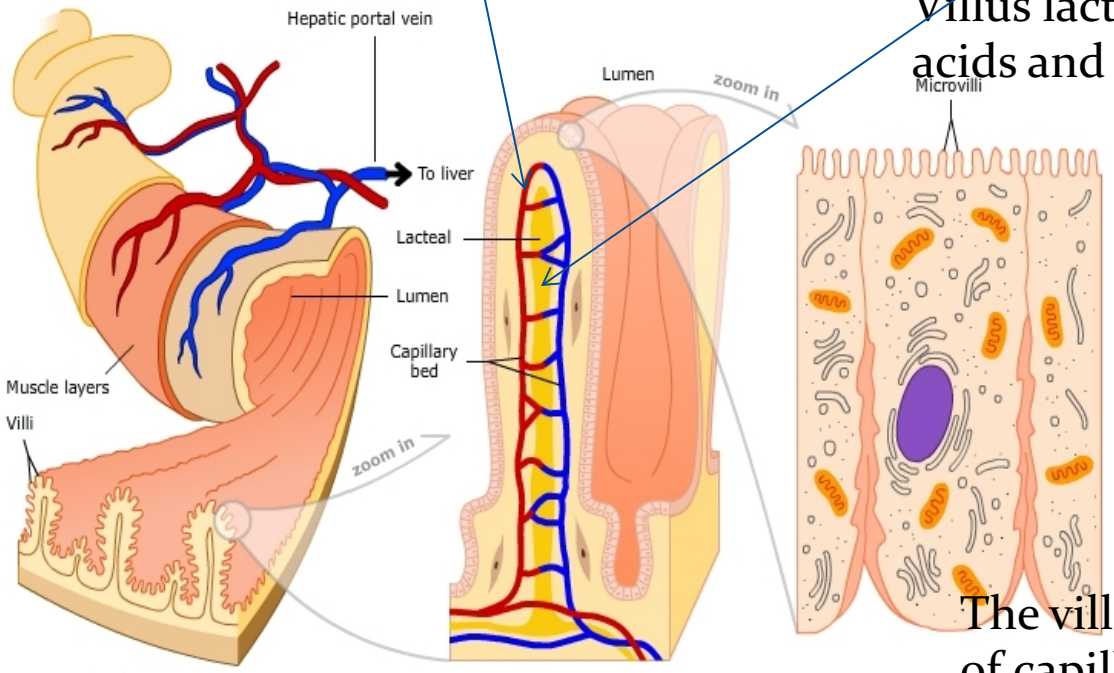
.Villi have **permeable membranes** . Thus, nutrients can easily get their way through them.

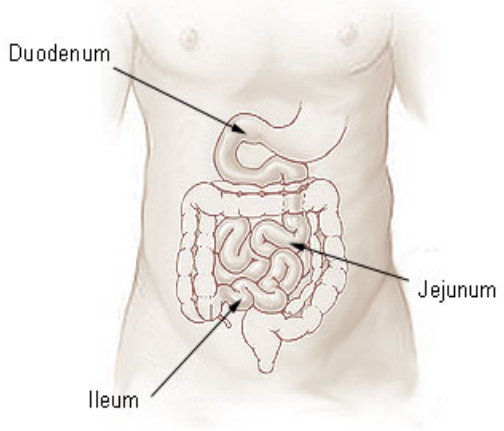


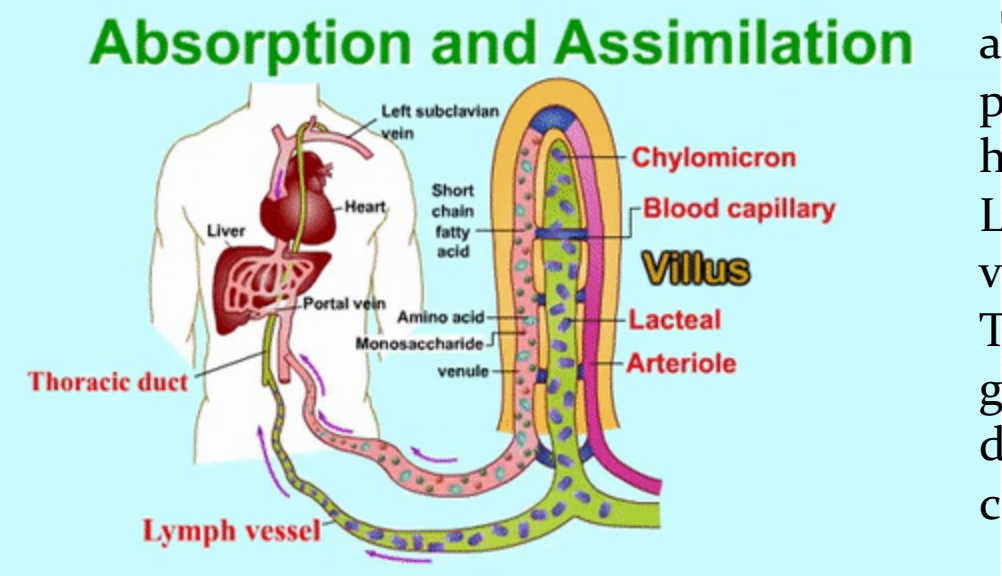


Villus capillaries collect amino acids and simple sugars taken up by the villi into the blood stream by active transport.

Villus lacteals (lymph capillary) collect fatty acids and glycerol through **diffusion**







The villi contain large numbers of capillaries that take the amino acids and glucose produced by digestion to the hepatic portal vein and the liver. Lacteals are the small lymph vessels that are present in villi. They absorb fatty acids and glycerol, the products of fat digestion, into direct circulation.

FATE OF PRODUCTS OF DIGESTION:

After digestion products of digestion amino acids , fatty acids glycerols and glucose is transferred to liver where they are utilized

.Glucose is used for respiration mainly Glucose serves as a primary fuel to generate energy that the body's cells use to carry out their metabolic and biological functions. and excess glucose is stored as glycogen by a hormone released from pancreas named “Insulin”, in time of needs glycogen breaks back to be used, through a hormone called “glucagon”.

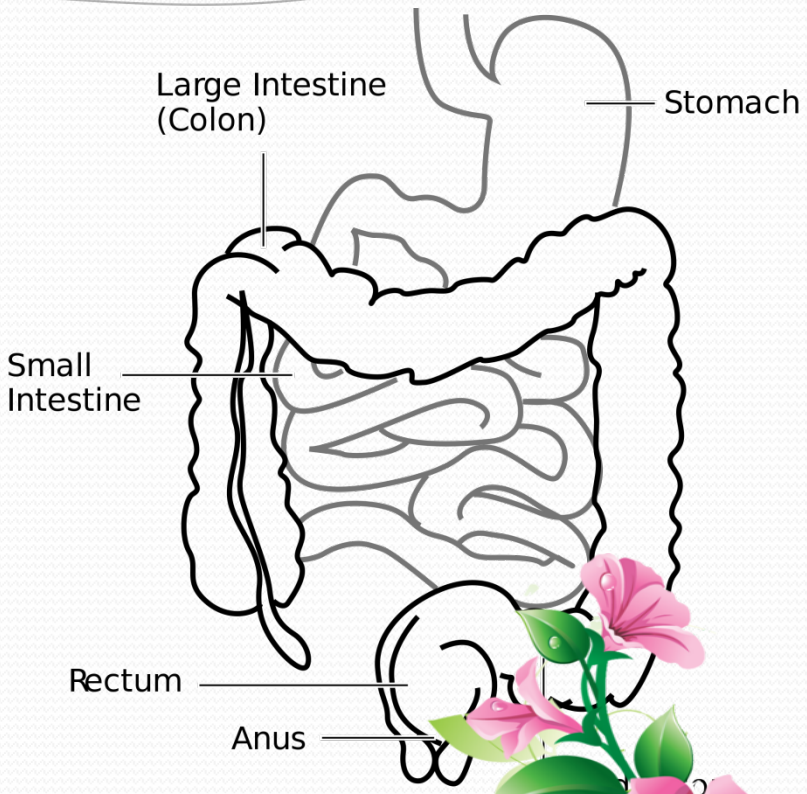
.Amino acids are utilized in building up new cells , growth and tissues .They're needed for vital processes like the building of proteins and synthesis of hormones and neurotransmitters. When excess amino acid is ingested amino acid is oxidized in the presence of an enzyme catalyst. At the same time the amine group, $-NH_2$, and a hydrogen atom, H, are removed from the main structure of the amino acid. The important product of this reaction is ammonia. The amine group is reduced to ammonia by the addition of a hydrogen atom. This process is called **deamination**. The non-nitrogenous portion of the molecule is converted to carbohydrates or fats. The urea and water are released from the liver cells to the bloodstream and transported to the kidneys where the blood is filtered and the urea is passed out of the body in the urine.

.The liver will send the fats to the muscle cell for energy or the adipose **fat** cell for storage .their most important function is to maintain cell’s structure . **Fatty acids and glycerol** are stored in adipose **fat** in complex forms, such as triglycerides until they are needed for metabolic processes.

Large intestine;

By the time indigestible materials have reached the colon, most nutrients and up to 90% of the **water** has been absorbed by the small intestine. The role of the ascending colon is to absorb the remaining **water** and other key nutrients from the indigestible material, solidifying it to form stool.

The descending colon stores feces that will eventually be emptied into the rectum. The sigmoid colon contracts to increase the pressure inside the colon, causing the stool to move into the rectum. The rectum holds the feces awaiting elimination by defecation.

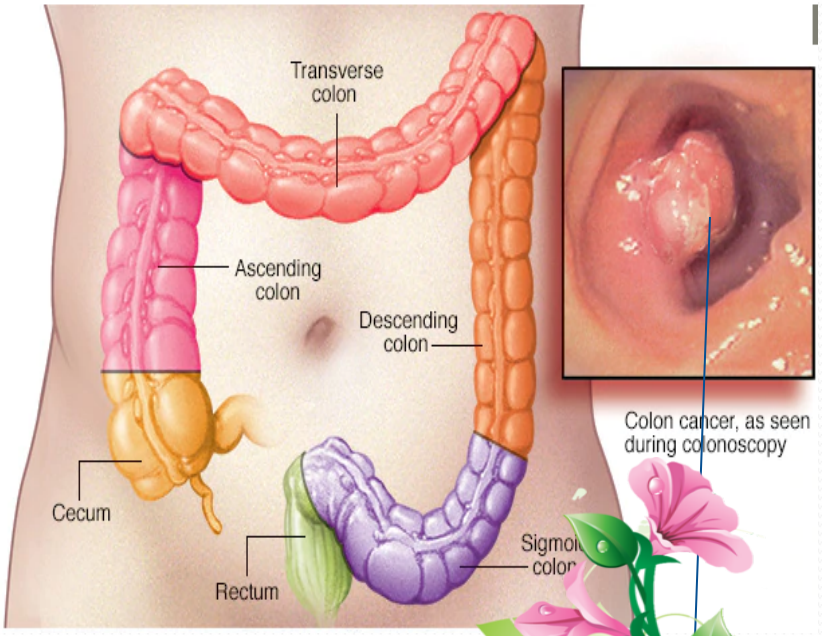


Colorectal cancer is cancer that occurs in the colon or in the lower colon near the rectum. It is one of the most common causes of cancer-associated death.

Diseases and symptoms:

Colorectal cancer is cancer that occurs in the colon or in the lower colon near the rectum. It is one of the most common causes of cancer-associated death.

Diarrhoea is when your bowel movements become loose or watery. Diarrhoea occurs when the lining of the intestine is unable to absorb fluid, or it actively secretes fluid. It can cause dehydration. Infectious diarrhoea is most commonly caused by viruses passed from person to person, or by eating or drinking food or water contaminated with viruses or bacteria. If you have diarrhoea you should drink plenty of fluids.



Over time some of these p… …becom… colon cancers.

Thanks