agMOOCs

Digestion, absorption and utilization of Nutrients-1

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Welcome back. Last two classes we have seen about the relationship between food, nutrition and health. We have seen what are the definitions which are related to these topics and how different nutrients are present in food and what are their actions in brief. So let us for this we have to know how digestion occurs in the food. How does the absorption occurs and how nutrients are utilized. So today let us see what is the digestion, absorption and utilization of nutrients.

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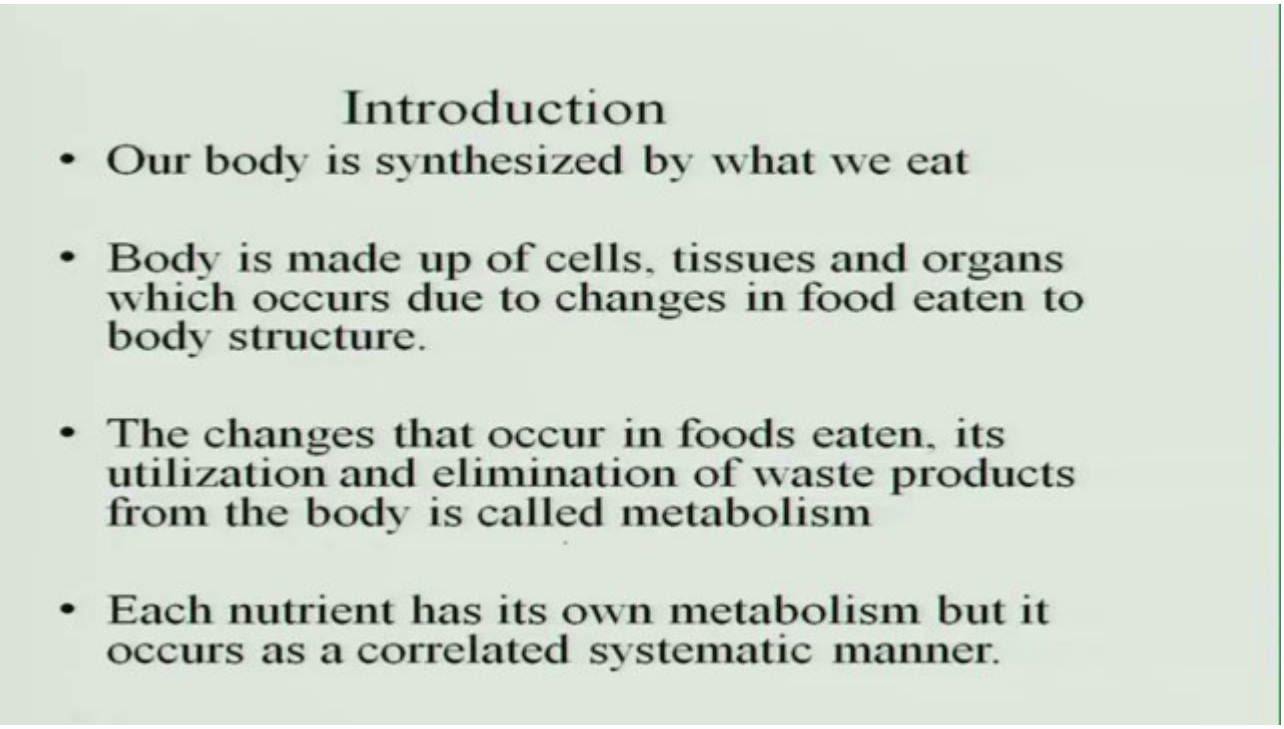

So I already told you what is the role of food and we are what we eat, isn't it. So our body is synthesized mainly by what we eat. So body is made up of cells, tissues and organs which occurs due to changes in the food eaten to body structure. So the body structure is made up by the food that we eat. And the changes that occur in the food eaten is by the utilization and elimination of waste products from the body which is called as metabolism. Each nutrient has its own metabolism and this metabolism occurs in a correlated systematic manner.

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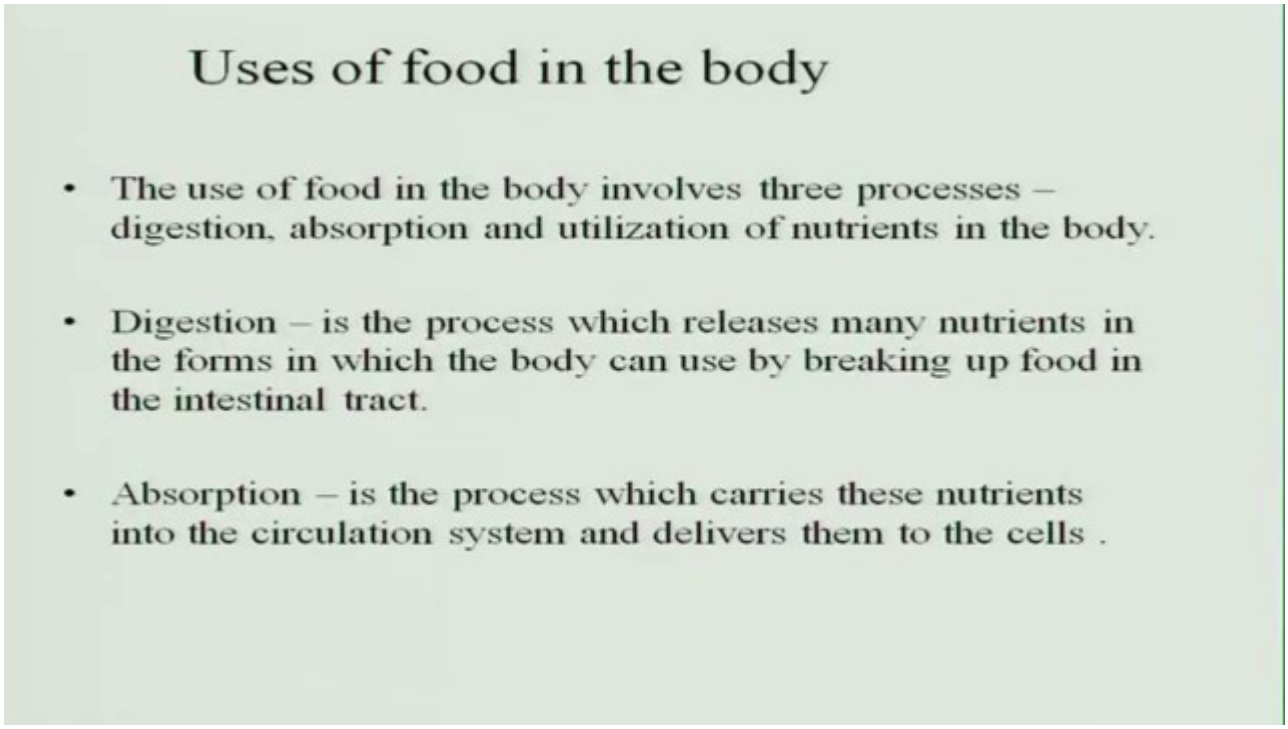

Now what are the uses of food in the body? We have been talking about the uses of food in the body. So it involves in three processes that is the digestion, absorption and utilization of nutrients in the body. These are the main functions of the food in the body. Now digestion, what is digestion? It is a process which releases the many nutrients in the form in which the body can break the food and utilize them in the intestinal tract. That mean simply digestion is breaking up of the food into simpler particles where the food can be utilized. And absorption is the process which carries these broken nutrients or simpler form of nutrients into the circulatory system and finally they deliver them into these cells.

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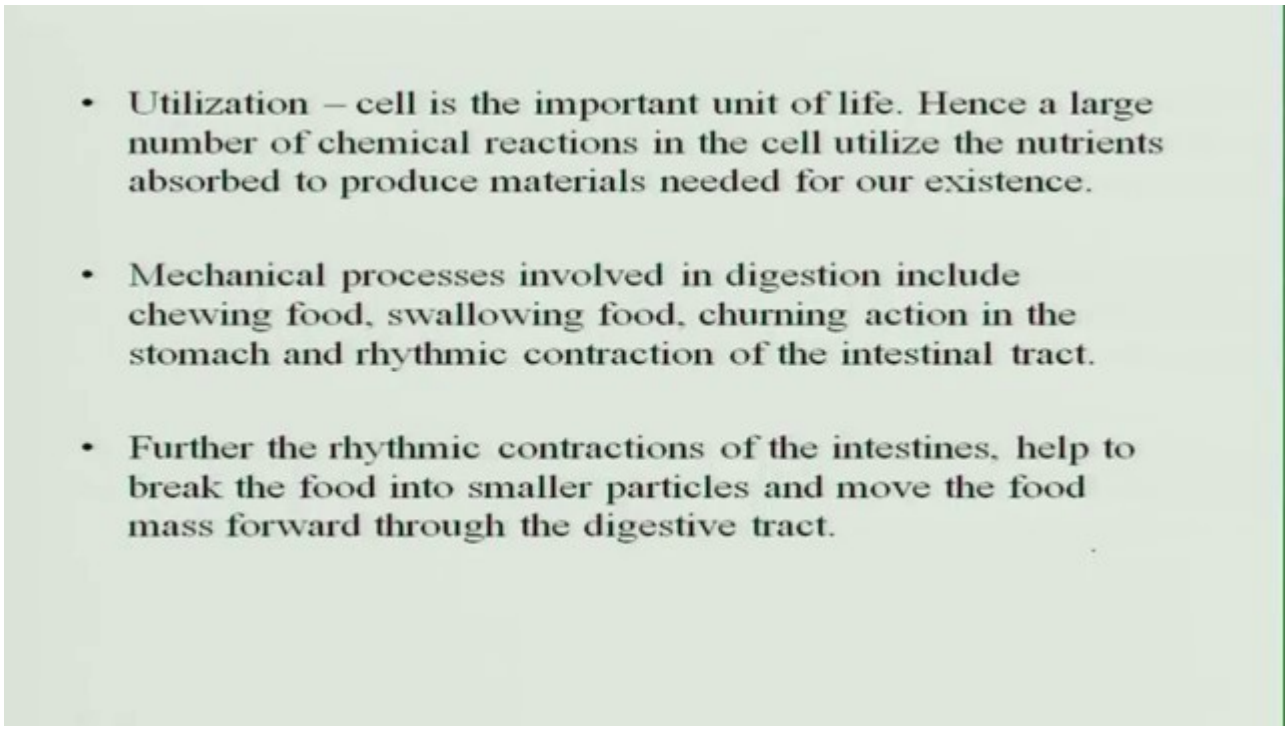

And utilization, after the four nutrients are absorbed and carried to the different cells, the cell being an important part of the life, so large number of chemical reactions takes place in these cells. So these reactions are to utilize the nutrients absorbed and produce the materials that are needed for our existence. And mechanical processes are involved in the digestion. So the moment we put our food in our mouths we start chewing them. So this is a mechanical action, chewing food. Then after chewing food you swallow the food. Then when it reaches the stomach churning action in the stomach starts. Then because of the rhythmic contractions which is called as the peristaltic movement. So the food moves slowly throughout the gastrointestinal tract to get absorbed and utilized because of the rhythmic contraction. So further these rhythmic contractions in the intestines they help to break the food into smaller particles then get mixed with the enzymes properly and the food mass is moved forward through the digestive tract.

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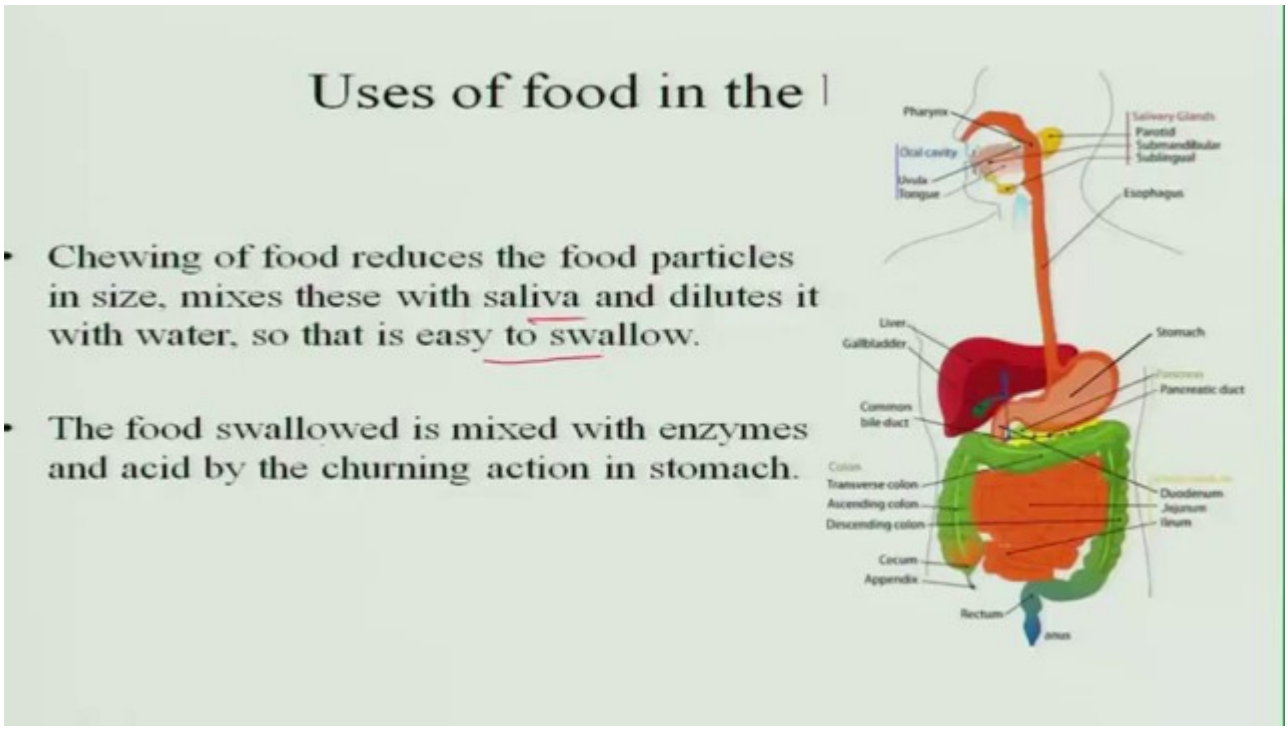

Now chewing the food reduces the food particles into smaller size and it mixes with the saliva first in the mouth, so that it dilutes with the water. You imagine we produce about 1 to 1.5 litres of saliva per day. So this is the amount of water that is mixed with the food, so that the food becomes very easy to swallow. When you eat something dry in the mouth you imagine the saliva makes it into a substance which can be solved very easily, because dry substances cannot be swallowed through the digestive tract. Now the food swallowed is mixed with the enzymes and acid and then churning action takes place. So here is the oral cavity where the food is chewed and it has to go through this very small tube, imagine. So for that the food has to become like a slurry and so that it can be swallowed and then reaches the stomach.

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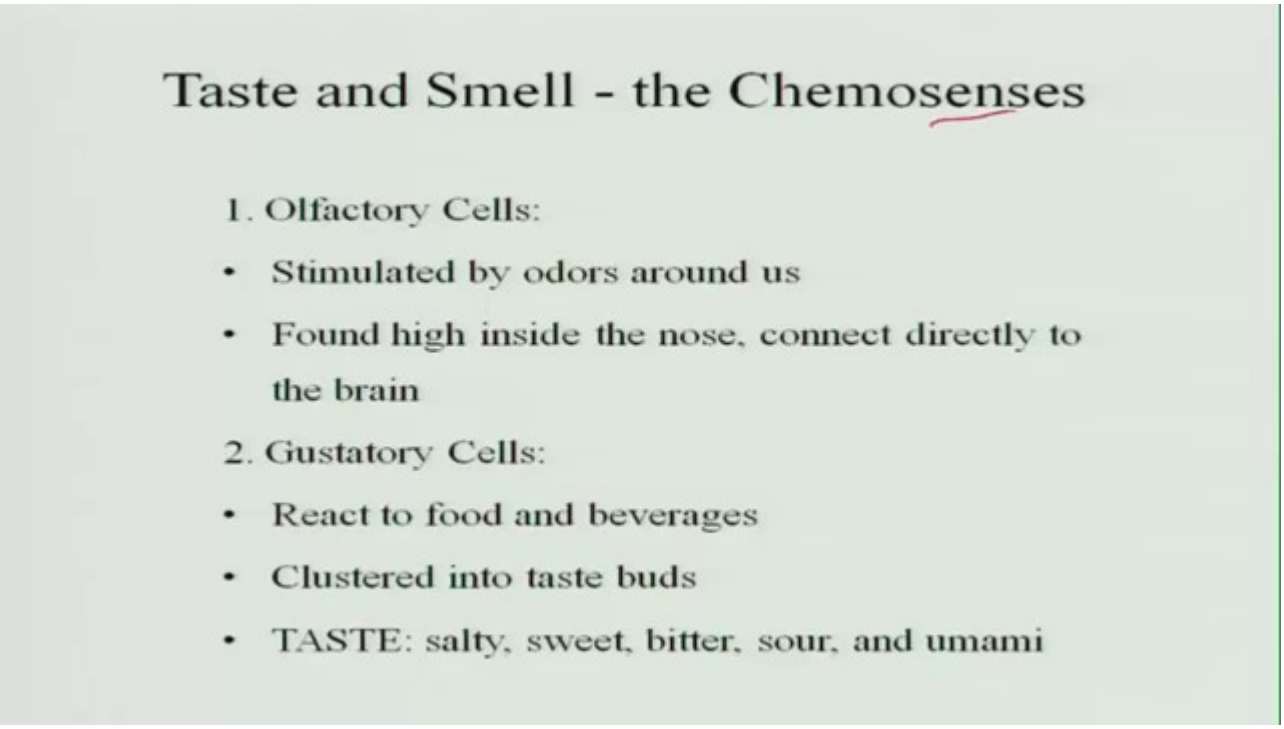

Now taste and smell are the chemosenses. How do we you feel hungry? Sometimes because of sight of food then when we talk of food we feel it like eating something, then the flavor or the smell of food also makes us feel hungry. So there are certain chemosenses which are required for the eating the food, so we have olfactory cells which are stimulated by the odour that is pure present around us. Say, suppose you are passing through a food court you get so many types of smell and some of the flavor attracts you to go and eat the food.

Then these olfactory cells are found inside the nose and they are connected directly to the brain. So they send these impulses to the brain and brain sends the – I mean answer saying that you continue with eating the food, isn't it. Then you have the gustatory cells which react to the food and beverages that means, when you eat the food in your mouth you get the taste, how do you recognize the taste because of these gustatory cells. So these are clustered into taste buds.

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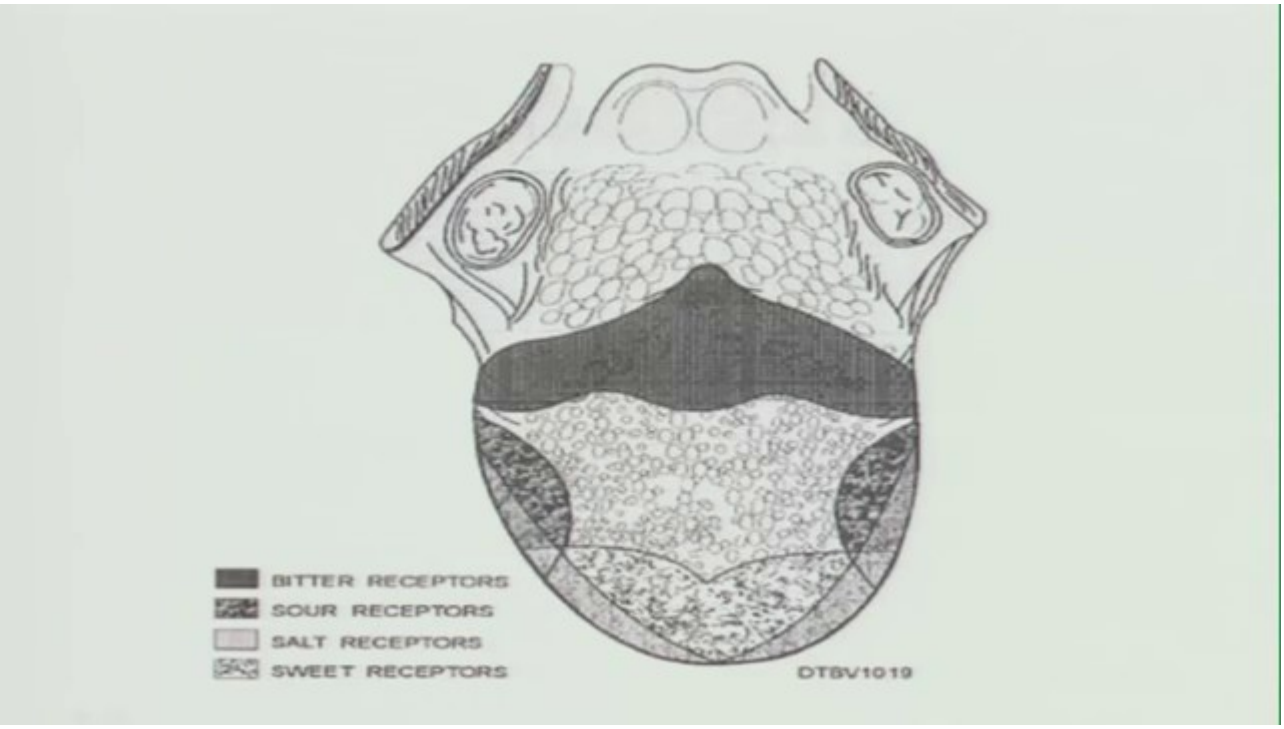

So taste, we have different types of taste like the salty taste, the sour taste, bitter taste and sweet taste. So the entire tongue does not recognize each taste. You have different sites in the tongue where different types of tastes are recognized. When you eat any bitter food the front part of the tongue does not have any role in recognizing the bitterness. So this is the end part of the tongue is the one which recognizes the bitter taste. I mean the sour taste is recognized by these taste buds which are present in the sides of the tongue. And the tip of the tongue is recognized it recognizes the salty taste. And the later part of the -- I mean the after the tip you can recognize the sweet. So these are the various areas that in the tongue recognize different taste. That is how we taste the food.

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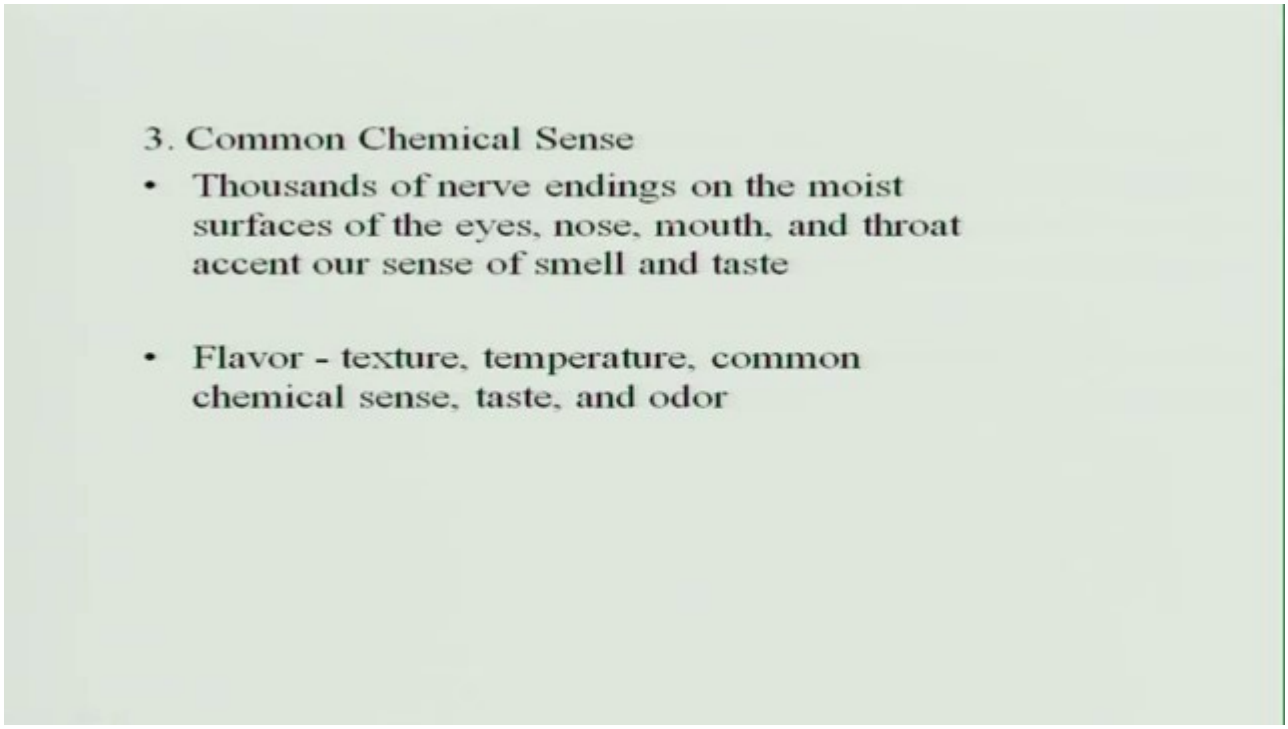

Then the common chemical sense, so there are thousands of nerve endings on the moist surfaces of eyes, your nose, mouth, throat, so all these help in recognizing the smell and taste of food. So flavor when we talk flavour, we talk about smell, we talk about odor, we talk flavor. So flavor it typically is a combination of texture, temperature then common chemical sense, taste and colors. So all these put together give us the flavour.

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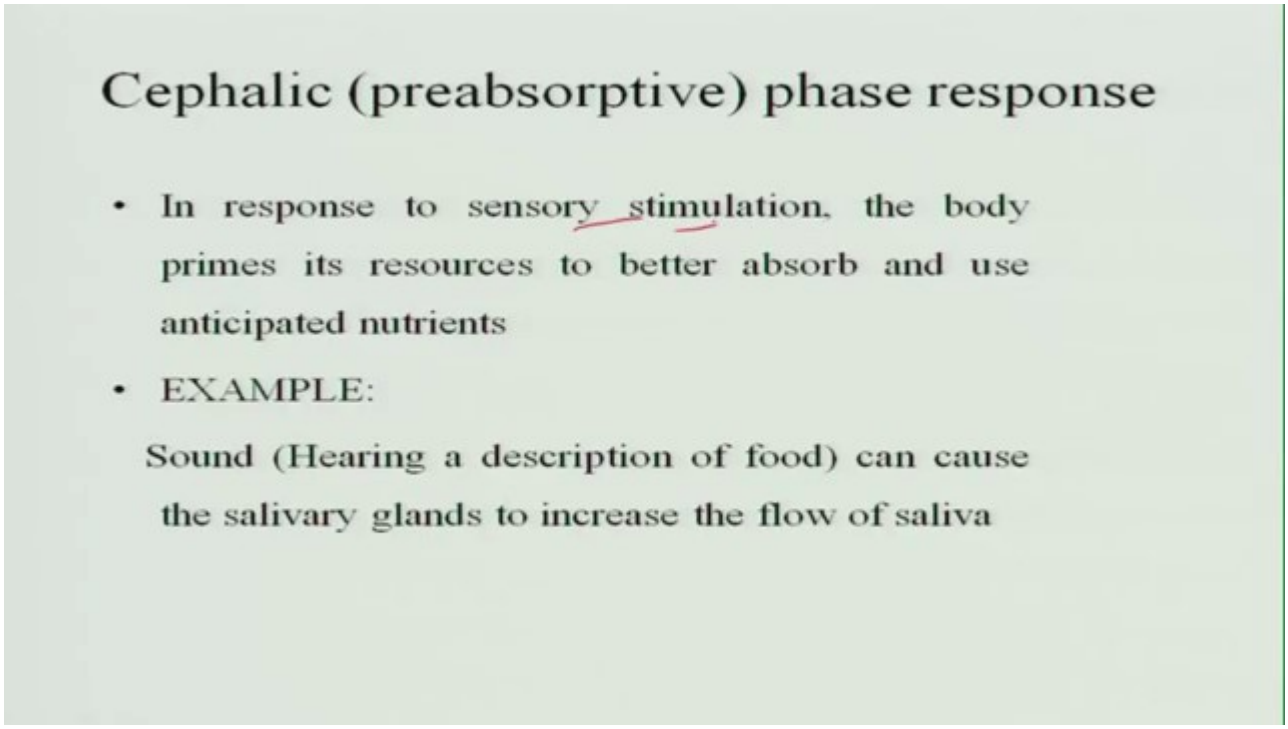

Now we have a preabsorptive stage which is called as a cephalic phase response, cephalic is brain, so cephalic phase response is before we eat the food. So in response to any sensory stimulation, see, the moment we think of food you feel saliva produce, saliva is produced in

the mouth, similarly gastric acid is produced in the stomach. So this is the response to the sensory stimulation in the body and it helps in better absorption of the anticipated nutrients. Then sound, hearing the description of sound also can produce the saliva in the salivary glands. In the mouth you have lot of saliva when you think of food.

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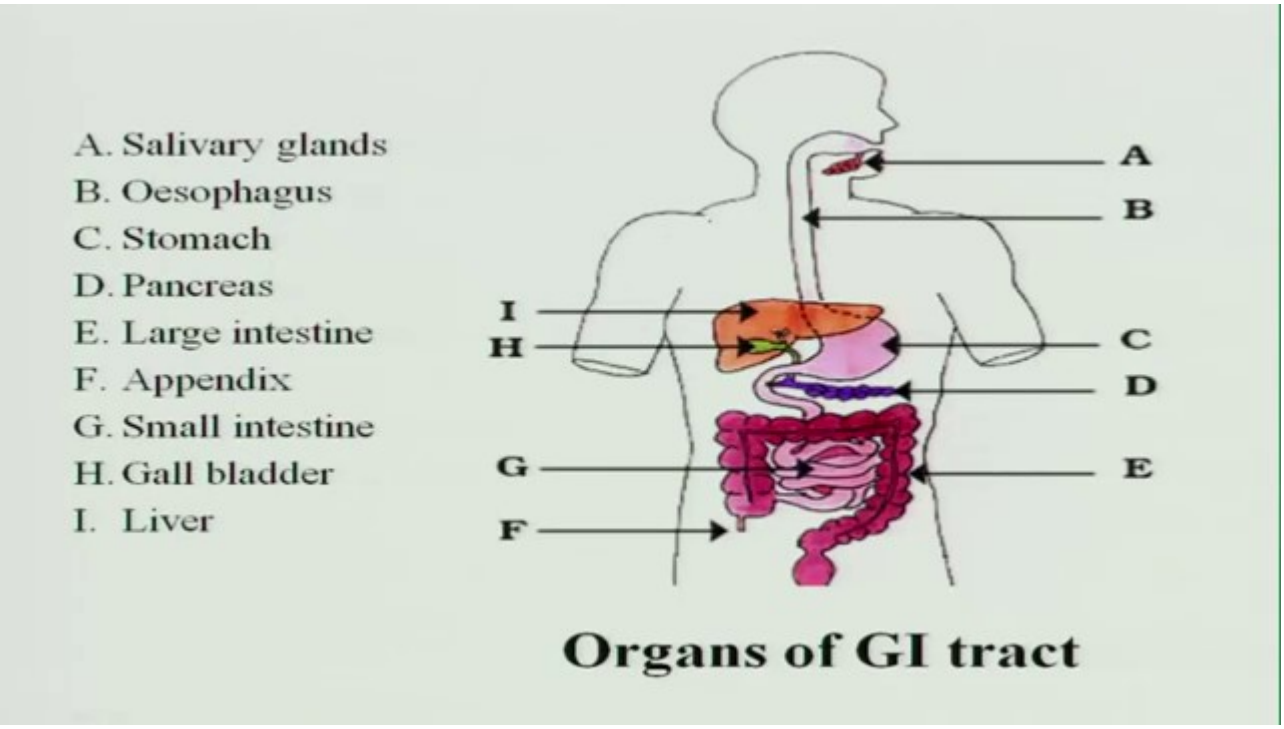

So the different organs of the gastrointestinal tract are the salivary glands, then you have the oesophagus or the food pipe, then you have the stomach, then you have the pancreas which release a lot of enzymes to digest various nutrients in the food, then you have the large intestine, you have the appendix, this is an accessory organ, actually it does not have any role in digestion, but still it is an accessory organ maybe it prevents against some disorders or maybe it has some disease protecting function. Then you have the small intestines. Then you have the liver. Liver is a site where a lot of enzymes are produced, they are stored and metabolized. So liver has -- since it is a largest gland it produces many enzymes and all. And the gall bladder is situated here in the liver, which has – which stores bile produced from the liver and releases into the duodenum whenever the fatty food enters into the duodenum.

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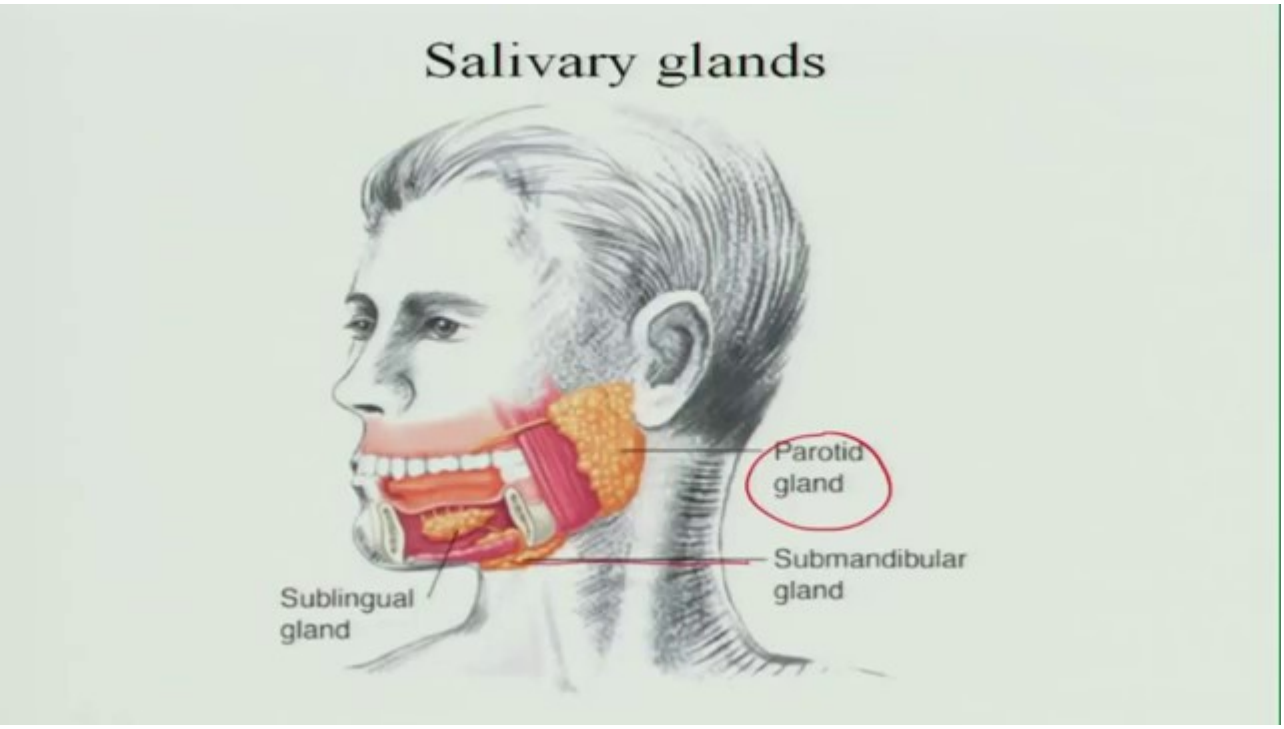

Now starting with the salivary glands, the salivary glands are the first glands which produce the liquid saliva along with enzymes, so that the food is moistened and also digested to a certain extent. So we have three types of salivary glands present in the mouth. One is the parotid gland which is the largest the gland present just below our ears, on the cheeks and you have the submandibular glands which is present under the mandibular and sublingual which are present under the tongue. And there are many more saliva glands which are small and produce little amount of saliva. So but these three are the main glands that are present in the mouth and these help whenever the site of or thought of food or presence of food this starts secreting saliva into the mouth.

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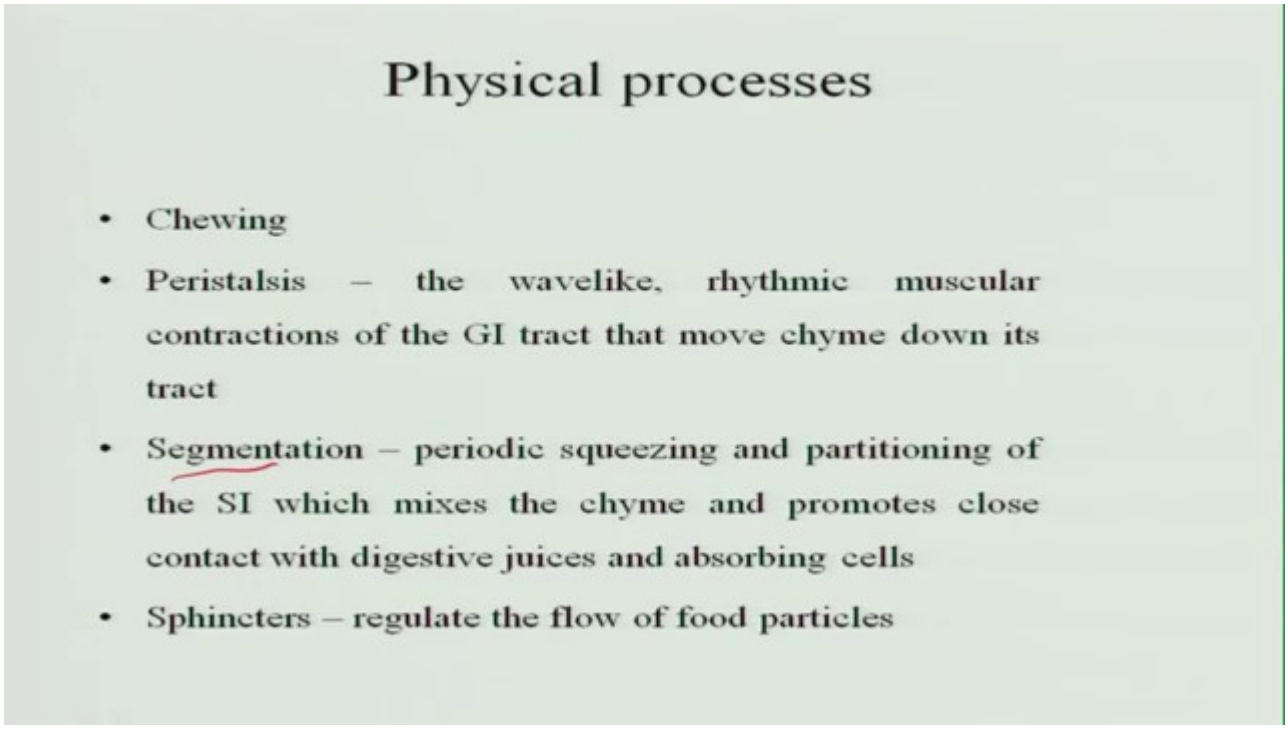

Now the physical processes; the first one is chewy and then you have the peristalsis and in the peristalsis you have a segmentation and for these to provide, I mean, to facilitate all these you have many sphincter is also present in the digestive tract. So chewing occurs in the mouth and peristalsis is a wave-like rhythmic movements that occur in the gastrointestinal tract. That means it contracts at some place and then relaxes, contracts and relaxes so that the food moves down the intestinal tract. After the food is put in the mouth and then it is combined with saliva it forms into a bolus type or small ball type which is called as chyme. So this chyme moves down the intestinal tract slowly because of the peristaltic movement. In the peristaltic movement you have a segmentation movement where there is periodic squeezing and partitioning of the small intestine.

So when the intestine is squeezed the entire food is in contact with the walls of the intestine and the food is mixed with the enzymes and the liquid that is produced in the intestine. So that the entire food is in contact with the enzymes and it is digested very well. So the digestive juices and absorbing cells also come in contact with the food. Then sphincters are to regulate the flow in the food particles.

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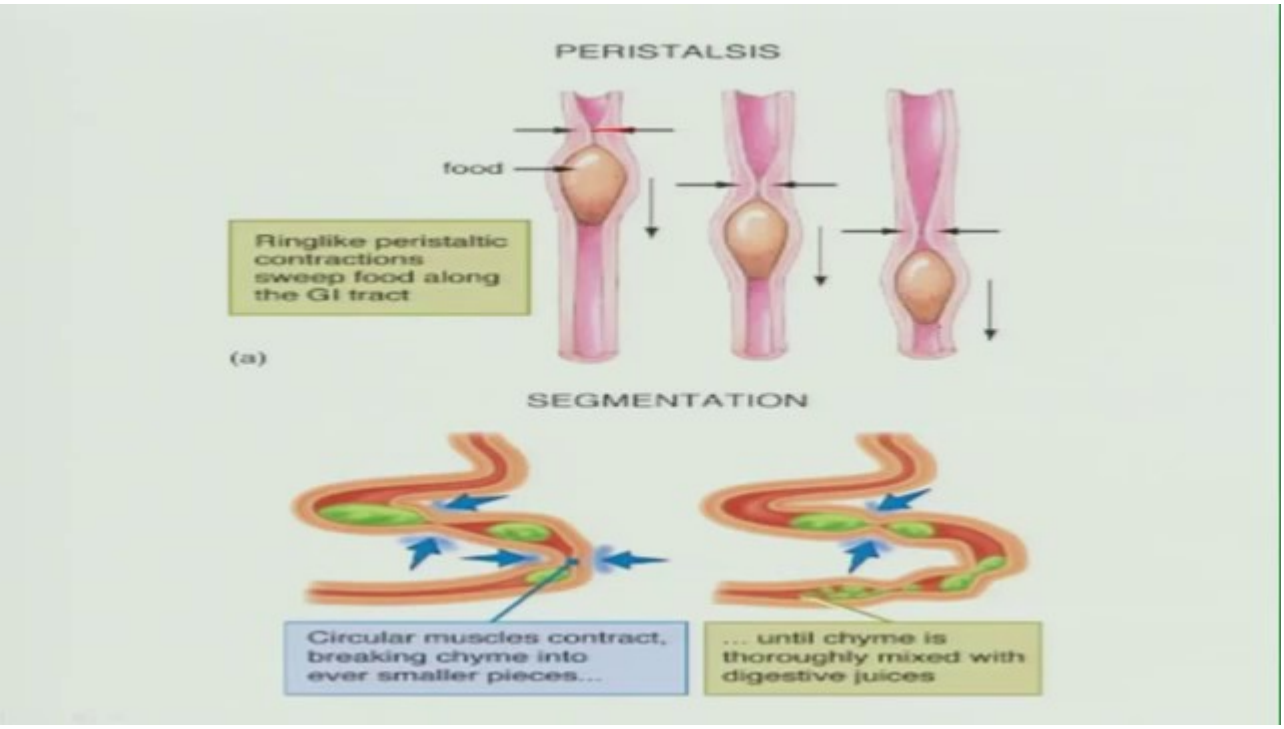

So this is how peristalsis look like, the food is moving. You see the contraction here and then the food is moving down the second, third you see, how the food keeps moving in this segmentation movement. And here the circular muscles are present in the intestines which contract, therefore keeps moving the chyme down into the intestinal tract.

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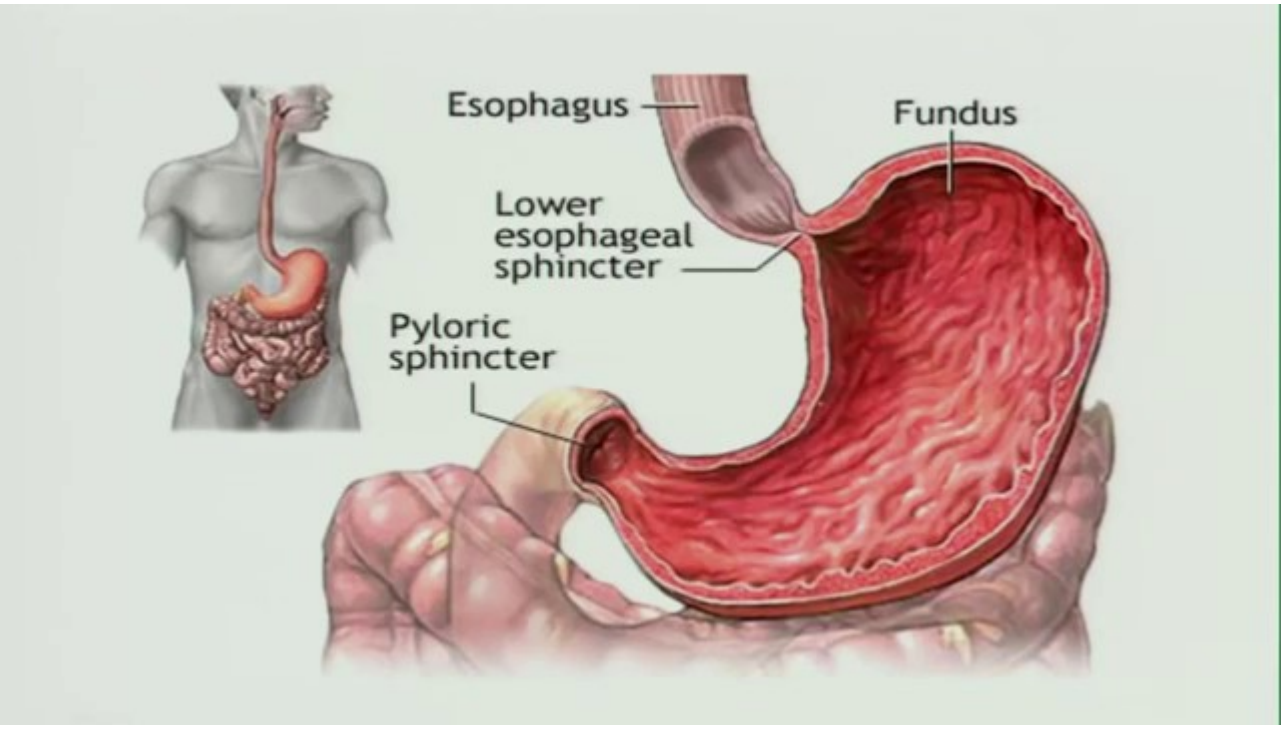

Now I was talking about this sphincters, these sphincters are to prevent the backflow of food out of the gast digestive tract. Suppose you are having vomitings, the food that is present in the stomach comes out through the mouth. So this should not happen generally unless there is some ill health. Normally food should not come out from the mouth after you eat. So this is

protected by sphincters which are present in the beginning of this stomach which is called as the lower esophageal sphincter and after the food goes out of the stomach again there is a sphincter called the pyloric sphincter, so that the food moves in a unidirection, it does not come back and spoils your health. Okay.

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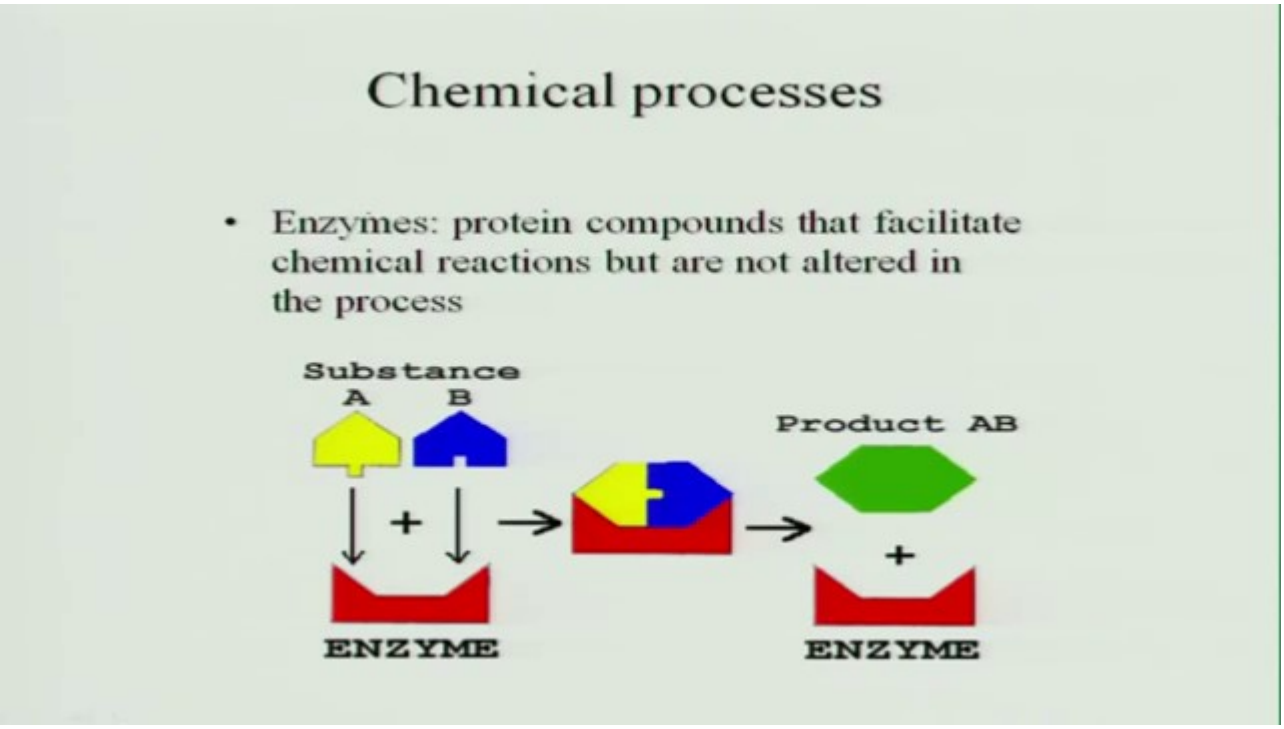

Then there are certain chemical processes that take place in the intestinal tract. For these enzymes are produced throughout the gastrointestinal, each place the type of enzyme produce is different and the pH of the food also changes, so these enzymes they are protein compose and they facilitate the chemical reaction, but these enzymes are not altered in the process. They only help in combining different chemicals or the nutrients, but they remain -- come back to their normal stage.

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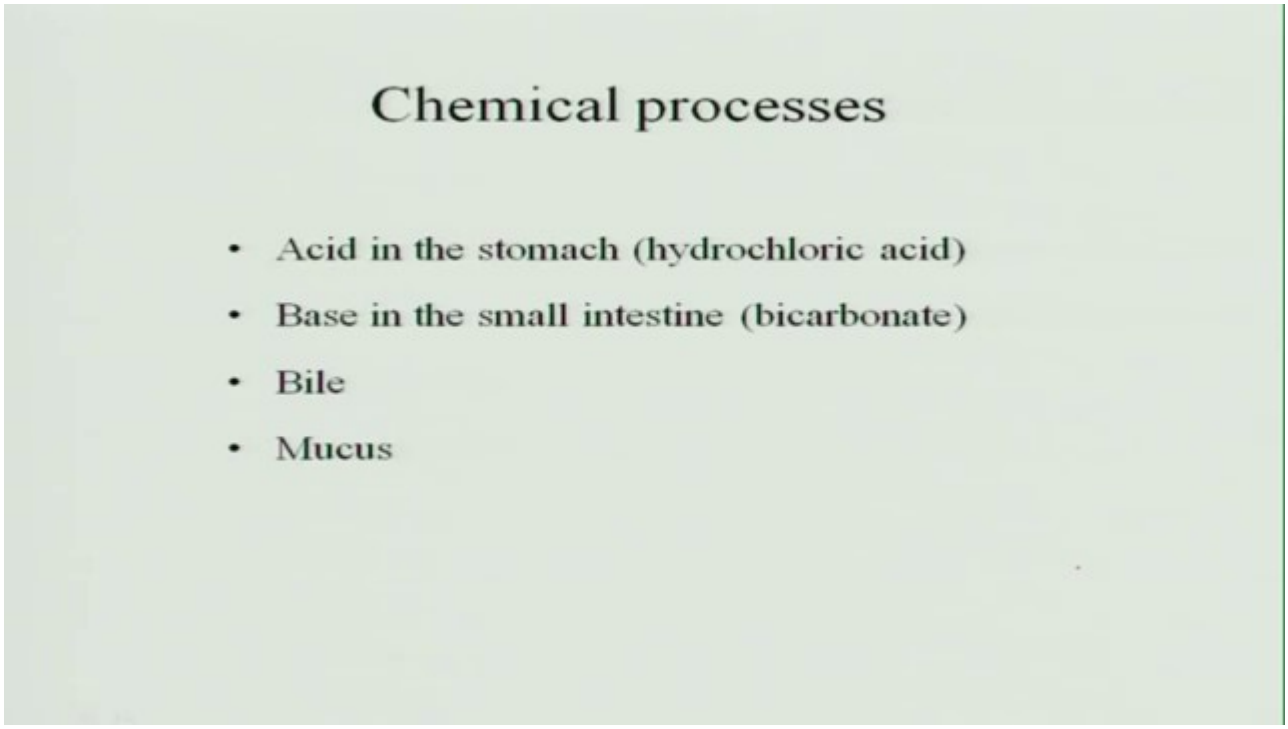

For example acid in the stomach, the stomach produces hydrochloric acid and when it comes to the small intestine the acidic nature has to go. So the substance has to become basic. So bicarbonate is produced in the small intestine. Then bile and mucus also are produced to improve the digestion.

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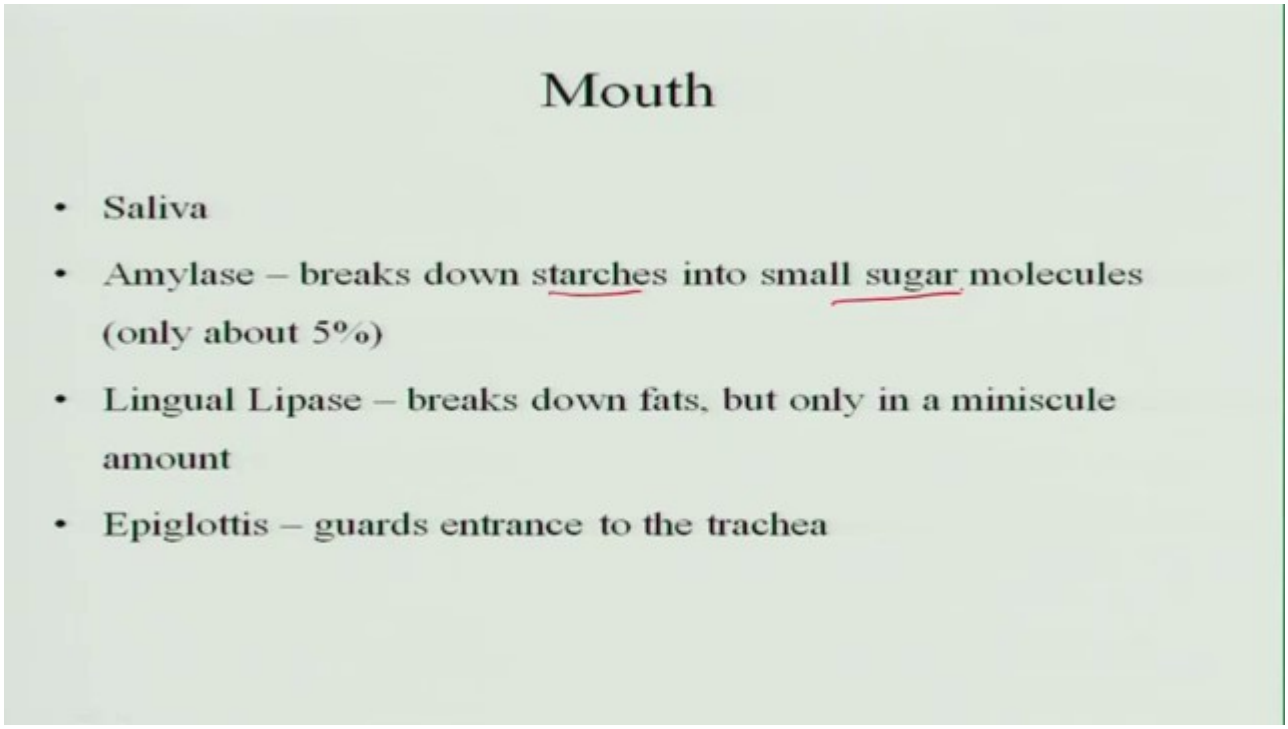

In the mouth you have this saliva which produces a salivary amylase is the enzyme that is produced which helps in breaking down the starch into simple sugar molecules. But since our food stays in the mouth for a very short time we just chew it and swallow it, isn't it? So in this short time there is not much of digestion that occurs, so only 5% of the starch gets breakdown

into sugars. Then you have lingual lipase. Lipase is a substance which digests the fats or breaks down the fat, but again as the food stays for a very small time the digestion is minimum. Then here you have an epiglottis. That is a guard that is present at the entrance of the trachea.

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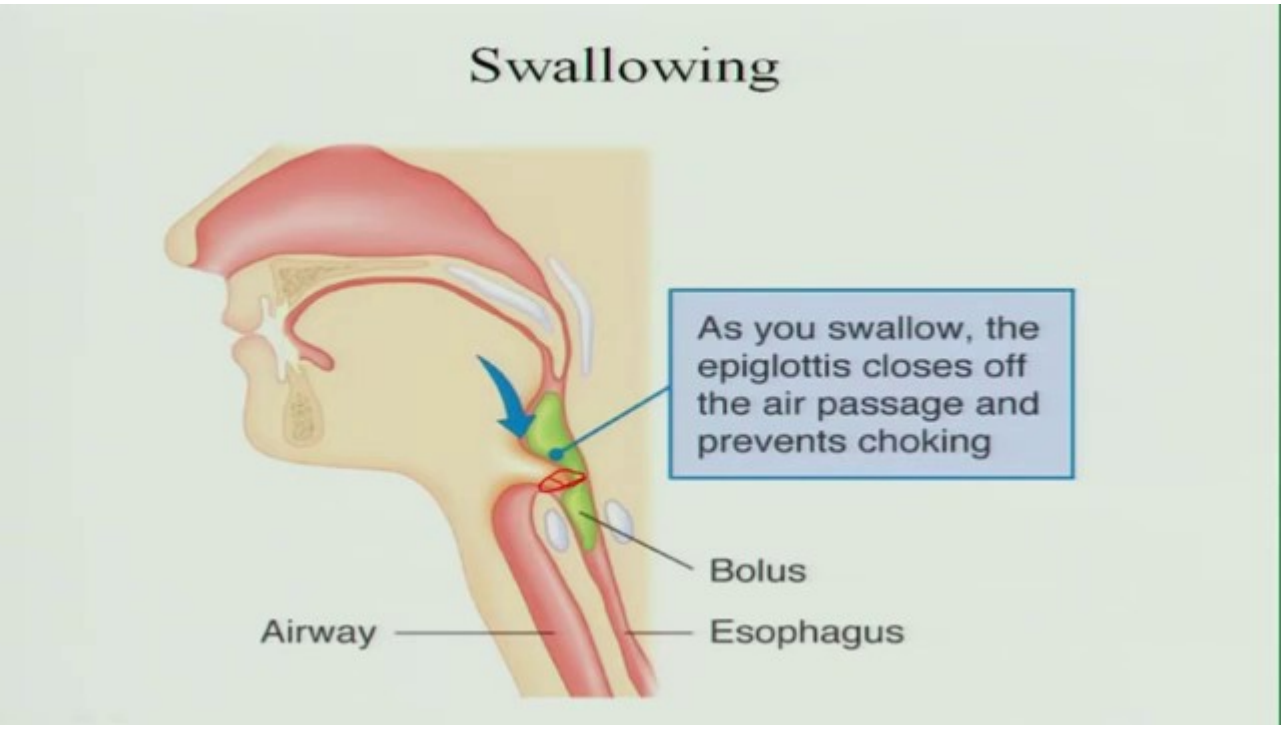

So this is the epiglottis and when you are breathing this epiglottis closes the esophagus and when you are eating the food it closes the airways. Otherwise the food you eat will go into the wind pipe and the choke your lungs. So it helps in closing the airways and pushing the food through the food pipe or the esophagus.

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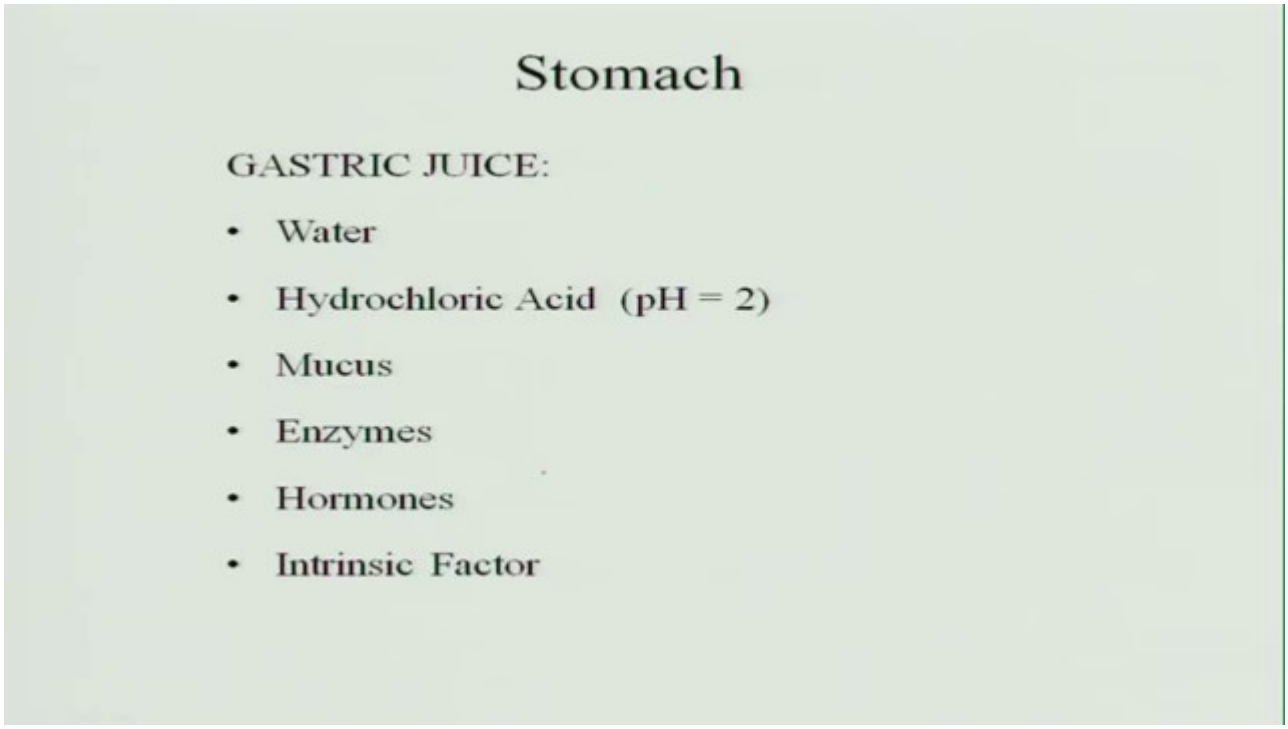

Then the stomach produces gastric juice which consists of water, hydrochloric acid, the hydrochloric acid that is produced by the stomach is of very high acidic in nature, it is the pH is 2 imagine if you pour that hydrochloric acid that is present produced in the stomach on the floor you will get a big hole. It can digest the anything. Then it has a thick layer of mucus and enzymes, hormones and intrinsic factor. This intrinsic factor is very essential for absorption of vitamin B12 otherwise B12 cannot be absorbed anywhere else, only when it gets combined with the intrinsic factor it gets absorbed.

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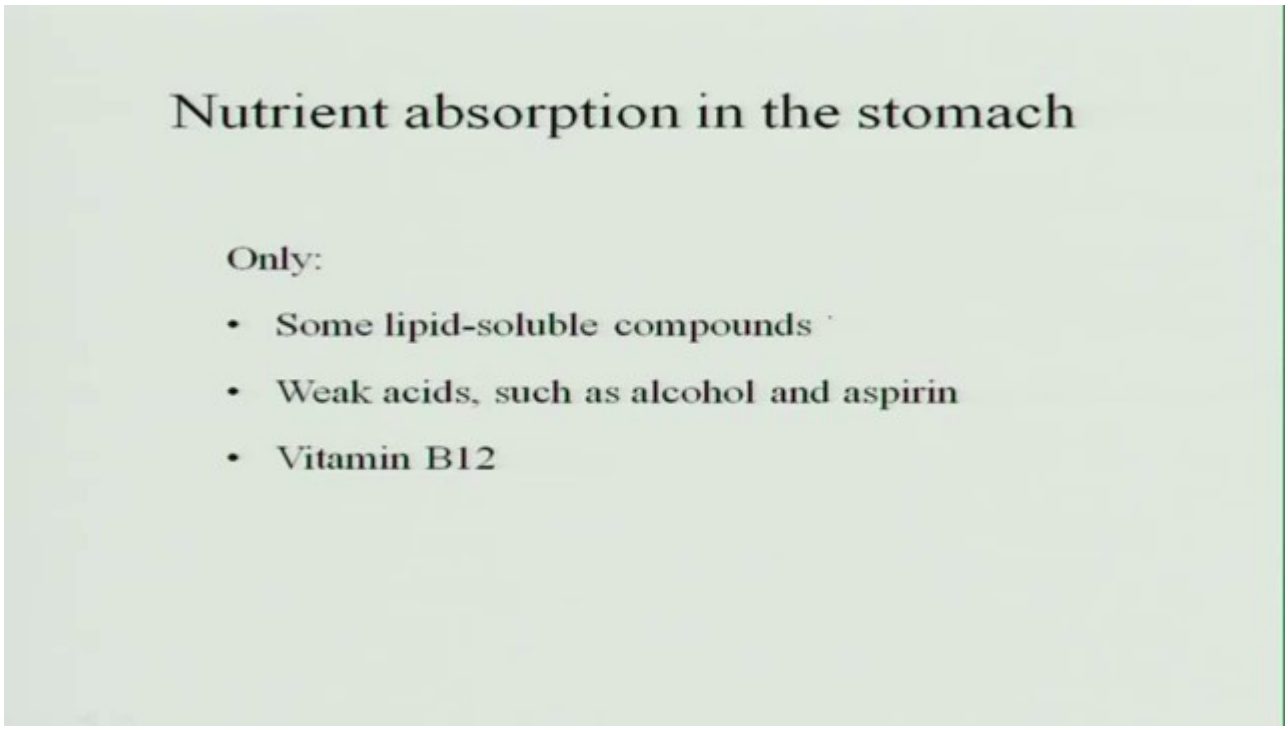

Nutrient absorption in the stomach only lipid soluble compounds are absorbed, weak acids such as alcohol and aspirin and vitamin B12. These are the only substances that are absorbed. Only digestion occurs in the stomach and no absorption except for vitamin B12. This is the digestion and breakdown of food from the mouth to the stomach. So next class we will see what, how the digestion occurs in the intestines and the other part of the stomach. So digestion, absorption and utilization of nutrients is very important for us to absorb the nutrients and utilize them for various body functions in our body. Thank you.