

# Tech Study

CLASS - VII

## BIOLOGY

### NUTRITION IN ANIMALS

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The animals depend upon other plants and animals for their food.

You are aware of the terms that animals that eat only plant and plant products are called herbivores e.g. cow, buffalo, camel, elephant, zebra etc.

Animals that eat only flesh of other animals are called carnivores e.g. lion, tiger, fox, wolf etc.

Animals that eat both plants or plant products and animals are called omnivores e.g. dog, cat, bear, crow, man etc.

You are also aware that some animals eat flesh of dead animals, hence, are called scavengers e.g. wolf, vultures, kites, etc.

**Nutrition:** The process of obtaining food is called nutrition. It provides necessary nutrients for growth and development of the body.

Animal nutrition comprises the mode of taking in the food in the body, nutritional requirements of the body and how animals can utilise their food. Food that animals including man consume is complex in nature, is insoluble in water hence, cannot be absorbed by the walls of digestive system. In order to utilise the eaten food it undergoes digestion.

Now what digestion is, let us understand:

**Digestion:** It is a process by which animals break down complex food substances in simpler substances. Like starch is a complex component present in wheat flour, rice etc. after digestion it is converted into glucose. This glucose is readily absorbed reaches the blood stream, circulated into the body and is utilised in generating energy.

Proteins are complex in nature so are converted into amino acids after digestion. Similarly fats are converted into fatty acids and glycerol.

Like wise all the complex food components are digested.

Different ways of taking the food

Mode of feeding in Animals

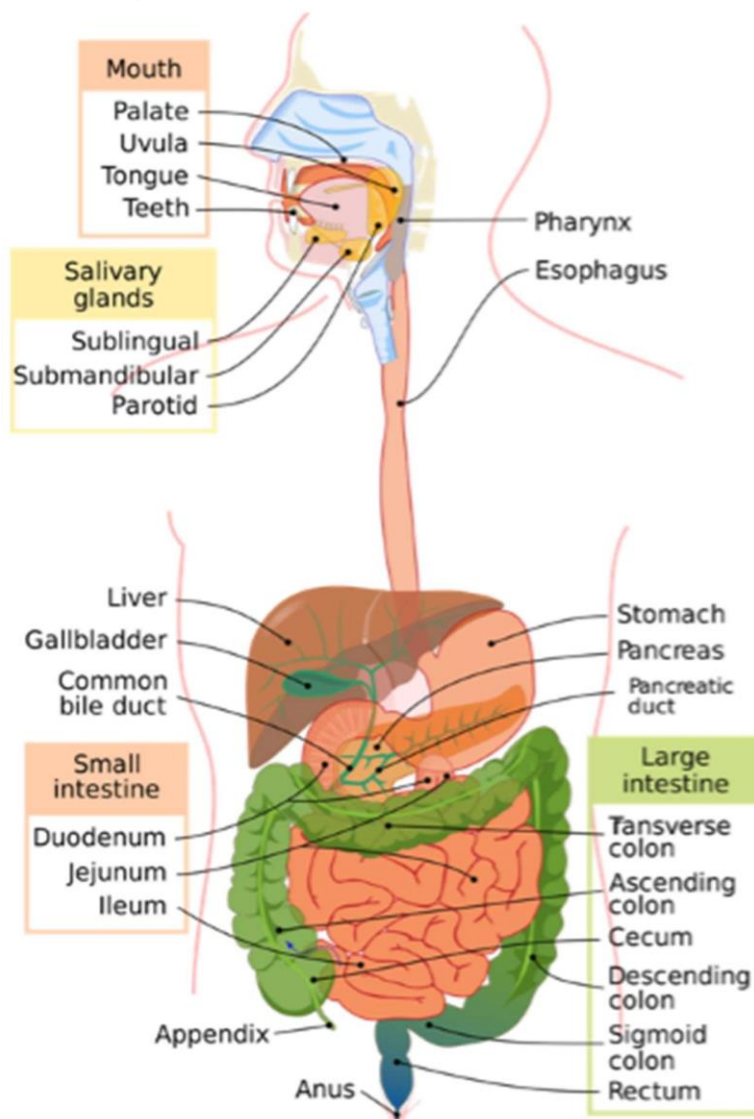
<b>Name of animal</b>	<b>Kind of food</b>	<b>Mode of feeding</b>
<b>Snail</b>	<b>Grass</b>	<b>Chewing</b>
<b>Ant</b>	<b>Insects</b>	<b>Scrapping</b>
<b>Eagle</b>	<b>Flesh</b>	<b>Swallowing</b>
<b>Humming bird</b>	<b>Nectar</b>	<b>Sucking</b>
<b>Lice</b>	<b>Blood</b>	<b>Sucking</b>
<b>Mosquito</b>	<b>Blood</b>	<b>Sucking</b>
<b>Butterfly</b>	<b>Nectar</b>	<b>Sucking</b>
<b>House fly</b>	<b>Decaying matter</b>	<b>Brewing</b>

Like wise Leech sucks blood of vertebrates these have suckers to do so, earthworm eats detritus and female anopheles mosquitoes also suck human blood while male anopheles mosquitoes use their proboscis or feeding tube to drink nectar from flowers.

**Alimentary Canal in Humans**

Now before we study mechanism of digestion in humans and other animals we should be aware of digestive system, its parts and function. Human digestive system is also called Alimentary Canal or Digestive Tract.

The food that we eat passes through a canal inside our body and undergoes chemical changes. Given below is the diagram of human digestive system.



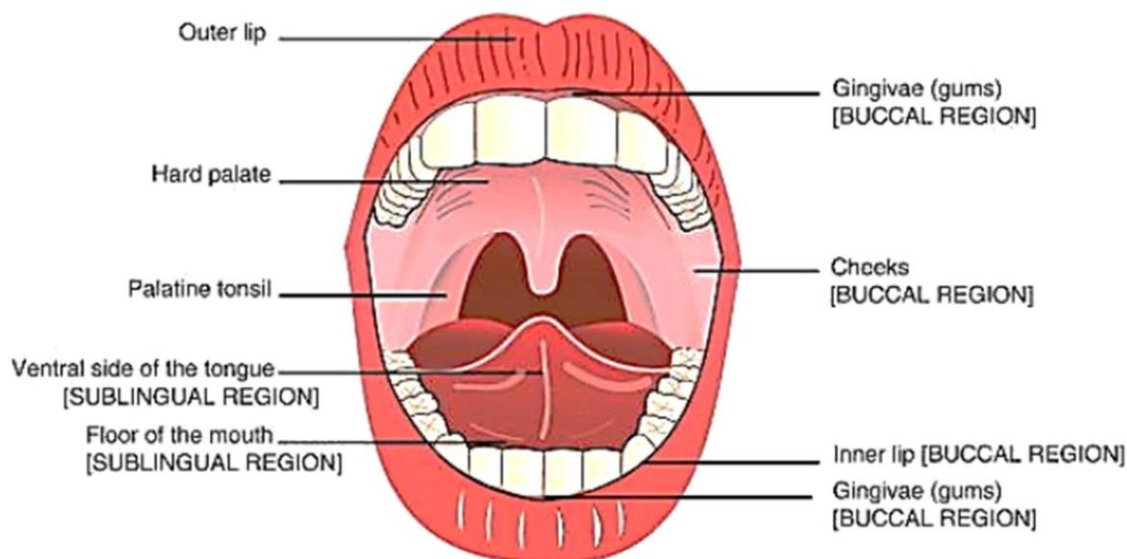
Digestive Tract(Alimentary Canal) in Humans

The Digestive System - The alimentary canal and the digestive glands together form a system in the human body which is responsible for the digestion of food in the body. This system is called the Digestive System.

Digestive juices convert complex food components into simple consumable food components, these are secreted by the inner walls of stomach and small intestine as well as there are three glands associated with the alimentary canal that also secrete digestive juices. These glands are present outside the digestive system and pour their secretions through ducts into different parts of the digestive system. Names of these glands are: Liver, pancreas and salivary glands

Let's study one by one parts of human digestive system and their functions

1. The Mouth or Buccal Cavity



The Mouth or Buccal Cavity

**Ingestion:** It is the first process under nutrition. Ingestion is defined as the process of taking in the food through our mouth.

The food is chewed with the help of teeth, saliva is secreted by salivary glands into the mouth and the tongue helps in mixing saliva with the food during mastication process.

The salivary glands present in our mouth secrete saliva which mixes with the food, moist it and breaks the starch present in the food into sugar.

In saliva only one enzyme named salivary amylase is present along with other components. This salivary amylase breaks down starch(a complex component made up of hundreds of glucose units)into maltose sugar( a compound made up of two glucose units).

#### Major salivary glands

The major salivary glands are the largest and most important salivary glands. They produce most of the saliva in your mouth.

There are three pairs of major salivary glands: the parotid glands, the submandibular glands, and the sublingual glands.

- **Parotid Glands:** The parotid glands are the largest salivary glands. They are located just in front of the ears. The saliva produced in these glands is secreted into the mouth from a duct near your upper second molar.
- **Submandibular Glands:** About the size of a walnut, the submandibular glands are located below the jaw. The saliva produced in these glands is secreted into the mouth from under the tongue.
- **Sublingual Glands:** The sublingual glands are the smallest of the major salivary glands. These almondshaped structures are located under the floor of the mouth and below either side of the tongue.

Salivary glands have ducts that pour their secretions in the buccal cavity or oral cavity commonly called mouth.

#### Tongue

The tongue present in the mouth helps in mixing the food with the saliva and helps in swallowing it inside the mouth. It also has taste buds which help in identifying the taste of anything that we eat.

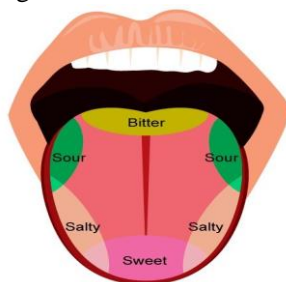
On average, the human tongue has 2,000–8,000 taste buds. Some taste buds are short lived and their average lifespan can be 8 to 12 days approximately. Though some taste buds are long lived as well. So taste buds regenerate themselves.

Let's know some medical terms for taste disorders

Taste disorders are categorized as ageusia (total loss of taste), hypogeusia (decreased sense of taste), and hypergeusia (increased taste sensitivity).

Taste dysfunction is common in disease and injury.

Besides this, the tongue also helps in talking.



Tongue The

## Teeth

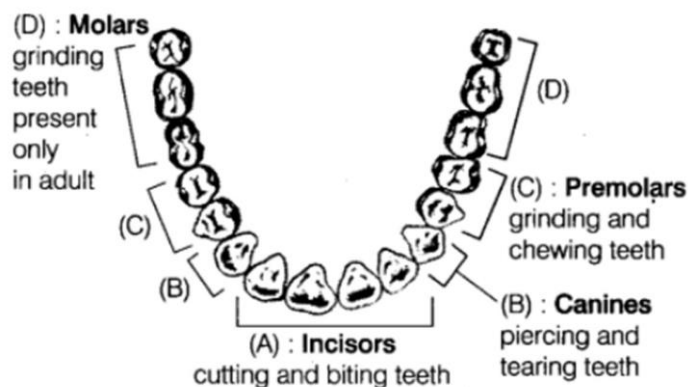
- **Milk Teeth or Deciduous Teeth**- In the early childhood a set of teeth growth in children that then fall off after certain age 6 to 8 years. These teeth are called Milk Teeth. These are 20 in number, in the set of milk teeth premolars and wisdom teeth are not found.
- **Permanent Teeth** - The teeth that grow after milk teeth fall off are called Permanent Teeth. They generally remain during the lifetime of a person or at least until old age and are 32 in number. In 32 teeth, Wisdom teeth (4 in total, 2 in each jaw) are the third and final set of molars that most people get in their late teens or early twenties.

Human Teeth are represented by dental formula given below

Milk or deciduous teeth:  $212/212$ ; adult =  $2123/2123$  for one jaw. Both childhood molars are replaced by adult premolars.

Study of teeth is called dentistry.

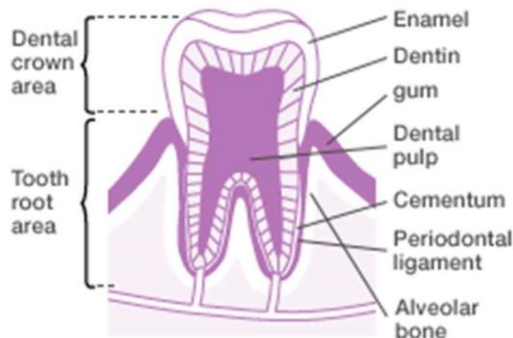
Different types of teeth and their functions are shown in the figure given below



Different types of teeth

**Structure of a Tooth:** A tooth consists of enamel, dentin, cementum and pulp tissue. The portion of a tooth exposed to the oral cavity is known as the dental crown, and the portion below the dental crown is known as the tooth root. The dental pulp cavity exists in the centre of the tooth, through which the dental pulp, called the nerve, runs. In order to receive an impact on the tooth and to absorb and alleviate the force on the jaw, the surface of the tooth root area (cementum) and the alveolar bone are connected by a fibrous tissue called the periodontal ligament. The tooth is supported by the tissue consisting of the alveolar bone, gums and the periodontal ligament.

- (i) **Enamel:** The hardest bodily tissue covering the surface of the dental crown. It is as hard as crystal.
- (ii) **Dentin:** The tissue that forms the tooth from the dental crown to the tooth root, situated inside the enamel and cementum. It is softer than the enamel. A small tube filled with tissue fluid, called the dentinal tubule, runs inside the dentin.
- (iii) **Cementum:** The tissue covering the surface of the tooth root. It connects the jaw bone with the tooth by the periodontal ligament. Its hardness is similar to bone.
- (iv) **Dental pulp:** Blood vessels and the lymph vessels, as well as nerve fibres, are located in the dental pulp, supplying nutrients to the dentin.
- (v) **Periodontal ligament:** Tissue consisting mainly of the fibrous tissue that connects the tooth root and the jaw bone. It prevents force applied to the tooth from being directly imposed on the jaw bone while chewing food.
- (vi) **Alveolar bone or jaw bone :** The jaw bone supports the tooth; the tooth is planted into this bone. When a large part of the alveolar bone is destroyed by periodontal disease or other causes, the tooth becomes loose.



Structure of a typical human tooth

#### Differences between Milk Teeth and Permanent Teeth

- (i) **Colour :** Milk teeth are almost white, and permanent teeth have a yellow-tinge.
- (ii) **Size:** Milk teeth are a size smaller than permanent teeth.
- (iii) **Teeth quality:** Both enamel and dentin are thinner in milk teeth; therefore, caries in milk teeth progress more quickly.

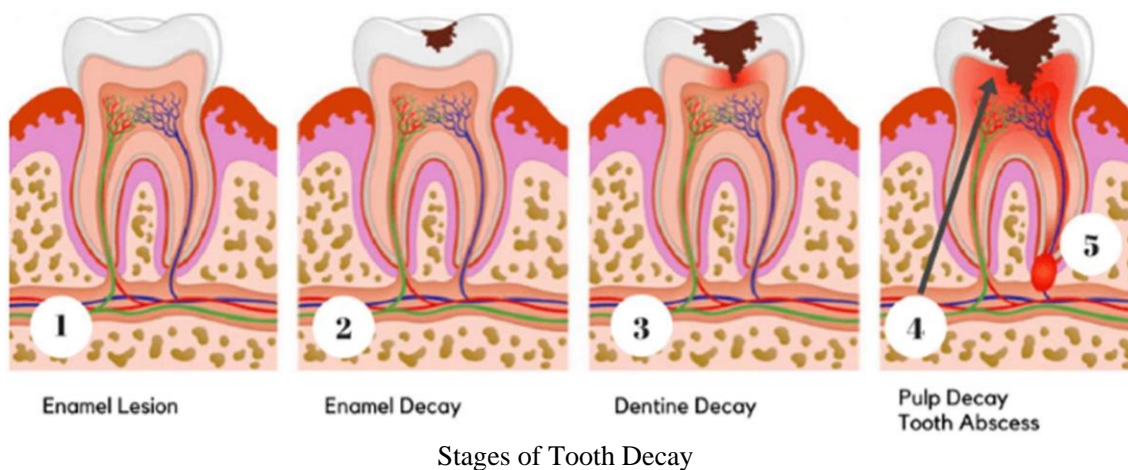
#### Tooth Decay

- A gradual damage of teeth is often called tooth decay.
- The main cause of tooth decay is the presence of bacteria in the mouth that grow if we do not keep our mouth and teeth clean.
- Any leftover food present inside our teeth is broken down by such bacteria.
- As a result, an acid is released which damages the teeth slowly.



- Tooth decay can cause severe pain and even toothless.
- Tooth decay is caused mainly because of eating food with high sugar content, soft drinks and chocolates.

### Stages of Tooth Decay



Stages of Tooth Decay

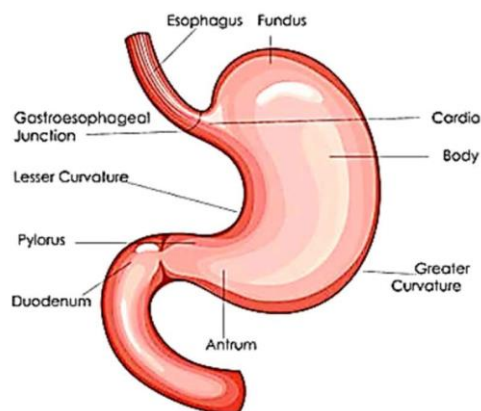
### How can we prevent tooth decay?

- Clean your teeth with a brush or dental floss at least twice a day
- Rinse your mouth after every meal you eat
- Do not put a dirty finger or any unwashed food items in your mouth

### 1. Food Pipe or Oesophagus

- The food pipe starts from the neck region and runs until the chest area in animals. In adult humans the length of oesophagus is usually 25 cm.
- The food, when chewed, moves through the food pipe and reach the stomach through this path.
- The food moves in downward direction in the food pipe. A wave like motion called peristalsis, is generated in oesophagus that helps in pushing the food into the stomach.

### 2. The Stomach



- It is the widest part of the alimentary canal.
- It's a bag like structure in a flat U shape.
- The stomach is connected with the food pipe and the small intestine.

The stomach's inner lining has gastric glands that produce three things:

Mucous: It protects the stomach lining against the action of hydrochloric acid.

Hydrochloric Acid: It kills the bacteria present inside the stomach and activates the digestive juices

Digestive Juices: Mainly pepsin is the enzyme that helps in digestion of the food by breaking down the only proteins present in the food into simple substances. Pepsin is secreted in inactive form called pepsinogen which is converted into active pepsin and then it works on proteins.

The gastric chief cell (also known as a zymogenic cell or peptic cell) is a cell in the stomach that releases pepsinogen.

Mucous, hydrochloric acid and digestive enzymes together make gastric juice. In stomach food is digested in acidic medium.

### 3. Small Intestine

- It is a highly coiled structure.
- The length of the small intestine is almost 7.5m.
- The liver and pancreas release digestive juices into the duodenum of small intestine.
- The inner lining of the intestine also secretes digestive juice of its own called intestinal juice.

#### Parts of Small Intestine

The small intestine has been divided into three parts:

- I. Duodenum: It is the first part of the small intestine and its main function is to initiate the digestive process. In this process, the food that enters the small intestine from the stomach is mixed with the digestive juices (bile and pancreatic juice) and is further broken down into simpler substances. Intestinal juice is also mixed with the food. In duodenum food is digested in alkaline medium.
- II. Jejunum: It is the middle part of the small intestine that contains numerous villi and hence, helps in absorption of digested food that goes into the blood capillaries of villi and thereafter in the whole body. This absorbed food is used in various bodily needs known as assimilation.
- III. Ileum: It is the third and last part of the small intestine that also contains villi-like structures. The ileum absorbs vitamin B12, bile acids and any other nutrients present in the food.

The small intestine (in duodenum) breaks the carbohydrates into glucose, fats into fatty acids & glycerol and proteins into amino acids. The glucose, amino acids, fatty acids and glycerol are readily absorbed by the walls of the small intestine and utilised by the body.

#### The Liver

- It is a gland reddish brown in colour present in the upper abdominal cavity. It is known as the largest gland of the human body.
- It secretes a digestive juice called bile juice which is stored in the gallbladder and interestingly has no digestive enzymes. But the bile juice makes it possible for the body to digest the fats by breaking big fat globules into smaller fat globules.

#### The Pancreas

- It is a cream coloured gland present in the human body and is the second largest gland in human body.

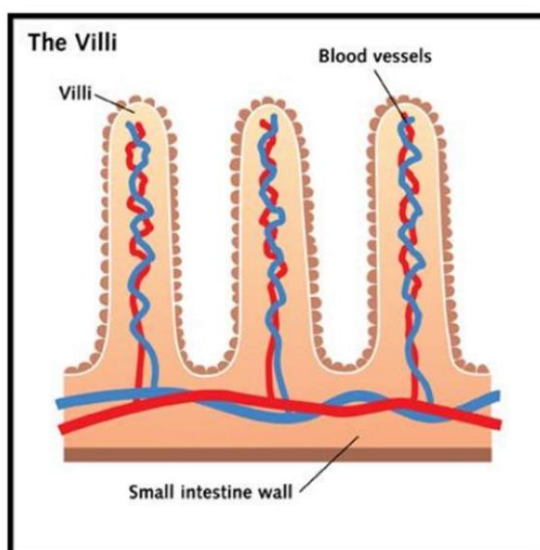


- It secretes pancreatic juice that helps in digestion of fats, carbohydrates and proteins. Through a common duct both pancreatic juice and bile juice are poured in duodenum.
- Pancreas also secretes hormones like insulin that maintains blood sugar(glucose) level in our blood.
- As it secretes both enzymes and hormones so is called mixed gland.( you will study in higher classes about it in detail)

How small intestine absorbs food?

Absorption: It is a process by which the digested food enters the blood vessels of the small intestine.

Villi in the intestine: The small intestine contains small finger-like structures called Villi. They increase the surface area of the intestine thereby increasing the amount of absorption. The digested food gets into the blood vessels through villi and then reaches the whole body.



Assimilation: The process by which the organs of the body utilise the digested food and form complex substances which the body needs such as proteins is called Assimilation.

Glucose is stored in muscles and liver in the form of glycogen( animal starch) is another example of assimilation.

#### 4. The Large Intestine

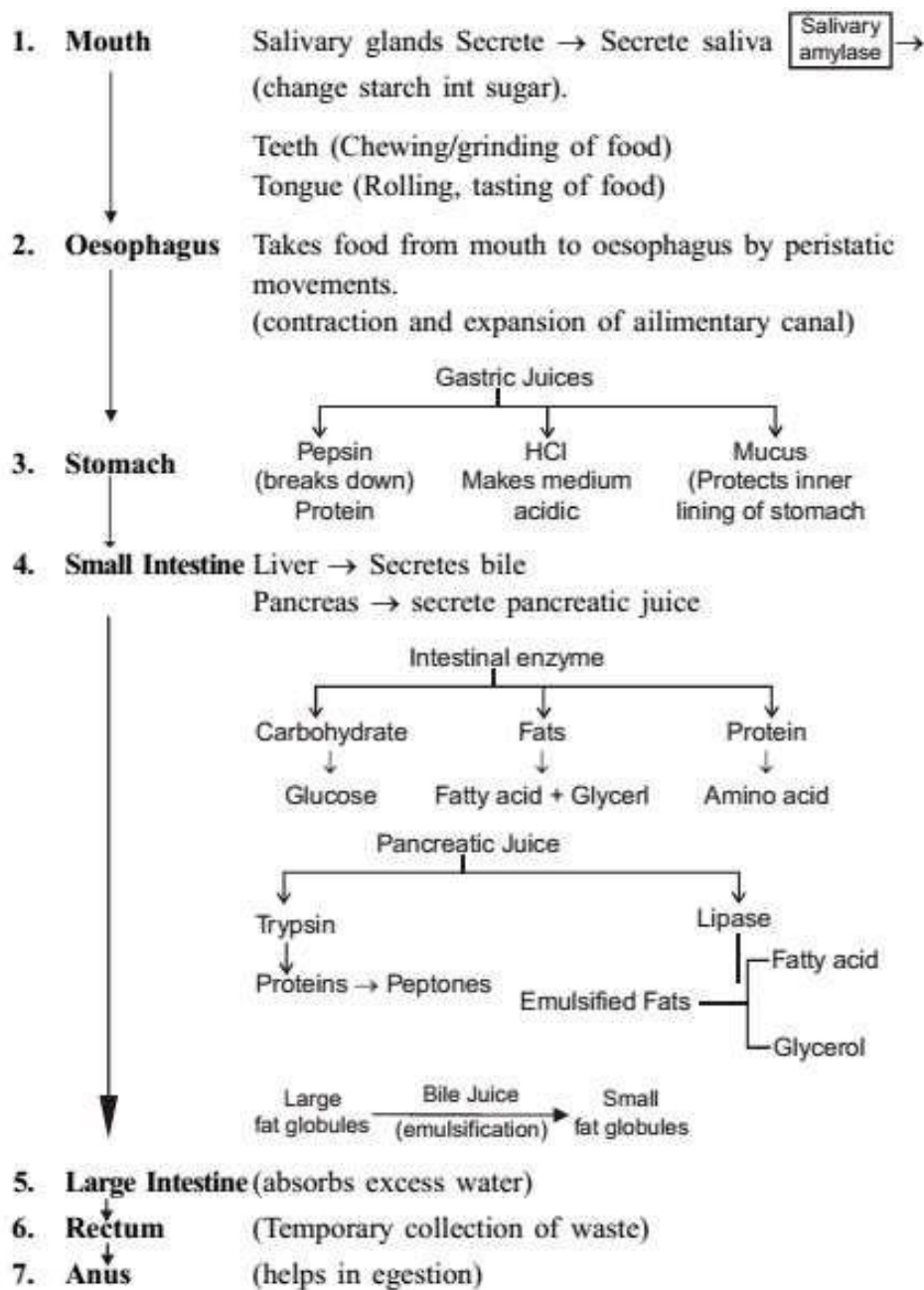
- Any food that is left undigested passes through the small intestine and enters the large intestine.
- It is a wide tube-like structure called colon and its last part is called rectum.
- It is only 1.5 m long.
- The main function of the large intestine is to absorb water and salts from the undigested food.
- The rest of the waste, undigested food pass through the rectum.

Egestion: The process by which the waste, undigested food (the faecal matter) get out of the body through the anus is called egestion.

Thus ,the process of nutrition can be summarised as given below :

1. Ingestion. The process of taking food inside the body is called ingestion.
2. Digestion. In digestion the ingested food is converted into simple form with the help of digestive enzymes.
3. Absorption. ...
4. Assimilation. ...
5. Egestion

The process of nutrition is also shown in the form of flow chart given below.



Let's study few diseases like diarrhoea, constipation, vomiting and food poisoning. What is diarrhoea?

- A condition when watery stools appear frequently is called Diarrhoea.
- Food poisoning and infection are two main causes of diarrhoea.
- It is a serious disease and can lead to death in severe cases because it involves extensive loss of water and salts from the body.

Generally, ORS (Oral Rehydration Solution) which is boiled cooled water in which a pinch of salt or sugar is added is recommended to the patients to maintain the water loss of the body.

What is constipation? What are the reasons for it?

Constipation occurs when bowel movements become less frequent and stools become difficult to pass.

The colon absorbs water from the waste, which creates a solid matter called stool. If you have constipation, food may move too slowly through the digestive tract. This gives the colon more time – too much time – to absorb water from the waste. The stool becomes dry, hard, and difficult to push out

Common lifestyle causes of constipation include:

- Eating foods low in fibre.
- Not drinking enough water (dehydration).
- Not getting enough exercise.
- Changes in your regular routine, such as traveling or eating or going to bed at different times.
- Eating large amounts of only milk or cheese.
- Stress.

What is vomiting?

Vomiting, or throwing up, is a forceful discharge of stomach contents due to anti peristaltic movement in the gastric muscles.

It can be a one-time event linked to something that doesn't suit to the stomach. Recurrent vomiting may be caused by underlying medical conditions.

Frequent vomiting may also lead to dehydration and weakness.

There are many reasons for vomiting , few are given below:

- food poisoning
- indigestion
- infections (associated with bacterial and viral illnesses) □ motion sickness etc.

What is food poisoning?

Food borne illness, more commonly referred to as food poisoning, is the result of eating contaminated, spoiled, or toxic food. The most common symptoms of food poisoning include nausea, vomiting, and diarrhoea.

Reason for food poisoning:

Bacteria is the most prevalent cause of food poisoning. When thinking of dangerous bacteria, names like E. coli, Listeria, and Salmonella come to mind first.

Ruminants: What are ruminants?

Ruminants include cattle, sheep, goats, buffalo etc. These animals all have a digestive system that is uniquely different from our own. Instead of one compartment to the stomach, they have four. Of the four compartments I.e. rumen, reticulum, omasum and abomasum, the rumen is the largest section and the main centre for fermentation of cellulose.

Ruminants are mammals that chew cud, that is, they regurgitate partially digested solids (the cud), and chew them again. They then re-swallow the cud. This re-chewing of the cud to further break down the semi-digested food is called “ruminating.”

Such animals include many members such as cattle, goats, sheep, bison, yaks, water buffalo, antelope, deer, and giraffes, but not pigs.

The stomach of a pig is simple like that of a human being, except for the presence of a small pouch or diverticulum at its cardiac end.

Camelids (camels, alpacas, and llamas) and deer are ruminants, but they have three-chambered stomachs, omasum is missing.

Kangaroos and certain other Australian marsupials also ruminate. Leaf monkey or Hanuman Monkey is also a ruminant.

### Ruminant Stomach

The ruminant stomach is a multi-chambered organ found in ruminants. It is usually composed of four separate chambers and allows digestion of large quantities of plant matter that would be relatively indigestible for most other types of mammals, in particular grass and the leaves.

The upper part of this stomach is where fermentation of green foliage takes place with help of anaerobic bacteria. These bacteria allow ruminants to break down cellulose, a major component of all leaves. The slow fermentation and digestive processes that occur within this complex stomach also allow better absorption nutrients as they go on from the stomach to pass through the intestines. Having a ruminant stomach is a big advantage because it makes it so easy to find something to eat as cellulose rich food (cellulose is the most abundant organic compound on earth).

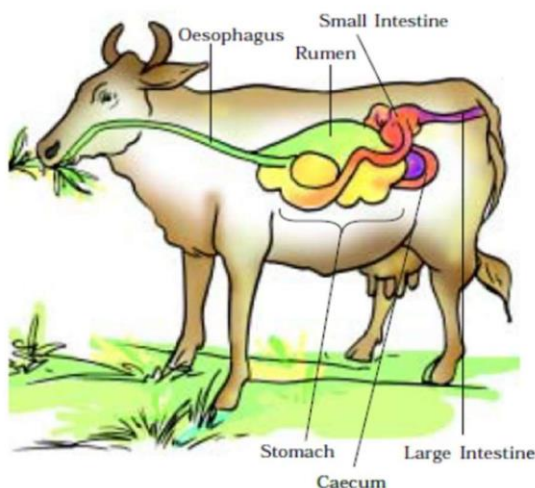
How does a ruminant stomach work?

A ruminant begins by chewing and swallowing its food. The ingested matter is then softened within the first two chambers of the stomach, the rumen and reticulum, which communicate freely with each other (considered as a single unit, these two chambers are called the "reticulorumen"). Microbes convert the food, particularly cellulose, into less indigestible substances. Both Rumen and Reticulum contain cellulose digesting bacteria called "Rumeococcus" and cellulose digesting protozoa called "Antodinium". These microbes help in the digestion of cellulose in ruminants and convert cellulose into short chain of fatty acids. Now this partially digested food is known as cud. Rumen is the largest Chamber.

After digestion of cellulose the food is known as "Cud". Which is brought back to mouth by anti-peristaltic movement for further digestion or we can say the animal regurgitates the cud, and chews it again, and reswallows it. The liquid portion of the material within the reticulorumen, passes on to the next chamber, the omasum. Here, water and minerals are absorbed into the blood. Omasum is absent in certain animals like camel and deer.

The remaining matter moves into the fourth chamber, abomasum. The Abomasum is the real stomach or real chamber because it contains gastric glands. It can be compared with the ordinary stomach of non ruminants.

In Abomasum the digestion of protein takes place due to presence of gastric juice.



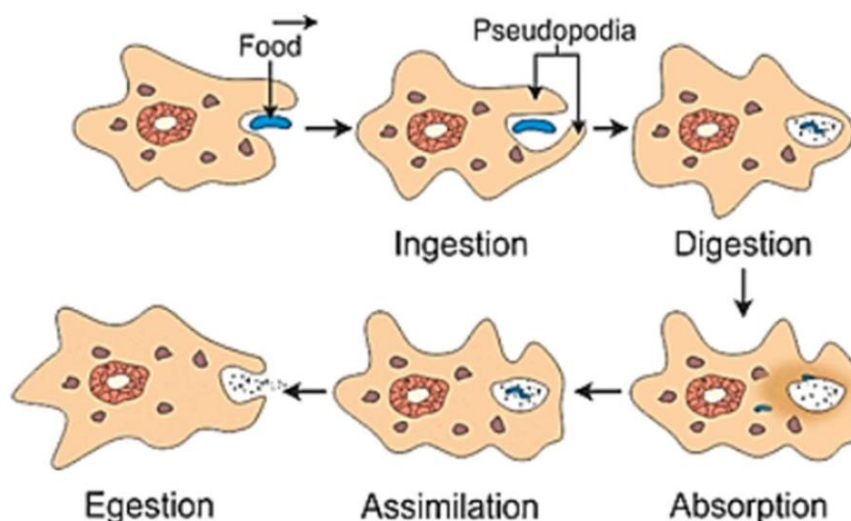
Digestive System in Cow

**Cud:** The partly digested food present in the rumen is called Cud.

**Rumination:** The cud returns to the mouth in these animals and then they chew it. This is called Rumination.

### Feeding and Digestion in Amoeba

- The Amoeba is a microscopic organism which is made up of only one cell found in fresh water.
- The Amoeba has a cell membrane, cytoplasm, a nucleus which is round and dense and small vacuoles which are like bubbles present all over it.
- The Amoeba is capable of changing its shape and position on its own.
- It uses false feet called pseudopodia to take in the food present in the surroundings. These pseudopodia are used for movement too.
- Whenever it wants to intake the food the pseudopodia or finger-like projections come out of its body.
- The pseudopodia engulf the food in and the food gets stored in the food vacuoles.
- Then it secretes some digestive juices inside the vacuoles that help in its digestion of the food.
- The Amoeba then absorbs the digested food and uses it for fulfilling different life processes such as multiplication and growth.
- The Amoeba also excretes solid waste products or undigested food out of its body through a process called exocytosis.
- In Amoeba contractile vacuoles are found that release out waste water continuously.



Various stages of Nutrition in Amoeba

When a piece of bread is chewed slowly it tastes sweeter after sometime Why?

When a piece of bread is chewed slowly, it tastes sweeter after sometime. give reason. This occurs due to an enzyme secreted by salivary gland known as salivary amylase. Salivary amylase breakdown the starch into simple sugar maltose due to which the bread tastes sweet after sometime.

This you can experience by chewing a piece of chapati or bread.

Let us find out whether salivary amylase converts starch into sugar.

Take two test tubes. Label them 'A' and 'B'. In test tube 'A' put one teaspoonful of boiled rice; in test tube 'B' keep one teaspoonful of boiled rice after chewing it for two to three minutes. Add 3-4 ml of water in both the test tubes. Now pour 2-3 drops of iodine solution in half of the contents of each test tube and keep remaining content for next test and now observe.

Why is there a change in colour in the test tubes?

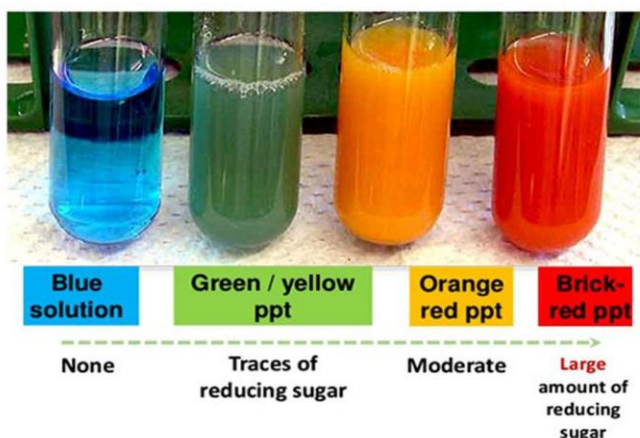


In the contents of test tube A blue black colour appears on addition of iodine. As we know that iodine solution turns blue black when added to starch rich food items.

In test tube B iodine doesn't give blue black colour that shows starch is not present, why is it so? What has happened to the starch of chewed rice let's test further.

In the remaining contents of test tube B now we will add Benedict's reagent (blue in colour). The colour appears which can be from greenish to yellow or orange. This colour indicates the presence of sugar in the contents. Thus, we can conclude that saliva breaks down the starch into sugars.

For reference if we add Benedict's reagent in sugar solution always the colour appears is from greenish to yellow, orange or brick red depending the amount of sugar. Green colour indicates traces of sugar while brick red indicates more amount of sugar.

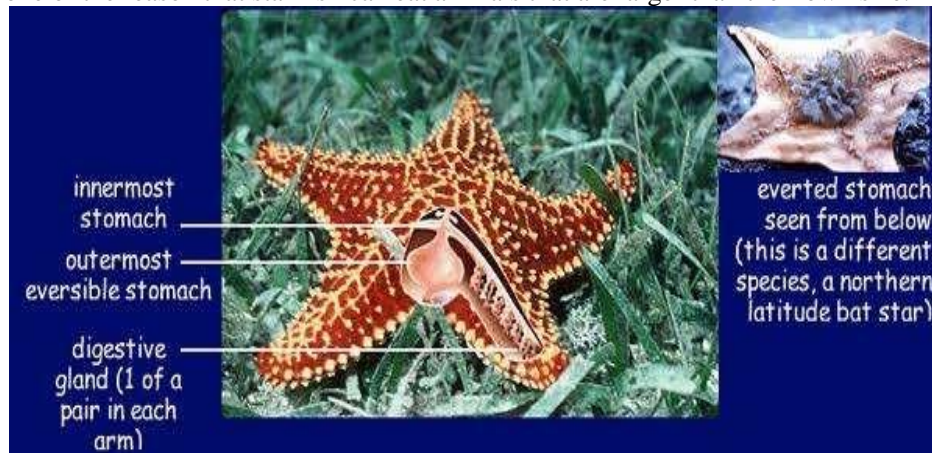


Amazing fact of Starfish (spiny skinned animal)

Starfish is not a fish, it has no bones or cartilage in it and are found in sea water or brackish water but are never found in fresh water. Most of them are carnivorous but few eat algae and other plant materials.

Starfish feeds on animals covered by hard shells of calcium carbonate. After opening the shell, the starfish pops out its stomach through its mouth to eat the soft animal inside the shell. The stomach then goes back into the body and the food is slowly digested.

The mouth is located in the centre of the oral surface and remains closed with a sphincter (type of muscles). The mouth opens through a short oesophagus into a stomach divided by a constriction into a larger, eversible cardiac portion and a smaller pyloric portion. Always the cardiac portion pops out through mouth to eat the prey. This is one of the reasons that starfish can eat animals that are larger than their own size.

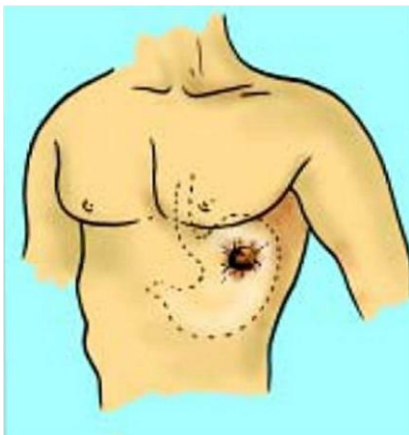


Discovery of Working of Stomach



The working of the stomach was discovered by a strange accident. In 1822, a man named Alexis St. Martin was badly hit by a shot gun. The bullet had seriously damaged the chest wall and made a hole in his stomach. He was brought to an American army doctor William Beaumont. The doctor saved the patient but he could not close the hole properly (Fig. 2.8). Beaumont took it as a great opportunity to see the inside of the stomach through the hole. He made some wonderful observations.

Beaumont found that the stomach was churning food. Its wall secreted a fluid which could digest the food. He also observed that the end of the stomach opens into the intestine only after the digestion of the food inside the stomach is completed.



Alexis St. Martin's shotgun wound

#### Always Remember

World Health Day is celebrated on 7 April every year to mark the anniversary of the founding of the World Health Organisation, it provides with a unique opportunity to mobilise action around a specific health topic of concern to people all over the world.



## ASSIGNMENT

Multiple choice questions. The given questions have one or more than one correct options.

1. Which of the following is correct for small intestine?  
(a) It is about 1.5m long                      (b) It is about 7.5m long  
(c) Its walls secrete juices                      (d) It receives secretions from liver.
2. Wisdom teeth normally grow during the age of  
(a) 17-28 years   (b) 12-15 years   (c) 38-40 years   (d) 40-45 years
3. Select the ruminants from the following  
(a) Camel              (b) Giraffe              (c) Deer              (d) Pig
4. The process of change of digested absorbed substances into complex substances and its use is called  
(a) Absorption   (b) Assimilation   (c) Digestion      (d) Ingestion
5. The intestinal juice changes fats into  
(a) Fatty acids   (b) Glycerol      (c) Glucose      (d) Amino Acids
6. The saliva breaks down  
(a) Starch into maltose sugar      (b) Sugar into glucose      (c) Fats into fatty acids                      (d) Starch into sucrose sugar
7. Amoeba uses ..... to capture food.  
(a) mouth              (b) one pseudopodium   (c) two pseudopodia                      (d) contractile vacuole.
8. The largest compartment in compound stomach is.....  
(a) rumen              (b) reticulum      (c) omasum      (d) Abomasum
9. .... is known as animal starch.  
(a) Glucose      (b) Maltose      (c) Starch              (d) Glycogen
10. Read the following two statements carefully and choose the correct options. (i) Blood vessels and nerves of a tooth are present in pulp (ii) Study of teeth is called dentistry (a) Statement (i) is correct while statement (ii) is incorrect. (b) Statement (ii) is correct while statement (i) is incorrect. (c) Both statements are correct. (d) Both statements are incorrect

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