Nutrition in Animals

One thing that distinguishes between Living and Non living organisms is the processes that take place in the bodies of living organisms. These are called the life processes. These processes are:

-Respiration

-Transportation- how the food moves through diff parts of the body

-Excretion

-Control & Coordination- synchronization between diff parts of the body

-Reproduction

-Growth & development

-Movement

FUNCTIONS OF FOOD

Food is required by all organisms including humans for

- growth
- repair
- Functioning of the body.

In order to grow and develop properly, every living being needs nutrients through various food. These then provide nourishment to our body.

NUTRITION

Is the process of obtaining food and changing it into simple absorbable form. E.g…a sandwich when eaten breaks up in our body and then provides us energy, helps in cell repair, maintaining immunity and increasing our resistance against diseases.

How do animals get Nutrition?

There are 2 modes of nutrition: **Autotrophic (self dependent for e.g. Plants) and heterotrophic (dependent on others, for e.g. Animals / Humans)**

Heterotrophic Nutrition could be of 3 types:

1. **Saprophytic** – Which depends upon dead organisms for their food . For example, Fungi, Bacteria
2. **Parasitic** – Which depends upon other living organisms for their food.

Some parasites enter the body by way of contaminated food or water and some live on the skin and the hair. Examples of parasites include:

- stomach and gut worms (threadworm, hookworm)
- skin mites (scabies)
- hair and body lice (head lice and crab lice)
- protozoa (Giardia

3. **Holozoic** – Organisms which intake (or take in) complex organic matter as food for e.g. Humans, Animals like goat, rabbit, horse etc. So holozoic animals can be herbivores, carnivores or omnivores.
   -Protozoa, such as amoebas, and most of the free living animals, such as humans, exhibit this type of nutrition.
   -This happens by the taking in of complex organic food through mouth opening in case of higher animals like the **humans** and through body surface in case of lower organisms like **amoeba**.

Holozoic nutrition involves following steps:

Ingestion – Intake of food in complex form.

Digestion – Conversion of complex food into simpler form by enzymes.

Absorption - It is a process in which the digested food gets absorbed by the walls of organs like the small intestine and then passes into the blood vessels.

Assimilation - Absorbed food being utilized for energy needed for various activities. Hence the absorbed food is used up by the cells of the body to convert it into substances like proteins and fat which are required by the body.

Egestion - Removal of undigested food.

ANIMAL NUTRITION

Since animals are heterotrophs, they get their foods in different ways. Listed below are feeding patterns of different animals.

Organisms	Feeding Pattern
Mosquitoes, Leeches	Pierching body of humans with their mouth parts and sucking blood.
Snakes	Swallowing whole food
Elephants	Using their long trunks to put food into their mouth
Birds	Through beaks and claws
Rabbits, Squirrels, Rats	Gnawing seeds and fruits with their sharp front teeth
Sponges	These simplest organisms feed on small particles on food suspended in water and enter their bodies through their pores.
Oysters	Filtering materials through a layer of mucus in their gills.
Starfish	Graze on the surface of the rocks present in the seabed, scrapping off the layer of algae growth for their food.
Butterfly and moths	Using their coiled mouth parts (proboscis) which probes down to the base of the flowers to suck nectar from them.
Molluscs	Siphoning
Carnivores	Cut, tear and eat

1. **AMOEBA**

FEEDING AND DIGESTION IN AMOEBA

- Amoeba is a microscopic single – celled organism found in ponds, lakes, freshwater, slow streams etc. (In contrast to the amoeba, humans are made up of millions of cells).
- It displays holozoic nutrition.
- Normally it is found creeping, feeding upon algae, bacteria etc.
- Under the microscope, it appears as irregular, jelly-like tiny mass
- It has no fixed shape and the outline of body continues changing due to formation of small finger like outgrowths called pseudopodia
- Pseudopodia are temporary finger like projections with blunt rounded tips which are constantly being given out or withdrawn by the body.
- Many pseudopodia are formed simultaneously.
- Pseudopodia not only helps it to move but also helps it in food capture.
- Like an ordinary cell the body of amoeba has 3 main parts:
    - Plasma lemma or plasma membrane or cell membrane
    - Cytoplasm and
    - nucleus.

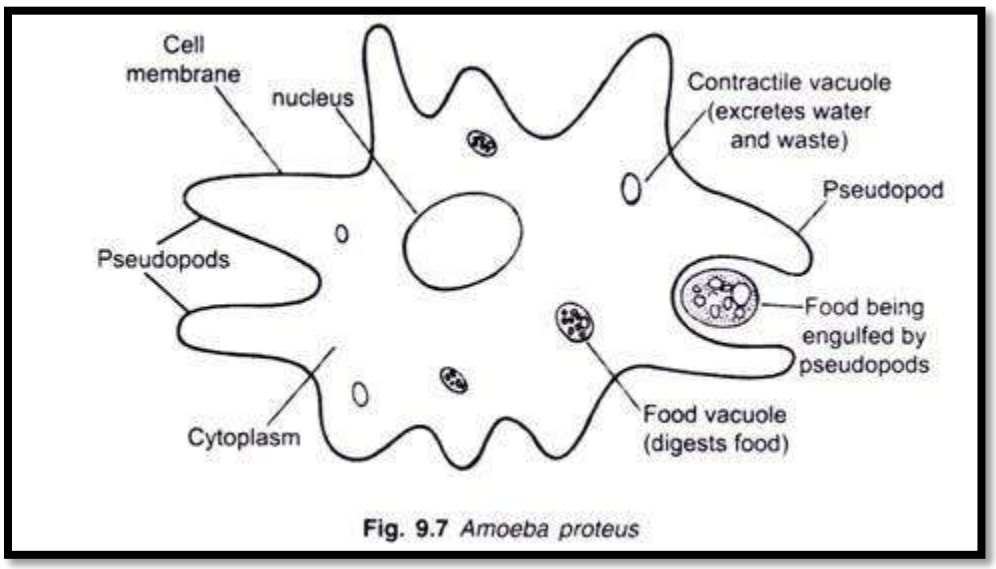


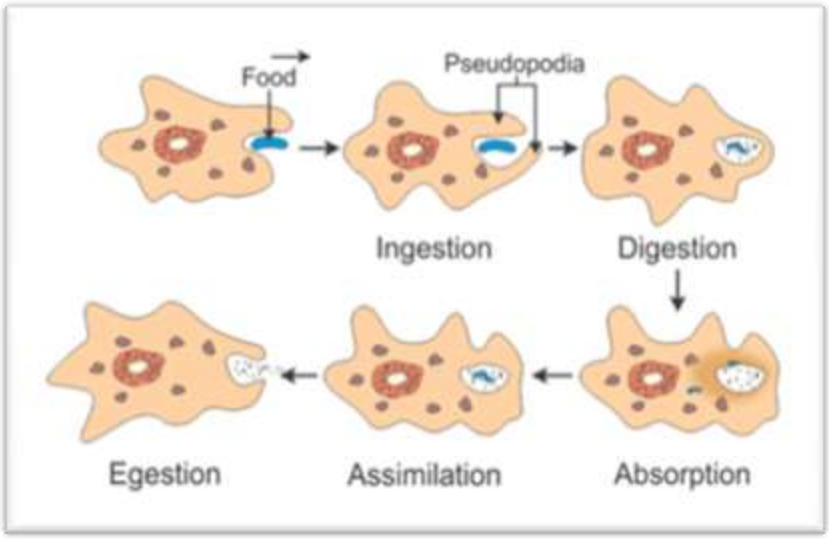
Fig. 9.7 *Amoeba proteus*

Plasma lemma----

- Plasma lemma is a very thin, delicate and elastic cell membrane of amoeba .
- This membrane is selectively permeable and regulates exchange of water, oxygen and carbon dioxide between the animal and the surrounding medium.
- From the outer surface of plasma lemma, small ridge like projections arise which helps in fixing the organism to the substratum.

Cytoplasm------ Inside the cell membrane is a thick material called Cytoplasm.

- The cytoplasm is differentiated into Ectoplasm and Endoplasm.
- The ectoplasm forms the outer and relatively firm layer lying just beneath the plasma lemma.
- It is a thin, clear (non-granular) and hyaline layer It is thickened into a hyaline cap at the advancing end at the tips of pseudopodia.
- The endoplasm forms the main body mass completely surrounded by the ectoplasm. It is granular heterogeneous fluid.
- Endoplasm contains a number of organelles or structures suspended in it. These organelles are nucleus, contractile vacuole, food vacuoles and water globules.
- There is a single conspicuous Nucleus.
- The outer part of the endoplasm near the posterior end contains a clear, rounded and pulsating vacuole filled with a watery fluid. This vacuole, called the Contractile Vacuole
- The Contractile Vacuole is basically a **water** bubble within the endoplasm . It's function is to regulate the **water** content of the cell. It is also a means of excreeting its waste from the cell (out through the **cell membrane**) VIA diffusion. ... Without the contractile vacuole, the amoeba may burst.
- Numerous Food Vacuoles are scattered in the endoplasm
- Each Food Vacuole contains a morsel of food under digestion. Digestion of food takes place inside the food vacuole.
- These are several small, spherical, colourless and non-contractile vacuoles filled with water called the Water Vacuoles.



DIGESTION IN AMOEBA

- When an Amoeba senses any food, it sends out its finger-like projections,(formed by extension of the cell membrane) called **pseudopodia,** around the food particle to engulf it.
- When a food particle comes near the Amoeba, then the Amoeba produces two pseudopodia around the food particle and surrounds it.
- The two pseudopodia then join around the food particle and trap it in a food vacuole with a little water.
- The food vacuole contains digestive enzymes which break down the food into nutrients and undigested waste. The nutrients from the food are directly absorbed by the body of the Amoeba, the Cytoplasm (Endoplasm). The undigested wastes are simply thrown out of the body through a rupture anywhere in the cell wall. After the nutrients are absorbed, the vacuole disappears.
- The mode of nutrition and digestion differs from animal to animal but the basic process of digestion remains the same.
- It is the breakdown of food so that it can be used to release energy for all their activities.

STARFISH

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 animals inside the shell. The stomach then goes back and the food is slowly digested.

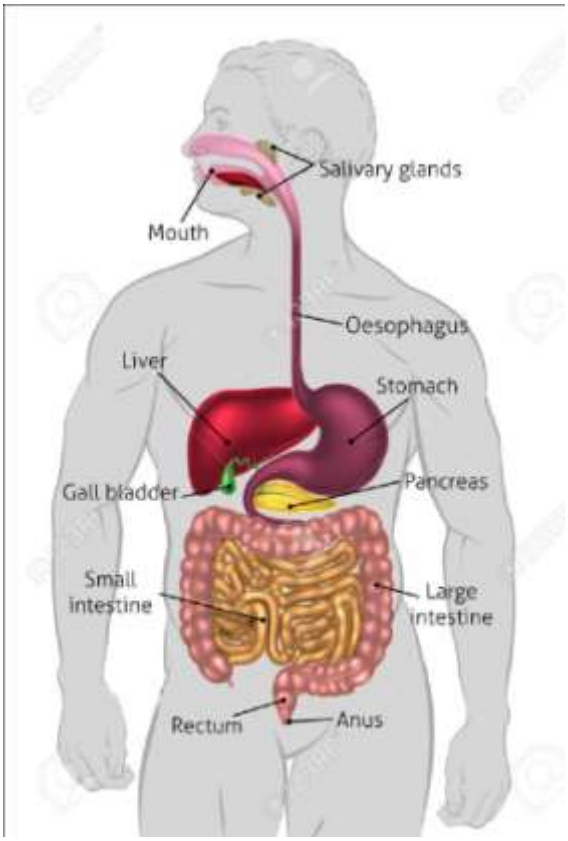
DIGESTION IN GRASS-EATING ANIMALS

- Cows, buffaloes and other grass-eating animals chew continuously even when they are not eating. Actually, they quickly swallow the grass and store it in a part of the stomach called **rumen.**
- Here they gets partially digested and is called **cud.** But later the cud returns to the mouth in small lumps and the animal chews. This process is called **rumination** and these animals are called **ruminants.**
- Many animals like cow, sheep, goat are called Ruminants.
- Cows have a special stomach having 4 pouches or chambers.
- When the cow or other ruminants eat, they quickly swallow plenty of grass / plants without chewing it.
- This partially chewed food then gets mixed up with saliva and gets stored in one of the 4 chambers of the stomach called the Rumen.
- Here the partial digestion of food take place and this partially digested food is known as the Cud.
- When the animal is resting, the cud returns to the mouth as small lumps, where it is chewed again and the digestion then continues as normal.
- Chewing of the cud helps in the digestion of the food and also breaks up the carbohydrates and cellulose.
- Small pieces of this food then returns to large sac - like structure known as the Caecum where it is completely digested by the action of certain bacteria which are not present in humans.
- **The grass is rich in cellulose, a type of carbohydrates. Many animals, including humans, cannot digest cellulose. Therefore, cellulose acts as roughage.**

Q. Why are human beings not able to digest grass?

Ans. Human beings don't have the special bacterial in their digestive system, which helps in the breakdown of cellulose and hence are not able to digest grass.

DIGESTION IN HUMANS



- We take food through the mouth, digest and utilize it.
- The food passes through a continuous canal which begins out the buccal cavity (mouth cavity) and ends at the anus.
- The canal can be divided into various compartments:
    a. the buccal cavity – or the mouth
    b. food pipe or esophagus – also known as gullet
    c. stomach
    d. small intestine
    e. large intestine ending in the rectum (comprising of caecum which has the appendix, colon and rectum)
    f. anus
- <u>These parts together from the alimentary canal (digestive tract). It therefore comprises of the whole passage along which food passes through the body from mouth to anus during digestion.</u>

- The food components gradually get digested as food travels through various compartments. The inner walls of the stomach and the small intestine, and the various glands associated with the canal such as salivary glands, the liver and the pancreas secrete digestive juices.
- The digestive juices convert complex substances into simpler ones. The digestive tract and the associated glands together constitute the digestive system.

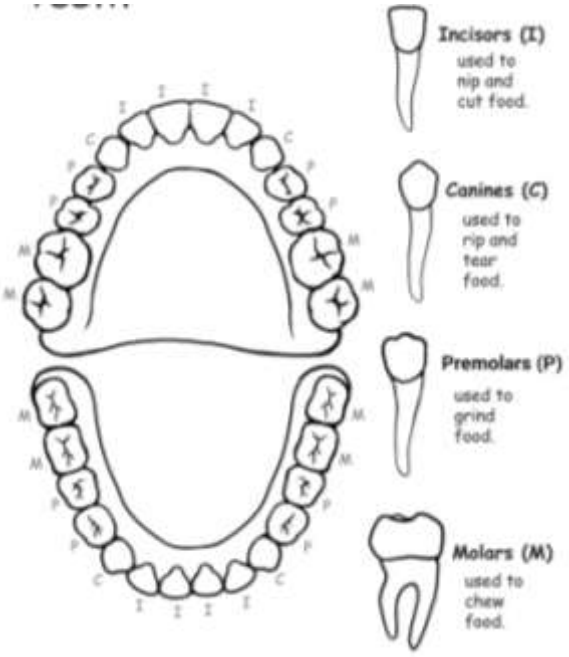
NOTE – Rectum is a part of the lower gastrointestinal tract. It is a continuation of the colon, which ends in the anus.

THE MOUTH AND BUCCAL CAVITY

INGESTION

- The process of taking food into the body is called Ingestion.
- The breakdown of food into small pieces with the help of teeth is known as Mastication.
- Digestive glands known as salivary glands release a watery liquid into the mouth called the Saliva
- We chew the food with the teeth and break it down mechanically into small pieces. Each tooth is rooted in a separate socket in the gums. Our teeth vary in appearance and perform different functions.

TEETH



- There are 32 permanent teeth present in our mouth (16 in each jaw). These come after the milk teeth start falling off.

Type	Function	Upper Jaw teeth	Lower Jaw teeth	Total
Incisosors (front)	Cutting and biting	4	4	8
Canines (an either side of the incisors)	Piercing and tearing	2	2	4
Pre Molars (behind the canines)	Chewing and grinding	4	4	8
Molars	Chewing and grinding	6	6	12
				32

- However, if we do not clean our teeth and moth after eating, many harmful bacteria also begin to live and grow in it.
- These bacteria break down the sugar present from the leftover food and release acids.
- The acids gradually damage the teeth and this is called Tooth Decay.
- It causes bad breadth, severe toothache, and in extreme cases it causes tooth loss.
- Chocolates, sweets, soft drinks and other sugar products are major culprits of tooth decay.

Dental Care

- Tooth decay or dental cavities is a common dental disease.
- This disease destroys the tooth's structure and produces holes called cavities.
- When food particles get stuck in the space between two teeth, they are acted upon by the bacteria which are already present in the mouth.
- Bacteria form a sticky colourless film on the teeth called plaque.
- This leads to production of certain acids that slowly damage the teeth leading to cavities.
- When plaque is not removed, it accumulates on the gums and teeth and hardens into a lime-like substance called tartar.
- This leads to disease called pyorrhea.
- People suffering from pyorrhea have shiny and bright-red swollen gums which tend to bleed easily.