

# Nutrition

## Nutrition in Animals

Nutrition is the process of obtaining food and then using it for obtaining energy, growth and repair of the body. There are five main processes concerned with the use of food by animals. As we know that Plants produce their own food by the help of photosynthesis. But animals are heterotrophs and hence they depend on other organisms for their food. This readymade food comes either from plants or from other animals. We are also animals and obtain food from plants in the form of rice, pulses, vegetables etc. and foods like milk; eggs, chicken, fish etc are obtained from other animals. Many other animals obtain their food by eating the flesh of other animals like fish, birds, snake etc. The big fish eat small fish, the snake eats frog and the insects eat dead bodies of animals. The non- green plants also obtain their food from other plants or animals e.g yeast plant. Also, plant eats insects like pitcher plant and Venus fly- trap.

Animals are divided into three groups on the basis of their food habits. These are: Herbivores, Carnivores and Omnivores.

(i) *Herbivores*: are those animals which eat only plants like grasses, leaves, fruits etc. Examples of herbivores are: Goat, Cow, Sheep, Horse, Ox, Elephant etc. Thus, herbivores are plant eaters and also known as herbivorous animals.

(ii) *Carnivores*: are those animals which eat other animals as food or they eat meat or flesh of other animals. Examples are: Lion, Tiger, Frog, Vulture, Lizard etc. Therefore, Carnivores are meat eaters and known as carnivorous animals.

(iii) *Omnivores*: are those animals which eat both plants and animals. Examples are; Man (Human Beings), Dog, Crow, Bear, Ant etc. Thus, Omnivores are plant eaters as well as meat eaters and known as Omnivorous animals.

As we know all the living things depend on sun for their own food. Plants use the energy of sun and prepare food by photosynthesis. Plants are eaten by herbivores and omnivores as food. Meat eaters or carnivores also eat other animals or other carnivores in the form of food and scavengers eat dead and decaying plant and animal. So, it is the energy of sun which provides food for plants and animals.

### Five steps in the process of Nutrition in Animals

There are five steps in the process of Nutrition in animals. These are: Ingestion, Digestion, Absorption, Assimilation and Egestion.

1. **Ingestion:** is the process of taking food in to the body or 'eating of food' by the animal. When we put food in to our mouth with hands, we are ingesting it.
2. **Digestion:** is the process in which the food containing large, insoluble molecules is broken down in to small, water soluble molecules which can be absorbed by the body or digestion is the dissolving of the solid food. Most of the animals include both physical and chemical methods for digesting the food. Physical method includes chewing and grinding the food in mouth and chemical method include the addition of digestive juices (enzymes) to food by the body itself.
3. **Absorption:** is the process in which the digested food passes through the intestinal wall in to blood stream. As, after the digestion, food molecules become small and soluble. This food passes through the walls of our intestine and goes in to the blood.
4. **Assimilation:** is the process in which the absorbed food is taken in by the body cells and used for energy, growth and repair. Blood carries the absorbed food to all the parts of the body.
5. **Egestion:** is the process in which the undigested food is removed from the body. The whole food which we eat is not digested by our body, a part of the food remains undigested which cannot be used by the body and so it is removed from the body in the form of faeces when we go to the toilet.

## Nutrition in Simple Animals

There are two very simple animals namely amoeba and paramecium. They are made up of single cell and so known as unicellular animals. So, all the 5 processes of nutrition are performed by single cell. The mode of nutrition in amoeba is *holozoic*. They eat tiny or microscopic plants and animals as food which floats in water in which it lives. The process of obtaining food by Amoeba is called phagocytosis means cell feeding.

(i) *Ingestion:* Amoeba has no mouth so food is ingested by using pseudopodia. When food comes near amoeba, then amoeba ingests this food particle by forming temporary finger like projections called pseudopodia around it. And the engulfed food with water formed a food vacuole which is considered as 'Temporary stomach' of Amoeba.

(ii) *Digestion:* In Amoeba food is digested in the food vacuole by digestive enzymes. These enzymes break down the food in to small and soluble molecules by chemical reactions.

(iii) *Absorption:* The digested food present in the food vacuole of Amoeba is absorbed directly in to the cytoplasm by diffusion. Due to the presence of one cell, blood is not required to carry the digested food. The food just spreads out from the food vacuole in to the whole cell of Amoeba and finally food vacuole disappears.

(iv) *Assimilation:* A part of the absorbed food is used to obtain energy through respiration and the remaining part of the food leads to the growth in Amoeba. And then amoeba can reproduce by dividing in to two daughter cells.

(v) *Egestion:* Amoeba has no fixed place for removing the undigested part of food. When a considerable amount of undigested food collects inside amoeba, then its cell membrane suddenly ruptures at any place and undigested food is thrown out of the body of Amoeba.

In case of *Paramecium*, hair like structures called cilia helps to sweep the food particles from water and put them in to mouth. This step is known as ingestion which is followed by other steps such as digestion, absorption etc.

# Nutrition in Plants

The process by which green plants make their own food from carbon dioxide and water by using sunlight energy in the presence of chlorophyll is called photosynthesis. Green plants also need food to acquire energy. All living organisms need energy to perform various life processes. This article deals with the modes of nutrition in plants. How plants prepare their own food, what all factors are responsible for photosynthesis etc.

Plants make their own food in the presence of sunlight and hence they are autotrophs. Plants convert sunlight energy into chemical energy. They use carbon dioxide, water and sunlight to make their own food in the presence of chlorophyll.

There are two types of modes of nutrition in plants. They are:

- 1) Autotrophic
- 2) Heterotrophic

Since we are learning about mode of nutrition in plants we will discuss only about autotrophic mode of nutrition.

## **Autotrophic mode of nutrition**

In autotrophic mode of nutrition organisms make their own food with the help of simple inorganic materials like carbon dioxide and water, in the presence of sunlight. Also in this nutrition organic food is made from inorganic materials.

Green plants have autotrophic mode of nutrition. These organisms are called autotrophs. The autotrophs have green pigments called chlorophyll which help in trapping sunlight energy. They use the sunlight to make food by the process of photosynthesis. The food produced by autotrophs is used by human beings and animals as well.

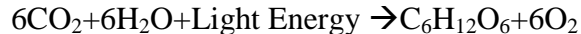
## **Nutrition in Plants**

Green plants synthesize their own food by the process of photosynthesis. Photo means light and synthesis means to build, so photosynthesis means 'building up by light. It is in the presence of chlorophyll that plants use energy of sunlight to make food from inorganic materials like carbon dioxide and water.

*Green plants make their own food by photosynthesis*

*Chlorophyll is present in green coloured bodies called chloroplast. The leaves of a plant are green due to the presence of chlorophyll in them.*

In the process of photosynthesis a lot of oxygen gas is released. Let us understand with the help of equation:



Food is prepared in the green leaves of the plant. Plant requires carbon dioxide to make food which it takes from air. The carbon dioxide enters the leaves through tiny pores in them called stomata. Water required to make food is taken from soil. This water is transported to the leaves through roots and stem. The sunlight provides energy to carry out chemical reactions and chlorophyll present in green leaves help in absorbing this energy. Oxygen produced as a by-product in this process which goes out in the air.

*The food prepared by the leaves is in the form of simple sugar called glucose. This glucose is then sent to other parts of the plant. The extra glucose is stored in the leaves of the plant in the form of starch. Glucose and starch belong to a category called carbohydrates. Thus green plants convert sunlight energy into chemical energy.*

### **The steps for photosynthesis are:**

- i) Sunlight energy is absorbed by chlorophyll.
- ii) Sunlight energy is converted into chemical energy and water is split into hydrogen and oxygen.
- iii) Carbon dioxide is reduced to hydrogen so that carbohydrate like glucose is formed.

It is not necessary that these steps of photosynthesis take place one after the other.

### **Conditions Necessary for Photosynthesis**

Following are the conditions necessary for photosynthesis:

- 1) Sunlight
- 2) Chlorophyll
- 3) Carbon Dioxide
- 4) Water

Let us discuss some experiments to prove that sunlight, chlorophyll, carbon dioxide and water are necessary for photosynthesis. *This can be proven by getting the result that green leaves make starch as food and starch gives blue-black colour with iodine solution.*

### **Experiment to Show that Sunlight is Necessary for Photosynthesis**

- Take a potted plant with green leaves and keep it in a completely dark place for three days. In this way all the starch stored in the leaves will be consumed by the plant and leaves will get destarch.
- Now wrap an aluminium foil tightly in the middle part of one leaf in such a way that a small part of a leaf is covered and remaining part is exposed to sunlight. The aluminium foil must be fixed tightly using paper clips so that sunlight cannot enter from the sides.
- Keep the potted plant in sunlight for three to four days.

- Pluck the partially covered leaf and remove aluminium foil. Now immerse this leaf in boiling water so that cell membranes of the leaf cell are broken down. This will make the leaf more permeable in iodine solution.
- Before testing the leaf for the presence of starch chlorophyll has to be removed from the leaf. This is because chlorophyll interferes in the test for starch.
- Now put this leaf in a beaker containing alcohol and place this beaker in water bath.
- Heat this water bath and in this way alcohol in the small beaker will also be heated and start boiling. This boiling alcohol will remove chlorophyll from the green leaf.
- After the green colour is removed from the leaf it will become colourless.
- Remove the colourless leaf from alcohol and wash it with hot water.
- Place this leaf in a petri-dish and drop iodine solution over it. You will notice a change in colour.
- The middle part of the leaf which was covered with iodine solution will not turn blue-black on adding iodine solution. This shows that no starch is present in this part of the leaf. This is because sunlight could not reach over the covered part of the leaf and it could not do photosynthesis to make starch.
- The uncovered part of the leaf which was exposed to sunlight turns blue-black on adding iodine solution. This is because it could do photosynthesis in the presence of sunlight and make starch.
- Therefore, we conclude that sunlight is necessary for photosynthesis and leaves make starch as food by photosynthesis

There are certain plants that have partially white and partially green leaves. Such leaves are called variegated leaves. Croton and coleus have variegated leaves.

### **How Plants Obtain Water for Photosynthesis?**

Plants obtain water for the process of photosynthesis from soil. Roots of a plant absorb water from the soil which transported upward to the leaves through xylem vessel and utilised for photosynthesis.

Plants use carbon dioxide and water as raw materials to prepare energy food called carbohydrates. Other material like nitrogen, phosphorus, iron and magnesium which are required by the plant are taken from soil.

### **Site of Photosynthesis: Chloroplasts**

The cell organelles of green plants which contain chlorophyll are called chloroplasts. It is here that the photosynthesis takes place. Chloroplasts are just below the upper epidermis of the leaf in palisade tissue.