Biologically Important Minerals. Sources and Uses of Biopolymers.

Learning outcomes:

Students will be able to:

1. enlist biologically important macro and micro minerals.
2. list the sources and uses of carbohydrates, protiens, lipids, nucliec acids and vitamins.

Minerals

Minerals are the inorganic elements present in the diet. These minerals do not supply energy like other nutrients such as carbohydrates, fats or protiens but their role in the diet is equally important for maintenance, building and rebuilding of tissues.

Although living matter contains traces of all the elements found in its surroundings, only 23 elements have been observed to be essential for life. Out of these 23 elements, 11 are non-metals, such as C, H, O, N, S, P, Cl, F, I, B, Si.
The rest are metals, such as Ca, Na, K, Mg, Fe, Cu, Zn, Co, Al, Ni, Mo,Se.

The minerals are useful to maintain pH, osmotic pressure and act as ion antagonists. Requirment of the minerals varies from 100 mg or more to a few micro grams per day. The elements required in microgram, are Cu^{+2}, Co^{+2}, Ni^{+2}, Al^{+3} etc.

Some of the important macro and microminerals are listed below.

Macrominerals	Microminerals	
Calcium (Ca) Magnesium (Mg) Phosphorus (P)	Chromium (Cr) Copper (Cu) Chlorine (Cl) Fluoride (F) Iodine (I) Iron (Fe)	Manganese (Mn) Molybdenum (Mo) Potassium (K) Selenium (Se) Sodium (Na) Sulfur (S) Zinc (Zn)

IMPORTANT MINERALS AND ITS FUNCTIONS

Calcium

A mineral important for strong teeth and bones and for muscles and nerve function.

Sources:

Milk and its products, fish with bones that are eaten, turnip and mustard greens, almonds and broccoli.

Chloride:

A mineral that regulates body fluid volume, concentration and acid-base balance.

Sources:

Table salt, foods processed with table salt, milk and its products, eggs and sea food.

Chromium:

A mineral important in regulating blood glucose. Although chromium works with insulin to help your body use blood sugar.

Sources:

Brewer's yeast, whole grain and meats.

Copper:

A mineral that is important for nerve function, bone maintenance, growth, blood formation and utilization of glucose.

Sources:

Organ meat, sea foods, nuts and seeds.

Fluoride:

A mineral that is important to dental and bone health. Greatly improves resistance to cavitites.

Sources:

Fluorinated water, fish with bones that are

eaten and tea.

Iodine:

A mineral essential for the production of thyroid hormones.

Sources:

Seafoods, iodized salt and food containing iodized salt.

Iron:

A mineral that is an essential constituent of blood and muscle and important for the transport of oxygen.

Sources:

Liver, red meat, egg yolk, legumes, whole grains and dark green vegetables.

Magnesium:

A mineral found mainly inside muscles, soft tissues and bone. It functions in many enzyme processes.

Sources:

Nuts, legumes, whole grains and green vegetables.

Manganese:

A mineral that is important for growth, reproduction, formation of bone, and carbohydrate metabolism.

Sources:

Whole grains, fruits, vegetables and tea.

Molybdenum:

A mineral involved in many enzyme processes, nerve function and protein metabolism.

Sources:

Milk, beans, breads and cereals.

Phosphorus:

A mineral essential to bone formation and maintenance, energy metabolism, nerve function and acid balance.

Sources:

Meat, poultry, fish,eggs, dairy products

and cereal products.

Potassium:

A mineral that is essential for nerve function, muscle contraction and maintenance of normal blood pressure.

Sources:

Fruits and vegetables.

Sodium:

A mineral that regulates body fluid volume, concentration of acid-base.

Sources:

Table salt, milk and its products, eggs and sea food.

Zinc:

A mineral involved in wound healing, taste sensation and growth.

Sources:

Meat, liver, eggs and seafoods.

Sources and Uses of Carbohydrates:

Sources:

Following are the rich sources of carbohydrates.

Jawar, Rice,Whole wheat flour, Green grams, Kidney beans, Apricot, Dry dates, Honey, Maize, Corn, Sugar cane, Potato etc.

Uses:

i. Glucose: is used as a food, as a raw material in the prepration of vinegar, in flavouring of syrups and jellys. It is also used as a reducing agent in the

silvering of mirror.

ii. **Fructose:** is used as a sweetening agent in different food materials and as a substitute of cane sugar for persons suffering from diabetes.

iii. **Sucrose:** is used as a food. Its a major ingrediant of jellys, jams, canned fruits and condensed milk.

iv. **Maltose:** is used in infant foods and in malted milk

v. **Starch:** is used as food, in coating and sizing paper to improve the writing qualities. It is also used to treat textile fibers, in laundring and in the manufacture of

starch nitrate which is used as an explosive.

Sources and Uses of Proteins:

Sources:

Meat, White meat, pulses, milk, egg, Nuts, Maize, Wheat, Rice, Corn, Barley etc.

Uses:

Protein is an important component of every cell in the body. Hair and nails are mostly made of protein. Your body uses protein to build and repair tissues. You also use protein to make enzymes, hormones, and other body chemicals. Protein is an important building block of bones, muscles, cartilage, skin and blood.

i. Proteins are used in the form of *leather*.
ii. *Gelatin* is used in desserts, salads, candies and bakery goods etc.
iii. Proteins are used in the form of wool and silk.
iv. A protein, *casein* has been used industrially for a long time. Casein plastics are used in the manufacture buttons and buckles.
v. *Collagen* has been widely used in cosmetic surgery, as a healing aid for burn patients for reconstruction of bone and a wide variety of dental, orthopedic and surgical purposes.
vi. In a human body, protiens provide structural support in tendons, bones and muscles, such as- Collagen(in connecting tissues of muscles) and *Keratin*(in hair, feathers, nails).

Sources and Uses of Lipids:

Sources:

Fats and oils comes from a variety of souces-animals, plants and marine organisms.

1. Animal Fats:

Tallow from cattle, sheep and goats. kidneys and heart are the best animal parts which contain lipids. Butter and ghee are a special type of animal fat because they are made from milk.

2. Vegetable Oils:

They are mainly present in seeds and nuts

of plants. For example soyabean, coconut, mustard, sesame, cotton, linseed, caster seeds are the best source of vegetable oils.

3. Marine Oils:

These are obtained from water animals such as sardines, herrings, salmons, whales, dolphins, seals etc.

Uses:

Here are some example of uses of lipids.

- They store energy over a long period of time in the body.
- They are good source of energy and make the food more platable.
- They exert an insulating effect on the nervous tissue.etc.

Lipids are used as human food. they are also used in the manufacture of soap, glycerol, fatty acids, and candles etc.

Sources and Uses of Nucleic Acids:

Sources:

The nucleic acids, DNA and RNA, are required for the storage and expression of genetic information.

Because they are formed in the body, nucleic acids are not essential nutrients. Dietary sources are plant and animal foods like meat, certain vegetables and alcohol.

Uses:

Essential body functions such as growth, repair and reproduction all rely on nucleic acid for direction and support. Nucleic acid is in nearly every cell of the body. It is found primarily in DNA and RNA molecules. It stores genetic information and regulates cellular processes and functions.

Multiple Choice Questions

1. Which of the following element is essential for strong teeth?

A. Iodine
B. Iron
C. Calcium
D. Potassium

2. Which of the following chemicals is used in the silvering of mirrors?

A. Starch
B. Glucose
C. Vegetable oil
D. Gelatin

3. Which of the following protein is utilized in the cosmetic surgery?

A. Gelatin
B. Collagen
C. Casein
D. Keratin