MATERIAL FOR SPOT TEST I & III
(OLD STATE BOARD)
HUMAN DISEASES
I. DEFICIENCY DISEASES

APPOLO STUDY CENTRE

Health and Hygiene

14.1 Health and hygiene

Last year, in sixth standard, you have learnt about health. Health is a general state of a person's physical, mental and social viability.

In this chapter you are going to study about quantity and quality of food that you need for keeping good health, personal domestic hygiene and role of secured food.

Food

Do you ever think about what type of food that you eat? Are you choosy in your food habit? Or do you eat the same kind of food daily? What is the use of food that you eat? As you know, food has many different nutrients: carbohydrates, proteins, fats, mineral salts, vitamins and water. Each nutrient has its own function like producing energy, formation and regeneration of cells and growth of cells, regulating the functions of all body organs etc.,. So food is essential for us to do work, to grow and maintain life and to keep healthy. Yes, food is the fuel for living organism as petrol is for a motor cycle.

14.1.1 Vitamins and minerl salts

Vitamins (vital+amines) are complex organic compounds present in small amount in our food.

Vitamins do not provide energy. They do not promote growth yet they are essential for normal body activities. Mineral salts regulate the functions of all body organs. Deficiency of vitamins and mineral salts lead to several unhealthy conditions, which are termed as **deficiency diseases**.

14.1.2 Types of vitamins -sources and uses

Vitamins can be classified into two types on their solubility in fat and water.

1. *Fat soluble vitamins* :
Vitamins - A, D, E and K.

2. *Water soluble vitamins*:
Vitamins B and C.

Each vitamin has its own chemical name and very complicated chemical formula. However, for simplicity they are represented by letters such as A, B, C, D, E, and K.

Sources of vitamins

Our body cannot make most of the vitamins. Vitamin D can be formed in our body by the action of sunlight on fat under the skin and Vitamin K is formed by the bacteria which are lodged in our large intestines to some extent. Almost all the food items contain more than one vitamin in varying amount. See table 14.1 for its sources and uses (figs. 14.1 to 14.6).

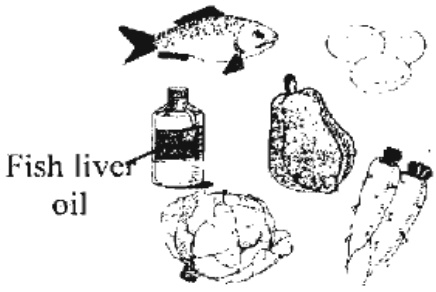


Fig. 14.1 Sources of vitamin A

APPOLO STUDY CENTRE

Sources of vitamins

Fig. 14.2 Vitamin B

Fig. 14.3 Vitamin C

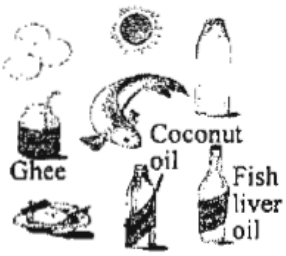


Fig. 14.4 Vitamin D

Fig. 14.5 Vitamin K

Table 14.1 Importance of some vitamins

Vitamins	*Importance*	*Where it is found*	*Deficiency*
A	Helps to keep eyes, hair and skin healthy	In carrots, butter, sweet potatoes, papaya and mango	***Night blindness and Xeropthalmia***
B_1	Helps the digestive and nervous system to work well	In eggs, meat whole cereals and yeast	***Beri-Beri***
B_2	Keeps the skin and mouth healthy	In green leafy vegetables, peas, beans and milk	***Retarded growth and bad skin***
B_{12}	Needed for healthy blood and red blood cells	Mostly in meat and nonvegetarian food	***Anaemia***
C	Helps to resist infections, of teeth, gums and joints	In almost all fresh fruits, specially lemon, oranges and goose berries and guava	***Scurvey***
D	Aids in the normal strengthening of bones	In fish liver oils, milk, meat	***Rickets in children Osteomalacia in adult.***
K	Helps in the clotting of blood	In green leafy vegetables, tomatoes, and egg yolks.	***Excessive bleeding after injury- Haemophilia***

Fig. 14.6 Sources of minerals

14.2 Food deficiency diseases

Every individual needs an adequate supply of nutritional food for good health.

Lack of essential nutrients in the diet is called **malnutrition**. It means the persons are generally weak and sick.

APPOLO STUDY CENTRE

Many people in our country and other developing countries suffer from malnutrition because of poverty; malnutrition specially affects the health of children severely. To control malnutrition government has taken several steps like noon meal scheme for school children and functioning ICDS.

A seventh class student like you needs about 2200-2500 calories daily (see Table 14.2)

Table 14.2 Recommended daily needs of some nutrients

Age group	12-15 year Girls	12-15 year Boys
Carbo hydrates	300 grams to 320 grams	300 grams to 320 grams
Proteins	2.5 g. per Kg of Body Weight	2.5 g. per Kg of Body Weight
Fats	30 to 50 g	30 to 50 g
Minerals	10 to 30 mg	10 to 30 mg
Vitamins	1 mg. of Vit. A. 1 mg of Vit. B. 50 mg of Vit. C.	1 mg. of Vit. A. 1 mg of Vit. B. 50 mg of Vit. C.
Total Calories	2200 to 2500	2200 to 2500

Table 14.3 Caloric requriments of adult according to age

Age	Men	Women
20-30	3200	2300
30-40	3100	2230
40-50	3000	2160
50-60	2750	2000
60-70	2500	1800
70-	2200	1500

14.2.1 Protein deficiency

The deficiency of proteins severely affect the children in our country in age group of 1-5 years.

Major types of diseases

1. Kwashiorkar
2. Marasmus

Kwashiorkar

This disease develops from the replacement of mother's milk by high caloric and low protein diets in a child more than one year.

Symptoms

Thinning of limbs, stunted growth retarded mental abilities. The abdomen, feet and legs are swollen in nature (fig. 14.7).

Fig. 14.7 Children suffering from Kwashiorkar disease.

Marasmus

This disease develops when the mother's milk is replaced too early by other foods, which are poor in both proteins and energy food.

Symptoms

Head of child is large, limbs look like stick, loss of body weight, impaired growth and brain development (fig. 14.8).

APPOLO STUDY CENTRE

Fig. 14.8 Children suffering from Marasmus disease

a b

Fig. 14.9 The rat (a) was fed a diet lacking in vitamin A. The other(b) had a properly balanced diet. Note the eyes and fur on both cases.

Table 14.4 Vitamins and mineral deficiency diseases

Deficiency Diseases	*Deficient Nutrients*	*Major Symptoms*
Night blindness	Vit. A.	no vision in dim Light
Xeropthalmia	Vit. A	dryness of cornea-Blindness (fig. 14.9)
Rickets (in Children)	Vit. D & Calcium	weak, soft, thin bones, swelling on wrist, elbow and knee (fig. 14.11)
Osteomalacia (In adult)	Vit. D & Calcium	weak bones of vertebral columns
Bleeding disease	Vit. K.	delayed blood clotting, so profuse bleeding
Beriberi	Vit. B_1	numbness, weakness, fluid accumulation in tissues.
Pernicious anaemia	Vit. B_{12}	Immature red cells without haemoglobin, very fatal. (fig. 14.10)
Scurvey	Vit. C	bleeding of gums, falling teeth
Goitre	Iodine	enlargement of Thyroid gland, impaired metabolism (fig. 14.12)
Anaemia	Iron	number and size of red blood cells & haemoglobin content reduced

Fig. 14.10 Feeding a diet containing vitamin B restored good health in this chick

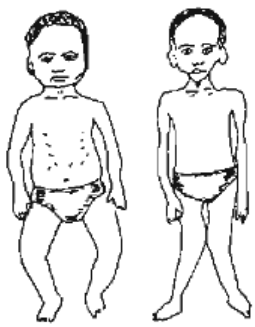


Fig. 14.11 Children suffering from Rickets

APPOLO STUDY CENTRE

Fig. 14.12 The photograph of woman suffering from Goitre

Mineral deficiency in plants

The basic needs of plants and animals are the same. They require carbohydrates, proteins, fats, minerals vitamins and water for their growth and development. Green plants can prepare their food from simple substances through the process called photosynthesis. There are three sources that supply inorganic nutrients to plants. These sources are soil, air and water.

Plants absorb a wide range of mineral elements. Out of more than 105 elements discovered, only about 20 elements are essential for normal growth of plants. There are some elements which are required in large quantities by the plants. They are called **macronutrients**. They include carbon, hydrogen, oxygen, nitrogen, phosphorous, sulphur, potassium, calcium, magnesium and silicon. NPK are the three main mineral elements supplied to crops as chemical fertilizers.

There are some elements which are required in less amount by the plants. They are called **micronutrients**. They include iron, manganese, copper, molybdenum, zinc, boron and chlorine.

Deficiency of any element in plants may lead to symptoms such as chlorosis,necrosis, stunted growth and other characterisitic symptoms.

Carbon, hydrogen, and oxygen are the building blocks of macromolecules like carbohydrates, fats and proteins. Now you will study the roles of some other elements in plants.

(i) Nitrogen

This is the mineral element required by plants in plenty. It is absorbed as nitrites, nitrates and ammonium ions. This is very essential for meristematic tissues. i.e. growing tips of plants. It is one of the constituents of proteins, nucleic acids, vitamins and hormones. Its deficiency causes yellowing of older leaves – chlorosis, stunted growth, late flowering and inhibition of cell division.

(ii) Phosphorus

It is absorbed by plants in the form of phosphate ions. It is one of the constituents of cell membrane and nucleic acids. Its deficiency causes delay in seed germination, and premature fall of leaves and flower buds.

(iii) Potassium

It is absorbed as potassium ions. It is more abundant in meristematic tissues. It is essential for maintaining acid base balance in cells and opening and closing of stomata. Its deficiency causes shortening of inter nodes, yellow edges to leaves and premature death.

APPOLO STUDY CENTRE

(iv) Magnesium

It is absorbed by the plants in the form of magnesium ions. It is a constituent of chlorophyll pigment. Its deficiency induces chlorosis between leaf veins.

(v) Boron

It is absorbed in the form of borate ions. It is essential for pollen germination, cell elongation, cell differentiation and carbohydrate translocation. Its deficiency includes formation of lesions in the stem and roots. Its deficiency also causes stunted growth.

14.2.2 Nutritional diseases in human

Some eat only roti or breads, while others prefer rice. In costal regions, people eat a lot of fresh and dried fish and in mountain regions, fruits and meat.

We eat a variety of food according to our taste and availability of food material. This constitute our food habits. Now the Globalization-concept of consumerism insists more on us to change our food habits from diverse food culture to mono food culture.

Unwanted change of food habits-i.e. more caloric value with sugar and fat leads to number of diseases like obesity, diabetes and cancer etc.,.

Obesity

Obesity means fatness. This is due to in take of more amount of high caloric value food. Over eating lead to overweight. Insufficient exercises, hormonal imbalance, hereditary are also the general causes of Obesity.

Fig. 14.13 An obese child

Regulated food, proper exercise and routine medical help can check this disease (fig. 14.13).

Cancer

Cancer is abnormal cell growth. 30-35% of cancer link with diet practice. Adulteration in food, over heating and use of reheated oil, use of synthetic chemical dye for artificial colouring, and some food preservatives are the major cause for cancer in normal man.

14.2.3 Balanced diet

For being healthy and strong, you must eat the right amount of food containing the right amount of each nutrient component. Such a food is **balanced food**.

A meal in which you eat balanced food is called a **balanced meal**.

A group of balanced meals taken during the day is called a **balanced diet**.

Balanced diet has three important qualities

1. It is rich in essential quality such as vitamins, minerals and certain amino acids.

APPOLO STUDY CENTRE

2. It provides enough energy raw materials for growth of cells, tissues, and organs.

3. It provides the energy required by the body (see table 14.5).

Activity 14.1

Choose your friends and make a list of their diet on a particular day. Tabulate their nutrients intake and check whether it is balanced or not.

Activity 14.2

Prepare a nutritive value of your daily food.

14.2.4 Toxicology

Toxicology is a branch of science that deals about the nature and effect of poison.

Food toxicology means any condition in which foods cause toxic reactions. Excessive use of chemical fertilizers and pesticides add toxins in the food items. These polluted chemical toxins leads to severe health problems like cancer, nervous disorder, even sterility.

Activity 14.3

Why should we use chemical fertilizers and pesticide? List out any alternate?

Activity 14.4

It is a common belief that the expensive food materials are of better quality. Is it true? Let us examine.

For instance, take the case of grapes and amaranthus. Grapes are available only during certain seasons. But what about amaranthus? Amaranthus is much cheaper than grapes yet we prefer grapes. Many people believe

Table 14.5 Various food stuffs needed to give us a balanced diet (quantity in grams)

Food Stuffs	*Average Man*	*Average Woman*	*Adolescent (13-15 Yrs.)*	*Child (5 years)*
Cereals (Rice, wheat etc.,)	520	440	420	270
Pulses (Various dhal-ground nuts, coconut, seeds can substitute)	50	45	45	35
Green leafyVegetables	40	100	50	50
Other vegetables(raw or cooked)	70	40	50	50
Roots and Tubers(potato, sweet potato, yam, tapioca)	60	50	30	20
Milk	200	150	250	250
Fats and Oil	45	25	40	25
Sugar and Jaggery	35	20	45	40

Note: Non-vegetarians can replace pulses = 2 eggs = 50 gms meat = fish

APPOLO STUDY CENTRE

that there is more nutritive value in grapes. Is it true? Look at the Table.

S. No	Nutritive factors	100 g of grapes	100 g of amaranthus
1.	Proteins	0.5 g.	2 g.
2.	Fats	0.3 g.	0.7 g.
3.	Carbohydrates	20.0 g.	29 g.
4.	Minerals	0.06 g.	1.7 g.
5.	Vitamin A	nil	3 µg.
6.	Vitamin C	1 mg.	30 µg.

On analyzing the table, what inferences you have arrived at. Note down:-

1. ---- 2.---- 3.----

4.---- 5.---- 6.----

14.3 Dental care and oral hygiene

Teeth are hard, calcified structures, attached to the upper and lower jaws of vertebrates and of a few lower animals.

Human teeth

Human teeth serve major functions other than chewing. The teeth are directly involved in the process of speech. The teeth also affect the appearence of face and modified by the loss of neighboring teeth or by any irregularity in tooth growth or colouring.

14.3.1 Structure and arrangement of teeth

Teeth arrangements

In buccal cavity, different types of teeth are arranged in definite order and embedded in gum socket (fig. 14.14).

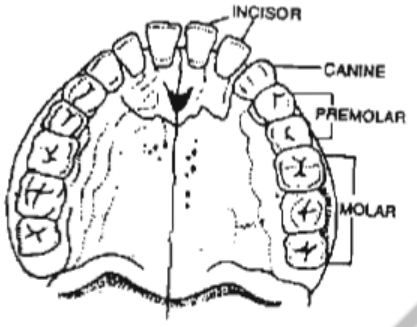


Fig. 14.14 Arrangement of teeth in the jaws

Tooth structure

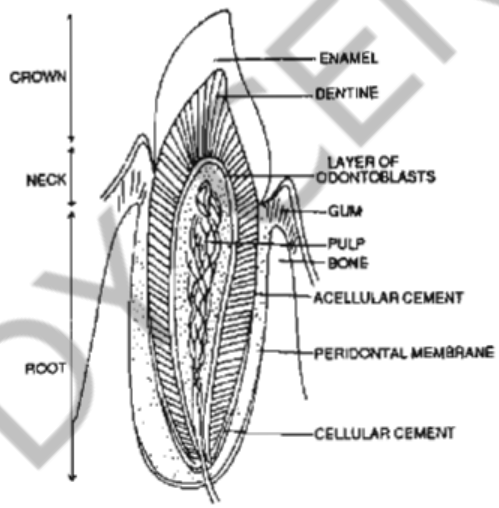


Fig. 14.15 V.S. of a Tooth

Human teeth consist of three parts; **crown, neck** and **root**. Only the crown part is exposed. Neck is surrounded by gum (fig. 14.15).

The root is embedded in a bony socket of the jaw. The outer layer of the crown is composed of calcified tissue known as **enamel**-the hardest and shiny substance in the body.

Internally the tooth contains a cavity called **pulp cavity** because it has a nourishing and sensitive material called **pulp**. The pulp is made of gelatinous connective tissues, lymph vessels, blood capillaries and nerve endings. Stellate cells called odontoblast line the pulp cavity.

APPOLO STUDY CENTRE

Odontoblasts produce a substance called **dentine**, a bone like substance extending from the inner surface of the enamel into the jaw to form the root. Dentine is further covered over by another hard substance in the region of root and neck. It is called cement.

Activity 14.5

Make a model showing teeth arrangement by paper pulp or synthetic clay and paint it properly.

Activity 14.6

Collect specimen of teeth from a dentist and preserve them

Milk or temporary teeth and permanent teeth

In human, one set of 20 teeth is produced for use during early jaw development; these are called the milk or baby teeth.

A second set of 32 larger permanent teeth replaces the milk teeth as the jaw matures. As a result of the growth and enlargement of the jaw, the roots of the milk teeth separate, allowing space for the larger permanent teeth to develop between them. The pressure of developing permanent teeth causes the tissues of the jaw to resorb, or suck up, the roots of the corresponding milk teeth.

Types of teeth

All the teeth in our mouth are not like. There are four types of teeth in our mouth. These are called **incisors, canines, premolars** and **molars**. The incisors are for biting the food, the canines for cutting and tearing the food and premolars and molars for grinding the food. So the teeth chew the food well (fig. 14.16).

Wisdom teeth are the third molar teeth, which do not usually erupt until adulthood.

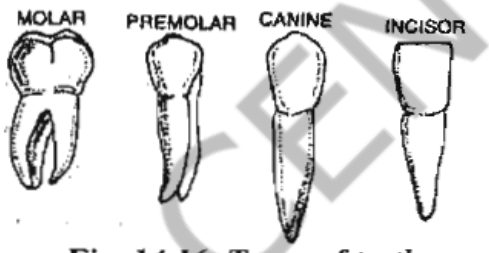


Fig. 14.16 Types of teeth

Dental formula

It is a symbolic representation of dentition in which the numbers of teeth of each type are shown for one half of mouth cavity, where those of the upper jaw as numerators and those of the lower jaw as denominators. Thus the dental formula for permanent teeth of human being is:

$$\frac{\text{I } 2.\text{C } 1.\text{PM } 2.\text{M } 3}{\text{I } 2.\text{C } 1.\text{PM } 2.\text{M } 3} = \frac{8}{8}$$

I - Incisor C - Canine
PM - Pre Molar M - Molar

Activity 14.7

Look into a mirror and count your teeth. How many of them are premolar and molar?

Activity 14.8

Look into the mouth of one of your friends. How many incisors and canines are present in your friend's mouth?

APPOLO STUDY CENTRE

14.3.2 Care of teeth

Oral hygiene

Proper oral hygiene and periodic dental examination help or prevent dental diseases.

Diet plays a vital role in maintaining dental health. A well balanced diet with a minimum of carbohydrates may minimize dental infections.

Eat as much as self cleaning foods, such as, raw vegetables, carrots, radish, spinach, cabbage fresh fruits and other food rich in vitamins and minerals.

Avoid eating sticky foods like sweets, chocolates, toffees and ice creams.

Brushing the teeth after meals to remove food residues helps to reduce decay. Teeth should be brushed in the direction of their growth to avoid gum irritation.

14.3.3 Tooth disease

Dental caries

Teeth are extremely susceptible to a process of decay - **dental caries**. You must have seen yellowing of teeth in, some of your friends and elders. This is due to a sticky film of food particles, saliva and bacteria, called **Plaque**.

Fig. 14.17 Tooth decay

If you eat sweets between meals, the plaque on your teeth absorbs the sugar like a sponge. Bacteria in the plaque changes this sugar into acid, which dissolves away the tooth enamel. The breakdown of the enamel permit other bacteria to penetrate the dentine. Ultimately, this makes a hole or cavity in the tooth, resulting severe pain.

Plaque is harmful for gums also. Plaque builds up where the teeth meet the gums and makes a space between them. Bacteria that grow in this space cause the teeth to become loose and fall out in many instances (fig. 14.17).

14.3.4 Gums pyorrhoea

pyorrhoea a chronic disease that attacks the gums and bone surrounding and supporting the teeth.

The disease begins with accumulation of tartar and debris from trapped particles of food beneath the gum margins. These accumulations cause inflammation of the gums. This affects the supporting bones and loosens the teeth. The most important cause of this is poor dental hygiene.

14.3.5 Halitosis

Offensive breath cause more and more dental decay.

14.3.6 Mumps

Mumps, the acute infectious disease is caused by a virus that mainly attacks glandular and nervous tissues, frequently characterized by swelling of

APPOLO STUDY CENTRE

the salivary glands. Improper oral hygiene and dental decay also infect the salivary glands. These leads to swellings of the salivary glands, below the sides of lower jaw. Its incidence is highest between the ages 5-9.

14.4 Zoonotic diseases

Zoonoses are defined as "those diseases and infections which are naturally transmitted between vertebrate animals and man". Zoonotic diseases may be due to viruses, bacteria, fungi, helminthes, protozoa, and arthropods (fig. 14.18).

Some of the important zoonotic diseases are given below:

- *Bacterial zoonoses* : Plague, Leptospirosis
- *Viral zoonoses* : Rabies and Japanese encephalitis.
- *Ptotozoan zoonoses* : malaria, trypanosomiasis, and kala azar.
- *Helminthic zoonoses*: taeniasis, ascariosis, and filariosis.
- *Fungal zoonoses*: Mycotic diseases
- *Ectoparasitic zoonoses*: Infestation with ticks and mites of dog.

Zoonotic diseases cause much damage to mankind by affecting the health or shortening the human life.

14.4.1. Men and animal relation -pets.

Our cave dwelling ancestors used dogs as the co-partner in hunting job. Subsequently, in all civilization dogs were used as guards, companions and hunters and in times of war. So first pet animal of man was dogs, then cats, horses and some birds (figs. 14.19, 14.20).

Pet animals kept for pleasures and companionship are usually domesticated and selectively bred for coexistence with human beings.

Besides their value as pets, pets serve utilitarian purposes protecting homes and property, destroying vermin and providing means of transport.

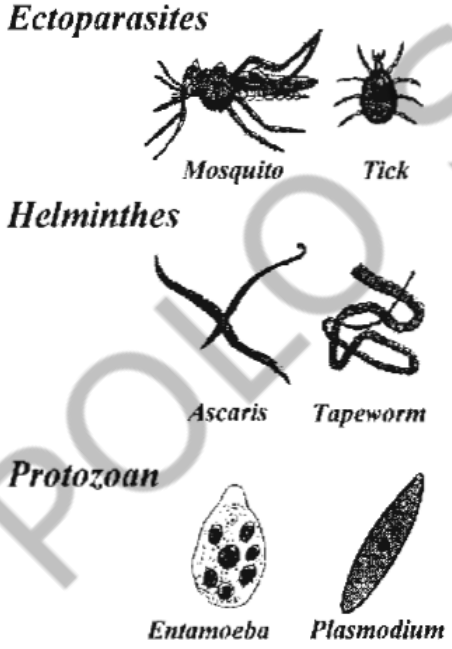


Fig. 14.18 Zoonoses - causative agents

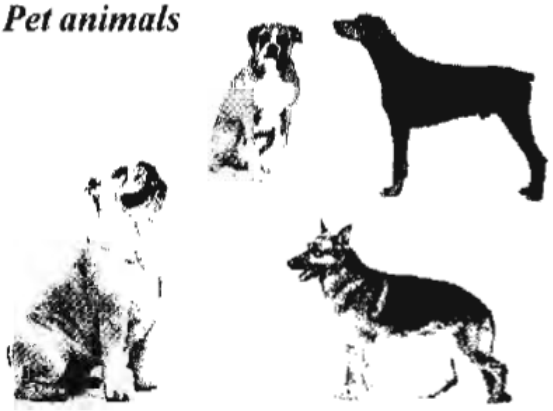


Fig. 14.19 Pet Dogs

APPOLO STUDY CENTRE

Fig. 14.20 Pet Cats

Activity 14.9

You prepare a chart showing various animals and the diseases they spread.

14.4.2 Diseaeses caused by animals

At least 40 different diseases can be transmitted from pets to people. They may be acquired from direct contact with infected animals or from the animal's excreta. Sometimes just breathing the air in the vicinity of man, infected pet can cause illness. (Table 14.6)

14.4.3 Protection from zoonotic diseases

- Acquire pets only from a reliable dealer who practises good sanitations. Do not attempt to take wild or sick animals or monkeys as pets.
- Have a veterinarian check over a new pet and provide needed immunizations.
- Keep your pet clean and properly housed. Empty litter boxes daily.
- Practise good hygiene.
- Always wash your hands after handling a pet.
- Don't let it lick your face. Keep pet's eating utensils separate.
- Keep pets out of people's bed.
- Health education to the general public should be accorded top priority.
- The high risk group should be protected by administration of specific immunization.
- Infested pets and the areas where the pets commonly reside should be treated with appropriate insecticides for fleas, ticks and mites and their larvae.

14.4.4 Protection of pet animals

- Proper food, a dry bed, sufficient exercise and affectionate care are necessary to keep animals, a happy and healthy member of the family.
- Owners should learn how to pick up pet animals correctly
- Periodic veterinary check up should be done.

Vaccination and medication

Vaccination is a very effective method of preventing infection of microorganisms, especially of bacteria and viruses.

Domesticated pet animals. such as dogs and cats are generally immunized against various infections like

- Rabies, canine distember, which affects the nervous system.
- Infectious canine hepatitis, which affects the liver

APPOLO STUDY CENTRE

Table 14.6 Some diseases caused by animals.

Name of disease	Causative agent	Aquired from	Symptoms	Prevention and control	Treatment
Anthrax	Bacillus anthracis-Bacterium	through open cut in skin, by inhaling spores, as from animal hair or wool or by consuming, contaminated meat or milk.	skin eruption respiratory tract inflammation and suffocation, may be fatal.	If there is any abnormal changes in skin, or any suffocation.	1. Compulsory inoculation of pet animals. 2. Workers of tannery and wool factories are to be vaccinated.
Rabies (Hydrophobia)	Rabies virus	Virus infected stray dogs and cats	Rabies dogs are mad, changed voice and excessive salivation with high mucous content. In man, rabies virus destroy brain cells and spinal cells, severe headache, high fever restless and inability to swallow even liquid due to choked throat.	Eradication of stray dogs and cats	Compulsory immunization of pet dogs and cats. *Anti Rabies vaccine* should be given immediately after the dog' bite.
Hydatidosis	Dog tape worm	Man acquires infection on eating food or drinking water contaminated with egg.	Eggs are developing into water haydatid or bladder worm in intestine liver, lungs and other organs. Causes inflammation in those organs. Liver is enlarged. Vomiting, diarrhoea and eosinophilia and other intestinal disorders.	Avoid playing with pet dogs, hands are thoroughly washed before eating, dogs should not be allowed to eat raw meat.	Men may be treated with drug like *Atrabin.* Dogs are treated with medicine called *Arecline hydrobromide.*
Leptospirosis	Leptospiro Bacterium	Spread thro' contaminated water, dead rats, dead domesticated animals, pet animals or even rat's urine may contaminate water.	Affecting normal functions of kidneys, liver, brain, eyes, uterus, lungs, intestine etc., vomiting, headache, fever, body pain, jaundice, acute renal failure, internal haemorrhage, blood vomiting leads to heart attack.	Dead rats and dead animals are disposed scientifically, rain water should not be logged in major path. Strictly avoid self medication	after proper diagnosing, proper antibiotic medicine should be given.

APPOLO STUDY CENTRE

- ❖ The highly contagious intestinal disease caused by virus.
- ❖ Inoculation against Leptospirosis.
- ❖ Treatment for internal and external parasites· (worms, fleas, ticks and lice).
- ❖ Cats can be periodically inoculated against many serious diseases.

Activity 14.10

How do you differentiate Anopheles with culex mosquitoes?

Activity 14.11

Visit any pet clinic and discuss with veterinary doctor about pet diseases.

14.5 Food Poisoning

If food is not properly preserved it can go bad, and lead to poisoning. Sometimes it can be sensed by an unpleasant smell and taste. Food decomposes as a result of the action of the enzymes contained itself, as well as the action of the bacteria and fungi that grow in it.

14.5.1 Factors causing food poisoning

- ❖ Bacteria and fungi play important role in food poisoning. Their toxic substances affect the quality of food and their intoxication and infections affect the general health factors.

eg. Mycotoxins-from fungi; Botulism by bacteria.

- ❖ Handling food: preparation of food also need more care. The improper cooking and food handling leading to food poison
- ❖ Poor personal hygiene in food handlers
- ❖ Cross contamination between raw and cooked food.

14.5.2 Food poisoning and health

As you know, food is very important for all living organism to perform all life activities. If food gets contaminated and poisoned, it will affect total upkeep of body health. Usually, intoxication of food shows some symptoms like vomiting, and intestinal disorders, which will recover with in a week.

Excess use of pesticides on crops, spraying pesticides in godown causes longterm damage to human health and cattle (fig. 14.21).

Pesticidal residues can also enter our body directly if we do not properly wash farm products like vegetables, fruits greens etc., before consuming them. DDT and related chlorinated hydrocarbons are some toxic chemicals. These chemicals damage all major systems like nervous system, circulatory system, reproductive system and immune system etc., in man.

Food hygiene: Food hygiene and food sanitation is a way of life.

Cleanliness and hygiene in food handling is very important.

Practise the following rules for cleanliness and hygiene of food:

- ❖ Tie hair neatly before starting food preparation.

APPOLO STUDY CENTRE

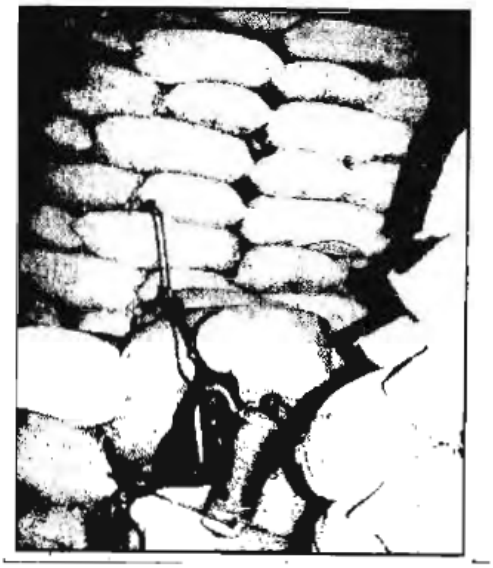


Fig. 14.21 Spraying pesticide in godown

- Wash hands thoroughly with soap and water before starting preparation.
- Food should be carefully washed to ensure removal of insecticide, worms, eggs and other parasites sticking to it.
- All drinking water should be boiled.
- Boil milk in a clean container as soon as possible after receipt and keep covered.
- Milk bottles need to be rinsed thoroughly with water and then washed with soap and water.
- Utensils and equipment used for preparations should be cleaned well.
- Cooked food should be stored and covered, preferably in the container in which it is, cooked.
- Reheating before use is advisable. But repeated heating should be avoided. Reusing the oil and reheating the oil should be totally avoided.

14.5.3 Food adulterants

Since food, like air and shelter, is an essential requirement of our life, any attempt to purposely degrade its quality is punishable under the law. Still there are some antisocial persons who adulterate food to make easy money.

When the quality of food , is lowered or affected either by addition of other inferior or injurious substances that causes damage to health.

A good example of this is the addition of water into milk or removal of fat from milk.

Adulterants are the substances (below standard) mixed with original food. Theses cause much danger to our body health as well as our society. The nutritional value of food is lost (See Table 14.7)

14.5.4 Spoilage of food

Decaying is a natural process, which makes all types of food to get spoiled sooner or later.

Causes of food spoilage

Food varies greatly in the length of time for which they can be held in their natural form without spoilage. These foods have high moisture content and are highly susceptible to spoilage.

Foods are spoiled by the action of

1. Physical means; mishandling of food

APPOLO STUDY CENTRE

2. Microorganism,
3. enzymes
4. Insects (rats, weevils and so on).

Food spoilt by microbes (bacteria and fungi) can cause illness by their extensive growth in it or by the toxins (poisonous substances).

Considerable amount of food and food materials are lost in every home due to wasteful practices and inefficient management of food. As food forms the single largest 'budget of the families, food management awareness is very important.

Activity 14.12

Testing of some food adulterants.

1. *Saw dust or Brick powder in Red chilly powder: If it mixes with water, saw dust floats, brick powder settles faster than the powder.*
2. *Papaya seeds in Black pepper: Put them in water, papaya seeds float.*
3. *Sugar solution in Honey: Dip cotton wick and burn. If wick burns with crackling sound adulteration is confirmed. (Honey will not burn)*

Table 14.7 Some common food adulterants and their harmful effects

FOOD ARTICLE	ADULTERANT	HARMFUL EFFECTS
Coffee powder	Chickory powder or Tamarind seed powder	Stomach disorder giddiness Joint pain and diarrohea
Tea	Used up tea leaves or Saw dust	Liver disorder, digestion problem
Milk, Kova & Cheese	Starch or water	Digestion problem and contaminated water could result in ill health
Sugar	Chalk powder	Can't be digested and leads to digestion problems
Black pepper	Papaya seeds or rotten pepper	Stomach, liver problems
Jaggary	Washing soda or chalk powder	Diarrhoea and vomiting.
Common Salt	Chalk powder	Digestion problems.
Mustard Oil	Argemone oil	Loss of eye sight, heart diseases and cancer epidemic infection similar to beri beri
Coconut oil	Mineral oil	Damage to liver and heart, sometimes even leading to cancer
Chilly powder	Saw dust or brick powder	Stomach disorder
Sweets and Aereated drinks	Inedible colour and chemical additives	Abnormalities of eyes, bone, skin, lungs, ovaries and testes. Sometimes leading to cancer.
Pulses (red gram)	Kesari dal	Cripping paralysis
Grains, spices and pulses	Sand, marble chips or artificial grains	Affect teeth gums, stomach, liver and intestine
Sweet, meats, icecream and bakery goods	Saccharine or other chemicals	Gastro intestinal disorder even cancer.

APPOLO STUDY CENTRE

4. *Try to find out whether you are able to see any adulterants in the food items you buy from the market. If so, make a list of them.*

14.5.5 Food preservation-various methods

Centuries ago people knew that if food was not stored or handled properly, the food would go "bad" and this could lead to sickness. Consequently, they learnt how to preserve food using salting, drying, pickling, smoking, and freezing methods to stop it deteriorating through the action of bacteria, yeast, and moulds.

Some appropriate methods and techniques of preservations can considerably reduce wastage of perishable food materials. Food preservation, in fact, offers several advantages:

- ❖ Augmenting food supply, especially out of season.
- ❖ Reducing food wastage making up for dietary inadequacies
- ❖ Increasing the storage period of food stuff, and
- ❖ Ensuring their availability in distant places.

Food preservation essentially means longer retention of the nutritive value of perishable food materials.

Methods of Food Preservation:

The different methods of food preservation are

1. drying and dehydration
2. canning
3. refrigeration
4. addition of food preservatives
5. pasteurization.

Drying and dehydration: Drying and dehydration remove water from food. The micro organisms are therefore unable to grow without water. Thus spoilage of food is prevented to some extent. Vegetables, fruits, meat and fish are dried by spreading them out in the sun. Thus these can be stored.

Canning: By cooking, we kill the micro organism but cooked foods cannot be kept fresh for a longer time. Canning is the method by which food can be preserved for a long time. In canning the food stuffs are exposed to high temperatures to kill the harmful micro organisms and to inactivate the enzymes. These foodstuffs are then sealed immediately in the air tight containers. Canned food can be preserved in a good condition for many months.

Refrigeration: Refrigeration is the method by which food is preserved at low temperature. By this method preserved foods are kept as fresh as possible without much loss of vital food values.

Addition of food preservatives: Salt, sugar, honey and oil are good preservatives. Salt and oil are used for preserving meat, fish, vegetables and pickles. Sugar and citric acid are added as preservatives in the preparations of jam and jellies.

APPOLO STUDY CENTRE

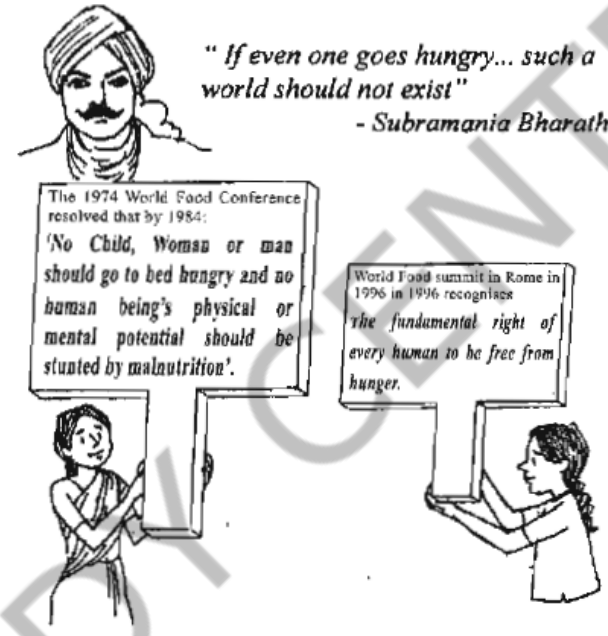
Pasteurization: Pasteurization is a process by which the disease causing bacteria in the milk are destroyed without losing its nutritive values. The milk is boiled at 60^0C for thirty minutes and cooled quickly. This is the contribution of Louis Pasteur.

Whatever the method is used for preservation of food, cleanliness and general sanitary conditions are important. Every effort should be taken to avoid contamination of food by dust, dirty utensils, soiled work surface and hands.

Activity 14.13

Find and list out the methods used in olden days to keep food grains and other edibles without damage or decay.

Nutrition is the basic requirement of health. It is the minimum need of a life of diginity-of life itself.



But achieving this still remains a distant dream...

APPOLO STUDY CENTRE

15.5 CANCER BIOLOGY

During growth, the body cells divide by mitosis. When the cell divisions become more frequent and uncontrollable, the condition is called as cancer. The cells thus formed are called as cancer cells. The cancer cells may spread all over the body and spread the disease. A study of such cells is called as **Oncology**.

The conversion of a normal body cell into a cancerous cell is mostly due to changes in the nucleus. The rapid cell division in cancer may be due to several stimulants, or inheritance. It may also happen due to viruses.

The abnormal process of cell division if spreads to the neighbouring tissues, the condition is named as **metastasis**. In the first stage, the cancer cells multiply in number. Later, through blood or lymph fluid they may spread to other regions of the body. These cells will affect several organs and cause the death of the person.

CARCINOGENIC AGENTS

As a result of research several agents that could cause cancer had been identified.

I. Tobacco usage: Tobacco used in various forms such as Cigarette, Beedi, Pan products, Snuff etc can cause cancer., Any form of tobacco can directly affect the buccal cavity, pharynx, oesophagus and lungs. Organs like kidney, pancreas and urinary bladder can also be affected.

II) Food factors: Processed and smoked food are considered carcinogenic.

III) Diseases: Certain viruses can cause cancer. The viruses causing hepatitis (jaundice) are considered carcinogenic. Sexually transmitted diseases can also result in cancer.

IV) Hereditary factors: The *retinoblastoma* affecting the retina of the eye is considered to be hereditary.

APPOLO STUDY CENTRE

V) Radiations: Organs such as breasts, bone marrow and thyroid glands can be affected by radiations. **Blood cancer** or **Leukemia** can be caused due to radiation treatments. The UV rays from sun's light can cause skin cancer.

VI) Factories:

Factory Products	Organs Affected
1. Plastics	Liver
2. Radiations	Several inner organs
3. Benzene	Blood
4. Asbestos	Lungs
5. Arsenic	Lungs, Skin and Liver

TYPES OF CANCER

There are 2 types of cancers.

1. Benign Tumour: In this type a tumour is formed due to uncontrollable cell divisions. The tumour is localized in a particular organ. It may spread to other organs too.

2. Malignant Tumour: It is the most dangerous form of cancer. The cancerous cells start spreading to neighbouring tissues.

CANCER TREATMENT

For proper treatment, the type of cancer and the extent of spreading should be determined. After confirming the cancerous nature of the tumour, the stage of cancer is assessed. A specialist doctor can make such an assessment and prescribe the treatment procedure.

1) Surgery: The cancerous part of the organ affected can be removed by surgical operation.

2) Radiation therapy: This treatment is made possible due to the discovery of 'X-rays' by Roentgen (1895) and radiations by Madam Curie (1899). In Radiotherapy radiation from an emitting source is made to fall on the small cancerous region. This treatment can destroy or destabilize cancerous cells.

3) Depending on the intensity of the disease, other treatments like **chemotherapy, hormonal treatment and laser treatment** may be adopted.

Eventhough several treatment procedures are available, an earlier diagnosis will be more effective.

PREVENTION OF CANCER:

For cancer, the saying 'prevention is better than cure' is more true. An avoidance of cancer causing agents can prevent cancer. A social awareness has to be created in this regard.

1. Usage of tobacco and related products such as cigarette, beedi, snuff, chewing of tobacco, pan masala and related substances should be totally avoided.

2. Consuming large amount of fatty food substances may be avoided.

3. Salted and pickled food are to be avoided.

4. Alcohol drinking is harmful.

5. Avoid places nearer to irradiations.

6. Avoid being a passive smoker by remaining nearer to a smoking person.

7. Consumption of fibrous food, fresh fruits vegetables, vitamin C can be much beneficial.

APPOLO STUDY CENTRE

13.3 Non communicable diseases

Non-communicable disease refers to impairment of bodily structure or function due to metabolic disorder that necessitates a modificaton of the patients' normal life. Diabetes, Coronary heart disease (CHD), Rheumatic heart disease (RHD), anorexia nervosa, renal failure, obesity and protein deficiency diseases are non communicable diseases.

1. Diabetes

Diabetes means that our blood glucose (often called blood sugar) is too high. Our blood always has some glucose in it because our body needs glucose for energy to keep us going. But too much glucose in the blood is not good for our health.

Glucose comes from the food we eat and also by glycogen conversion in our liver and muscles. Our blood carries glucose to all the cells in our body. Insulin is a hormone synthesized by beta cells of pancreas, and released into the blood. If our body doesn't produce enough insulin or if the insulin does not work the way it should, glucose cannot get into our cells and stays in our blood. Then our blood glucose level increases, causing diabetes.

Symptoms

Diabetes exhibits the following symptoms.

(i) Polyurea - excretion of increased quantity of urine.

(ii) Polydipsia - excessive thirst leading to increased consumption of water.

(iii) Polyphagia - excessive appetite leads to increased intake of food. Inspite of over eating diabetic patient looses weight.

(iv) Weakness and body pain.

Prevention

(1) Maintenance of normal body weight through adoption of controlled nutritional habits and physical exercise.

(2) Alcohol and smoking should be avoided.

(3) Control of blood pressure, cholesterol and triglycerides levels.

(4) Routine checking of blood sugar.

Severe diabetes is a major cause of blindness, kidney failure, coronary thrombosis etc.

APPOLO STUDY CENTRE

2. Coronary heart disease (CHD)

Coronary heart disease is the most common form of heart disease which often results in heart attack. The heart works for 24 hrs a day. To function normally, it needs a constant supply of oxygen and nutrients which is delivered by the blood through the coronary artery. The blood flow can be reduced by a process called atheroscelerosis in which fatty substances build up inside the surface wall of blood vessels. In CHD atherosclerosis affects the coronary artery which supplies blood to the heart muscles by reducing the lumen of the artery.

Symptoms : Symptoms of CHD are chest pain or shortness of breath, with or without discomfort and at times the first symptom of CHD is a heart attack or cardiac arrest (a sudden, abrupt loss of heart function).

Chest pain is caused when the blood flow to the heart is critically reduced and does not match the demands placed on the heart called Angina. The same inadequate blood supply also may cause no symptoms, a condition called silent ischemia.

In men, angina is felt behind the sternum and may radiate up the left arm, neck, shoulder etc. Women may get a less typical form of angina with a feeling of shortness of breath and congestion and can linger behind the sternum.

Risk factors : Cigarette smoking, high blood cholesterol, high blood pressure, over weight/obesity, physical inactivity and diabetes.

3. Rheumatic heart disease (RHD)

Rheumatic heart disease is a condition in which permanent damage to heart valves is caused by rheumatic fever. This damage generally begins with a strep throat infection caused by bacteria called streptococcus, and followed by rheumatic fever. Rheumatic fever is an inflammatory disease that can affect many connective tissues, especially in the heart, joints, skin or brain. The infection often causes heart damage particularly scarring of the heart valves, forcing the heart to work harder to pump the blood. The damage may resolve on its own, or it may be permanent, eventually causing congestive heart failure, a condition in which the heart cannot pump out entire blood that enters it, which leads to an accumulation of blood in the heart and the blood vessels.

Symptoms : The earlier symptoms are fever, weightloss, fatigue and stomach pain.

Treatment for RHD

The treatment is based on (i) patient's overall health and medical history, (ii) duration of the disease, (iii) patient's tolerance for specific medications.

The best treatment for RHD is prevention Antibiotics can usually treat strep throat (a streptococcus bacterial infection) and stop acute rheumatic fever from developing. Antibiotic therapy sharply reduces the incidence and mortality rate by rheumatic fever and rheumatic heart disease. If inflammation of the heart has developed patients may be placed on bed rest. Medications may be given to reduce inflammation and antibiotics to treat infection. If heart valve damage occurs, surgical repair or replacement of the valve may be considered.

An **angiogram** is an examination of our blood vessels using X-rays. A doctor (physician) specially trained in interventional radiology performs this procedure. The doctor will insert a small tube (catheter) into the blood vessel and then inject X-ray dye (contrast) that makes the vessels visible. When the X-ray pictures are being taken, it allows the doctor to determine how well the blood moves through the vessels.

Angioplasty is a form used to describe a procedure for treating blockages and blood clots in the blood vessels. The procedure involves the use of thin balloons and other devices that are threaded through a blood vessel into the coronary artery. The balloon is inflated to squash the blockage or blood clot and stretch the artery open restoring normal blood flow.

ICCU - Intensive coronary care unit

The intensive coronary care unit is designed for patients who require very close observations and careful nursing care around

APPOLO STUDY CENTRE

the clock. All staff are well trained in cardiac treatment. Intensive monitoring is provided for all patients so that the staff may quickly assist and respond to any change.

4. Anorexia nervosa

In this condition patients aim to become slim and remain as such. The determination to diet (loss of appetite) is a desired disorder. In this, young girls are mainly affected and boys react more rarely ; hostile relationship with their mothers occur and also they will be affected by depression.

Treatment : Psychotherapy to achieve emotional maturation is usually necessary in hospital in addition to correction of the eating disorders.

5. Renal failure

Renal failure occurs when the kidneys lose their ability to filter out wastes as a result toxins build up in the body and becomes fatal, if neglected

Two different forms of the disease exist : 1. acute renal failure, 2. chronic renal failure

(1) If the kidney function stops suddenly the disease is considered acute. Acute renal failure (ARF) is often caused by blockages in the blood vessels leading to the kidney.

(2) Chronic renal failure (CRF) is characterised by a gradual decrease in organ function. CRF is often caused by other medical conditions, including hypertension and diabetes.

Symptoms

1. fatigue
2. fluid retention
3. tissue swelling
4. oliguria (low urine output)
5. coma
6. seizures
7. swelling in legs

Once organ function drops to less than 10%, the kidneys can no longer process wastes effectively enough to maintain life. Dialysis or a kidney transplant is required. Dialysis provides an artificial filtering system to replace lost organ function. Dialysis is carried out by a machine called artificial kidney to filter impurities from the blood stream.

Dialysis is not a cure but only a temporary arrangement to remove nitrogenous wastes. Infections and malnutrition may occur and long-term dialysis has been linked to a increased risk of renal cancer. A kidney transplant is a more permanent solution to renal failure.

6. Obesity

Obesity is defined as an excessive high amount of body fat or adipose tissue in relation to lean body mass.

Overweight and obesity result from an energy imbalance. This involves eating too many calories and not getting enough physical activity.

Body weight is the result of genes, metabolism, behaviour, environment, culture and socio-economic status.

Behaviour and environment play a large role causing people to be overweight and obese.

When the number of calories consumed is not equal to the number of calories used.

Weight gain :

Calories consumed > calories used

Weight loss :

Calories consumed < calories used

No weight change :

Calories consumed = calories used

(Energy balance is like a scale. When calories consumed are greater than calories used weight gain results).

7. Protein deficiency diseases

Protein deficiency diseases are due to the result of inadequate intake of protein. Infants and young children are especially suceptible as they need protein nutrients to grow and develop normally. Marasmus and kwashiorkor are the examples for protein defeciency diseases.

APPOLO STUDY CENTRE

(1) Marasmus

Marasmus is the term applied when there is a severe muscle wasting in an infant with sunken features, loss of sub cutaneous fat and

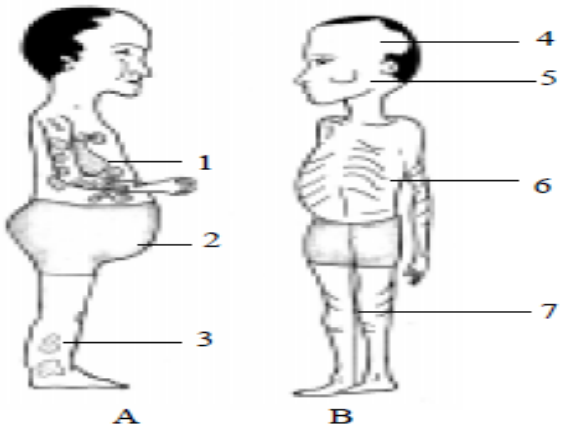


Fig. 13.6 (i) Kwashiorkaor (ii) Marasmus

1. Scalyskin 2. Distended abdomen 3. Swollen ankles (oedema) 4. Hair loss 5. Old person's face 6. Wrinkled skin 7. Severe muscle wasting.

pyloric obstruction. The commonest cause is malnutrition, namely inadequatic amount of breast milk or cow's milk or of a digestible diet.

Most of the infants who suffer from marasmus are fed artificially with overdiluted formulas. Marasmus is a clinical syndrome. Weight loss of more than 60% is much more common in infants than in older children. This is particularly true with premature babies.

(2) Kwashiorkor

This is mainly caused by protein deficiency and occurs in infants and children in some developing countries where there has been serious drought and crop failure. Growth stops and there is loss of weight. The other features are

1. discolouration of skin and hair
2. alimentary disturbances
3. liver enlargement
4. associated vitamin deficiencies

Poverty is an important predispising factor in the causation of malnutrition.

APPOLO STUDY CENTRE

2. Development of Vaccines (History of vaccine)

Some specific chemicals (antibiotics) extracted from micro organisms to cure the infection has greatly reduced human mortality. The discovery made by the British Physician, Edward Jenner, that milkmen and maids seldom suffered from the dreaded disease of small pox was very important. To explain this, he assumed that their resistance to small pox was perhaps caused by their continued exposure to cows who often suffered from cowpox. He accordingly proceeded (1798) to inject a small amount of matter from a cowpox sore into the arm of his son to ensure protection from small pox, although he did not at that time understand the mechanism which produced this effect.

Later, Pasteur established that many diseases including the small pox, were caused by viruses. At that time, the practice of injecting a small amount of the pathogen into the body to develop resistance against a specific disease, was applied to other disease such as rabies, cholera and tuberculosis. Pasteur called this practice VACCINATION derived from 'vacca' meaning 'cow' in Latin.

Vaccine is an antigenic preparation of micro organisms such as bacteria or virus,

APPOLO STUDY CENTRE

administrated for prevention or treatment of infectious diseases.

Vaccines are now made in large quantities by growing the respective micro organisms in factories, and a number of processes are available for making live or attenuated (not fully active) micro organisms. You might wonder how a small quantity of these cells when infected into the body make it resistant to further attack instead of producing the disease itself. Later, you will be acquinted with the fascinating mechanism whereby the body, when vaccinated, learns to recognize a future intruder and deal with it. In simple words, it can be explained as follows.

When the cells in our blood encounter the infected viral cells, they produce some specific chemical molecules that kill the infected cells. These defending molecules once formed, tend to persist in the body for sometime during which period they successfully eliminate any infection caused by that particular virus. Such resistance created in our body to fight infection is known as immunity and the process of vaccination against diseases is called immunization.

(i) Antigen : A substance that can produce specific immune response when it is introduced into the tissues of an animal and that can react specifically with the products (antibodies or sensitised cell) is known as an antigen.

(ii) Booster dose : A dose of antigen (secondary) given after the primary dose stimulates accelerated production of large amounts of antibody. If booster doses are given, the immunity can be maintained.

(iii) Antibody : When an immunoglobulin reacts with a specific antigen it is called an antibody. They can specifically react with the antigen, destroying it or neutralizing it, and thus protects the body from the effect of the antigen. All antibodies are immunoglobulin but all immunoglobulins may not be antibodies.

3. Immunization Scheme

Days	Immunization	Place	Immunization against diseases
14 days	Oral polio	All the Govt. Hospitals and primary health centres	Polio
within 1 month	BCG		Tuberculosis
1½ months	DPT Polio		Diptheria/Pertussis/Tetanus and polio
2½ months	DPT polio	"	"
3½ months	DPT polio	"	"
9 month 270 days	vaccination	"	
1½ years	DPT polio (booster)	"	"
5 years	DT.	"	Diptheria / Tetanus
10 years	TT	"	Tetanus
16 years	TT	"	Tetanus

Pregnant woman, 3rd month, TT I dose
4th month TT II dose

DPT - Diphtheria, Pertusis (whooping cough) Tetanus

DT - Duel antigen

TT - Tetanus toxoid

BCG - Bacille Calmette Guerin

APPOLO STUDY CENTRE

II. VECTOR BORNE

17.3 Communicable diseases

"Health is wealth" is an old saying. It indicates the importance of health. Health is a fundamental human right and is an integral part of development.

17.3.1 Disease

Disease is a condition of the body or a part of it in which functions are disturbed. Disease results from a complex interaction between man and disease causing agent and environment. The disease agent is a substance or a force.

17.3.2 Modes of communication chain

Diseases spreading from person to person are said to be communicable diseases (e.g.) cold.

Chain of infection

Communicable diseases are transmitted from the diseased individual or source of individual or source of infection, to an easily affected host. There are 3 links in the chain of infection (Fig. 17.7). They are:

a) Source or reservoir of infection;

b) The modes or routes of transmission and

c) Susceptible host.

a) Source or reservoir of infection

It is divided into three types. They are:

1. Human reservoir (man to man);
2. Animal reservoir (animal to man) and
3. Reservoir of nonliving things (non-living things to man).

b) Routes of transmission

It may be divided into two types

(i) Direct transmission:

1. By direct contact (e.g.) scabies, AIDS;
2. By droplet infection (e.g.) common cold;
3. By contact with soil (e.g.) tetanus and
4. By bite of an animal (e.g.) rabies.

APPOLO STUDY CENTRE

(ii) Indirect transmission:

1. By water-borne
   (e.g.)cholera, typhoid, etc.,
2. By air-borne
   (e.g.) measles, mumps, etc.,
3. By vector-borne
   (e.g.) malaria, rabies, etc.,
4. By fomite-borne (through articles like clothes, spoons)
   (e.g.) skin infections, etc.,
5. By unclean hands and fingers
   (e.g.) dysentery, etc.,

c) Susceptible host

Individual who does not possess any resistance against disease causing agent is easily attacked by the disease.

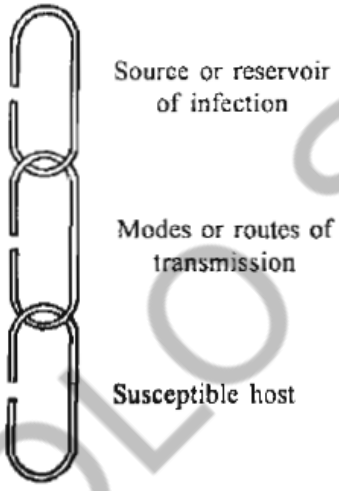


Fig. 17.7 Chain of infection

Delinking the infection chain

The fundamental concept in controlling disease is to break the weakest link in the infection chain. This is done by,

1. Controlling the reservoir;
2. Breaking the routes of transfer and
3. Vaccinating the susceptible host.

17.3.3 Water and food-borne diseases

Diseases spread through water and food are called water and food- borne diseases. Some of the water and food-borne diseases are cholera, dysentery, typhoid, jaundice, poliomyelitis, etc.

Cholera:

Cholera is an accute diarrhoeal disease caused by vibrio cholera. Cholera is both an epidemic and endemic disease. It has a high potential to spread fast and cause death. Cholera affects all ages and both sexes.

Symptoms

Typical cases are characterised by sudden onset of profuse, effortless, watery diarrhoea, followed by vomiting, rapid dehydration and suppression of urine (Fig. 17.8).

Fig. 17.8 Cholera

APPOLO STUDY CENTRE

Control and preventive measures:

Food, hygiene practices and Vaccines

17.3.4 Air-borne diseases

Diseases spread through air are called air borne diseases. Some of the air-borne diseases are common cold, measles, chickenpox, influenza, mumps, diptherea and tuberculosis (Fig. 17.9).

Common cold:

The common cold is the blanket term for any upper respiratory infection caused by viruses.

Symptoms:

The symptoms include coughing, sneezing, running nose and headache.

Fig. 17.9 chickenpox and mumps

Control and preventive measures:

Bed rest, hot liquids and aspirin can cure the symptoms. Large doses of vitamin 'C' can reduce the duration of symptoms.

17.3.5 Contact diseases

Diseases transmitted by direct contact. Some contact diseases are scabies, leprosy and sexually-transmitted diseases like AIDS.

17.3.5.1 Scabies, Leprosy and AIDS

Scabies:

It is caused by *'itch mite'*.

Symptoms:

It gives rise to pimples and itching in between fingers, elbow folds and arm pits. The common symptoms are itching and fever. It is spread by contact with patient or his clothings.

Control and preventive measures:

1. Avoid contact with patients;
2. Maintain cleanliness and good personal hygiene and
3. The patients and the family members must be treated simultaneously.

Leprosy:

It affects mainly the peripheral nerve, skin, muscles, the eye, bones, testis and internal organs (Fig. 17.10).

Symptoms:

1. Hypopigmented patches;
2. Loss of cutaneous sensation in the affected areas;
3. Loss of fingers or toes and
4. Nasal depression.

APPOLO STUDY CENTRE

Leprosy is a major public health problem in India. It is often called a "*Social disease*".

Fig. 17.10 Leprosy

Control:

Multidrug therapy. National Leprosy Eradication Programme (NLEP) has been in operation with the goal of eradicating the disease completely.

AIDS

It is dreadful communicable disease. The Acquired Immuno Deficiency Syndrome (AIDS) is caused by a virus known as the Human Immuno deficiency Virus (HIV).

This virus destroys the body's protective mechanism (Immune system). If a person has HIV in the body, he is called HIV positive person.

Symptoms:

1. Chronic diarrhoea and prolonged fever for more than one month;
2. Weight loss and
3. Night sweat.

17.3.6 Agencies involved in control of diseases

The following are involved in control of diseases.

1. National Leprosy Eradication Programme - to eradicate leprosy (NLEP).
2. Massive polio immunisation campaign to arrest polio completely.
3. National Tuberculosis Programme (NTP - to eradicate Tuberculosis).
4. National Filarial Control Programme (NFCP - to eradicate Filaria).
5. National Malaria Eradication Programme (NMEP - to stamp - out malaria).
6. The National Immunisation Programme in India - recommends measels vaccination MMR between 9 and 15 months of age.
7. Global Immunisation Programme for children to protect them against six preventable diseases DPT, Polio, Tuberculosis and measles.
8. The State AIDS cell started functioning in Tamilnadu from 1990 to create awareness about AIDS.

17.3.7 Effect on the human society

The healthy person is the one who

APPOLO STUDY CENTRE

has sound body, lives in harmony (peacefully) with others and has the ability to face stresses and strains. The relation between mind and body of a healthy person will be good.

Community is nothing but group of people living in a particular area. Individual plays an important role in community health.

Health in fact is a key to education, success, good citizenship and happy life. Without wholesome health an individual cannot perform efficiently. The health of an individual and society are interlinked significantly.

Some disease causes serious loss of working ability of manpower by affecting both physical and mental development of the sufferers. This leads to the economic and social backwardness of the victims and also breaks the progress of a country.

17.4 Vaccination and immunisation

Vaccination is the most common method of preventing infection from microorganisms, especially, from bacteria and viruses. In this a vaccine (antigen) is inoculated inside the body to stimulate the formation of antibodies through the defensive mechanism of the body. Thus the vaccination protects a person from disease.

Inoculation of vaccines to prevent diseases is called immunisation. The ability of the body to fight against various diseases is called immunity. Immunology is the study of resistance to infection.

17.4.1 Antigen - Antibody reactions

An antigen is a substance which is capable of stimulating the production of a specific antibody.

An antibody is a specific substance (protein) produced in the blood serum in response to the stimulation of foreign antigens. They react to particular antigens and make them inactive.

Antibodies are specific (i.e.,) each type of antibody can combine with one specific antigen (disease causing agent).

1. Antibody combines on the outer surface of bacteria (antigen) and destroys them;
2. Antibody dissolves the disease causing agent bacteria and virus (antigen);
3. Antibody makes the disease causing agent to stick together to form clumps and make them inactive and
4. Antibody produces antitoxins. It neutralises the toxins produced by the disease causing agent (antigen).

APPOLO STUDY CENTRE

17.4.2 History of vaccination

Some virus and bacteria cause diseases in man and animals. The first effective method of prevention was developed for viral disease. Smallpox vaccination was discovered by Edward Jenner in 1798. Hydrophobia (or) rabid vaccination was discovered by Louis Pasteur.

Enders, Robbins and weller laid the foundation for the development of effective poliomyelitis vaccine. From 1968 onwards vaccine for mumps is also available.

Thus vaccines were discovered and nowadays many vaccines are available for treating many diseases.

17.4.3 Methods / types of vaccination

Vaccines are prepared from living or killed micro organisms, vaccines are of two types. 1) Live vaccines 2) Killed vaccines.

Live vaccines:

They are prepared from living organisms. They produce durable immunity. (e.g.) BCG vaccine (Tuberculosis Vaccine).

Killed vaccines:

They are prepared by killing them by heat or chemicals. When they are inoculated into the body, they stimulate active immunity. It is safe but less effective. (e.g.) Cholera vaccine.

17.4.4 Immune system

The major cells of the immune system are the lymphocytes. (B-cells and T-cells are produced in the bone marrow).

Immunity:

The development of specific resistance to infection is called immunity. Immunity against infectious diseases is of two types 1. Natural immunity 2. Artificial immunity.

Natural immunity:

Natural immunity is developed in an individual without having the disease or immunisation against it. (e.g.) secretion of sweat glands contains certain chemical substances which prevent the entry of micro organisms.

Natural immunity is the resistance to some diseases transferred from mother to baby through the placenta in humans.

When an individual is affected by a disease (for example chickenpox) antibodies are produced against that disease. This immunity may persist in the individual until his death. So when the person is affected by the chickenpox germ next time he may not suffer from the disease.

APPOLO STUDY CENTRE

Artificial immunity:

Artificial immunity is the resisitance induced by vaccines (e.g.) Typhoid vaccines.

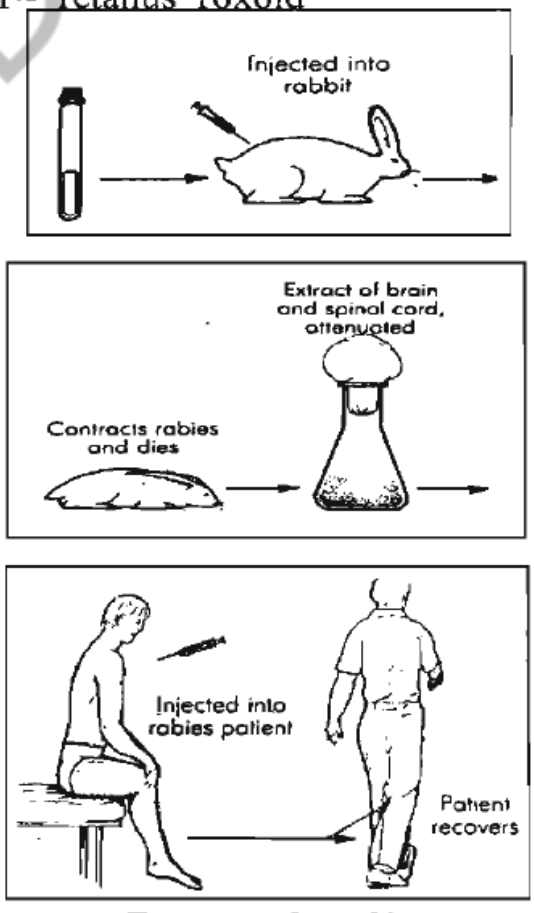
Activity 1

Visit a Primary Health Centre to understand the vaccination and inoculations (Table 1).

17.4.5 Immunisation schedule (Table 1)

Age	Vaccine	Dose
Birth	BCG OPV Hepatitis	- 1st dose 1st dose
6 weeks	DPT OPV Hepatitis B	1st dose 2nd dose 2nd dose
10 weeks	DPT OPV	2nd dose 3rd dose
14 weeks	DPT OPV	3rd dose 4th dose
6-9 Months	OPV Hepatitis B	5th dose 3rd dose
9 Months	Measles	-
15-18 Months	DPT MMR OPV	1st booster - 6th dose
5 Year	OPV DPT	7th dose 2nd booster
10 Year	TT Hepaties B	3rd booster 1st booster
15-16 Year	TT	4th booster

BCG = Bacillus Calmette Guerin (Tuberculosis),
OPV = Oral Polio Vaccine (polio),
DPT = Diphtheria Pertussis Tetanus
Hepatitis B (Jaundice - 'b' strain),
MMR = Measles Mumps Rubella. Bu no vaccine is yet available agains AIDS.
TT= Tetanus Toxoid



Treatment for rabies

APPOLO STUDY CENTRE

17.5 Medicinal Herbs

Medicinal Herbs and their uses

Medicinal plants and herbs have medicinal value and they have been known for their medicinal effects for a long time. One of the oldest forms of medicine is Ayurveda practised in India. Ayurveda totally deals about the medicinal plants, roots and herbs and their valuable use in medical field. From then, the medicinal plants have been in use. The herbs were the main source of medicines for curing any sort of illness.

The fresh leaves, bark and roots may be used as such, or in the form of capsules, powder, tablets, liquid, extracts, creams, lotion and oil.

Some herbal extracts may be added to juice and consumed while fasting. Herbal teas can be used for long term benefits.

17.5.1 Indian Medical System Siddha Medicine

The Ancient Indian Medical system is the Siddha medicine which has emerged from Ayurveda. The siddha medicine was first introduced by an ancient group of people called 'Siddhar' and hence the medical science named after them as Siddha Medicine. It totally involves the usage of herbs and herbal products. The use of such medicinal herbs and plants gives goo relief without causing any side effects

17.5.2 Medicinal Herbs of TamilNad

Tamil Nadu is quite famous for it medicinal herbs, especially at Nilgris Kodai, Valparai, Kolli hills and a Yercaud several medicinal herbs an plants are available.

Here are a few of the commonl available medicinal herbs (Figures 17.1 to 17.14).

Fig. 17.11 Allium sativum

Fig. 17.12 Acalypha indica

APPOLO STUDY CENTRE

Table 2 List of some medicinal herbs and their uses

S.No	Common Name	Botanical Name	Family	Uses
1	Vellai poondu	Allium sativum	Liliaceae	Used as a medicine for cough, Whooping cough, asthma and Constipation
2	Kuppaimaeni	Acalypha indica	Euphorbiaceae	The whole plant constitutes drug-Acalypha. Useful in pneumonia and asthma
3	Katrazhai	Aloe barbadensis	Liliaceae	Leaf juice is used as a medicine for skin diseases, constipation, and as a purgative.
4	Vallarai	Centella asiatica	Apiaceae	Fresh and dried leaves and stem-used in the preparation of the drug. Roots and seeds used as medicine. Leaves consumed for improving memory power. Very much used in the treatment of leprosy and TB
5	Thulasi	Ocimum sanctum	Lamiaceae	Medicinal, antibacterial, useful in cough & bronchitis
6	kizhanelli	Phyllanthus amarus	Euphorbiaceae	Entire plant is medicinal, used as a medicine for jaundice and ulcers.
7	Manathakalli	Solanum nigrum	Solanaceae	Whole plant is medicinal used for mouth ulcers, antiseptic, used as a tonic used in treating skin diseases.
8	Kandan kathiri	Solanum xanthocarpum	Solanaceae	Whole plant is medicinal, used for constipation, hypertension, cough and epilepsy.
9	Ginger(Ingi)	Zingiber officinalis	Zingiberaccae	Rhizome is medicinal, used to control nausea and indigestion. Used as an appetiser.

APPOLO STUDY CENTRE

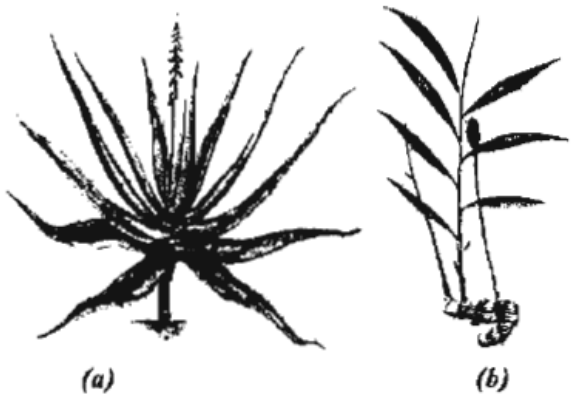


Fig. 17.13 (a) Aloe barbadensis
(b) Zingiber officinale
(c) Hemidesmus indicus

Fig. 17.14 (a) Solanum nigrum
(b) Phyllanthus amarus
(c) Solanum xanthocarpum

17.5.3 Common Medicinal plants and their uses (Table 3)

S. No	Common name	Botanical name	Family	Uses
1	Karisalangkanni	Eclipta prostrata	Asteraceae	Used in Siddha medicine jaundice & fever.
2	Nannari	Hemidesmus indicus	Periplocaceae (Asclepiadaceae)	Roots used in water as chilling agent.
3	Asafoetida	Ferula asafoetida	Umbelliferae	Used for indigestion
4	Hena	Lawsonia inermis	Apiaceae	Used as an Ayurvedic medicine & Unani medicine. Leaves have medicinal property.
5	Castor	Ricinius communis	Euphorbiaceae	Castor oil is used as a purgative.
6	Turmeric	Curcuma longa	Zingiberaceae	Rhizome used for treating ulcers.

Activity 2 *: Grow some medicinal herbs in your school. Know their names and uses.*

APPOLO STUDY CENTRE

17.6.6 Diseases - AIDS and Tuberculosis

'Health is wealth'. A person must be in a good state of health, both mentally and physically. If there is any deviation in the normal functioning of the body, then it is called as a disease.

A healthy person leads a joyful life; has more potentiality to carry out various tasks. When the good health is affected, it leads to several disorders or diseases.

The diseases are caused by several microorganisms like bacteria, fungi and viruses. We are going to discuss about the viral infection AIDS and the bacterial infection Tuberculosis.

AIDS

AIDS stands for Acquired Immuno Deficiency Syndrome. This syndrome is caused by a Virus called as Human Immuno deficiency Virus (HIV). This Virus, on attacking the body, reduces the natural immune system. As a result, the patient is prone for all other diseases and the patient can die because of any disease. This is the most dreadful syndrome. AIDS is a sexually transmitted viral infection. AIDS is easily spread through transfusion of blood from AIDS infected person, through the infected needles (needles used by AIDS patient).

APPOLO STUDY CENTRE

The best way to prevent AIDS is to have a good character and conduct since there is no medicine or any treatment for AIDS.

Tuberculosis

Tuberculosis is a bacterial disease which mainly affects the lungs. It is commonly called as TB. This disease is caused by the bacterium Mycobacterium tuberculosis. This infection spreads through the droplets of the infected person, when they cough or sneeze.

The symptoms of tuberculosis are weight loss, loss of appetite, chest pain, fatigue, sweating at night and in advanced stages blood is seen in the sputum in large quantities.

Due to the medical advancement patients could be given good treatment and they could be cured if the diagnosis is done at an earlier stage. Certain tests like skin tests, chest X-ray and Laboratory tests examining the patient's sputum are available.

On diagnosis, the patient must first be isolated since it is a communicable disease and proper medical care should be given. The health centers called 'Sanatorium' gives special attention and treatment for the patients.

There are effective anti-tuberculosis drugs like rifampicin, Streptomycin and Isoniazid.

To prevent TB, BCG vaccine is given to the new born to develop strong immunity.

BCG vaccine-Bacillus Calmette Guerin vaccine.

Thus an early diagnosis and effective medical treatment followed by good health care and nutritious diet in a hygienic environment helps a patient to get over this disease.

APPOLO STUDY CENTRE

17.2 HUMAN DISEASES

Healthy feeling is a state of mind. Healthiness is due to good feeding, protected surrounding and being free from infections. A disease may be considered as a deviation from a normal healthy state. A disease may affect an organ, a particular region of the body or entire body. The diseases are of two types. They are 1. Non-communicable 2. Communicable

Non communicable diseases:

These diseases are caused due to defective metabolic processes or defects in the functioning of organs within the body or damage to organs and organ systems. Such diseases can also be caused due to life style and changes in the environment. Inadequate nutrients in feeding can also cause non-communicable disease. These diseases can easily be diagnosed. If proper care is taken at an early stage, they can be controlled.

Communicable diseases:

These diseases are due to infections caused by disease producing agents such as viruses, bacteria, protozoans, helminthic worms and fungi. The invention of microscopes has greatly helped us to identify the causative organisms and diagnose the disease. Such studies have also helped us to provide effective treatments or 'therapy' Several organic chemicals obtained from natural sources are found to be antibiotic. Suitable application of an antibiotic can control the disease.

The perpetual continuance of the causative organism is due to various transmission methods. The transmission could be either biological or non-biological. The **biological transmissions** are caused by intermediary agents such as mosquitoes, houseflies, dogs, cats etc., **Non biological transmissions** may be due to agents such as water, air, soil and clothing. Physical contact between humans can also transmit diseases.

The disease causing organism is called a **pathogen.** The infected organism is called as **the host.** Pathogens have host specificity. After entering the body of a host the pathogen may require an **incubation period**. During this period and during the period of infection the pathogens release toxic substances. These are called **antigens.** The host body produces certain proteins to suppress the harmful effects of the antigen. These substances are called **antibodies**.

The **'antigen-antibody reaction'** is very much specific. In this reaction the infected host may develop resisistance to the disease. This is known as **Immunity**. If the immune system is weak or it fails, the disease is expressed and the host suffers.

TUBERCULOSIS (T.B)

This disease is caused by a bacterium called **Mycobacterium tuberculosis**. The most common form of T.B is pulmonary tuberculosis. It affects the lungs in many ways.

1. **Primary tuberculosis:** In 95% of the cases it is silent. It occurs in non-immune individuals. The risk of infection is due to closeness and duration of the patient's contact with the carrier. Coughing and sneezing of the carrier can spread the disease.

APPOLO STUDY CENTRE

Tuberculosis is identifed by cough, moderate fever and sweating. It can be confirmed by X-rays and tuberculin skin test.

2. **Miliary tuberculosis**: This disease spreads to many organs. It affects 3-6 months after primary infection.

Treatment:

1. One of the earliest practice for T.B. Treatment was isolating the patients and make them live in a healthy surrounding.

2. There are good drugs available. These drugs act against both inter and extra cellular ***M. tuberculosis.***

CHOLERA

Cholera is charactersed by severe diarrhoea and vomitting. Hence there is a great loss of body fluid. It results in body debydration and muscular cramps. Death may be caused due to renal failure.

The causative organism for cholera is a bacterium called ***Vibrio cholerae*** or 'Comma bacillus'. This bacterium produces a toxic substance, which causes accumutation of fluid in the intestine. The incubation period of this bacterium is 1 - 2 days.

Diagnosis: Microscopic examenation of the 'rice-water stool'.

As a preventive method vaccines obtained from killed bacteria are available.

ANTHRAX

This disease normally affects sheep and cattle. In these animals the lungs, spleen may be affected. It is not a common disease in man. Only persons who work with animals have a chance of getting infected. In man the disease affects skin, lung and the intestine. Of the three the respiratory(lung) anthrax is more harmful.

The disease is caused by a bacterium called "Bacillus anthracis". It spreads by production of spores.

LEPROSY

The disease Leprosy or Hansen's disease is caused by the bacterium ***Mycobacteruim leprae***. These bacteria normally affect the skin. The skin on exposed parts of the body such as face, hands, arms and legs are normally affected. Initially it starts as insensitive white patches. The children are more prone to infection. The incubation period ranges from 2- 4 years.

Treatment: Fortunately leprosy can be cured and controlled. Effective drug therapy is available.

LEPTOSPIROSIS

This disease is caused by the microrganism ***Leptospira*** sp. Its infestation is characterised by high fever. A continuance of the disease affects most of the visceral organs. Human infection is mostly due to water containmented by urine of animals such as rats. Infection can also occur as a result of bathing in infected water. Infections may be caused through cuts and lacerations of the skin.

Diagnosis is done by blood studies. The treatment involves administration of antibiotics.

HIV / AIDS

The name AIDS is an acronym formed from the following words.

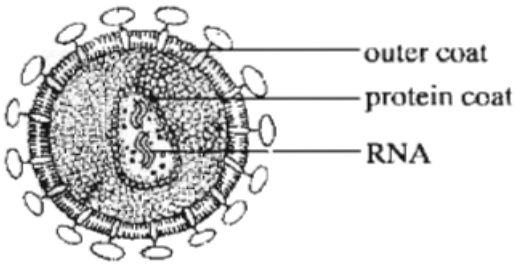


Fig. 17.2.1 HIV

Acquired - Characters obtained during life time.
Immune - Bodily resistance to infections.
Deficiency - Short coming or inadequate
Syndrome - A collection of symptoms

The disease AIDS is caused by HIV (Human Immunodeficiency Virus) The

APPOLO STUDY CENTRE

charactertic and dangerous nature of this virus is the destruction of body's immune systems. Hence a person infected by HIV can get affected very easily by other lethal diseases. The body completely loses its protection.

HIV is called as a retrovirus containing RNA (Ribose nuclic acid)

It is surrounded by a protein and a lipid coat. In our blood it selectively infects specific white blood cells responsible for immune defence system. It can also affect nerve cells directly.

Transmission: It is conclusively proved that the modes of transmission are sexual, parenteral and mother to child in the uterus. The parenertal tramission involves tranfusion of infected blood or use of contaminated needles and syringes.

Symptoms: After infestatation it may take 6 months to many years to observe symptoms of AIDS. Some people appear healthy for a long time and function as 'carriers'

Major symptoms:

1.Weight loss 2. Prolonged Fever
3.Chronic diarrhoea 4. Night sweat

Diagnosis:

The easiest and cheapest method of diagnosis is testing blood by **ELISA** (Enzyme Linked Immuno Sorbent Assay) The confirmatory test is the expensive **Western Blot Test**.

Prevention of AIDS

Since no specific drug to cure AIDS has been discovered the only alternative is prevention of infection. It can be prevented by

1. Avoiding improper / illicit sexual practices.
2. Insisting on usage of sterile, disposable needles and syringes.
3. Obtaining proper reproductive health education.
4. Ensure screening of blood before transfusion.

Some basic concepts

1. Healthy feeling is a state of mind.
2. The diseases are classified into non-communicable and communicable diseases.
3. Non communicable diseases may be due to defective metabolic processes. Communicable diseases are due infection caused by disease producing agents (Pathogen).
4. The substances produced in response to antigen is called antibody.
5. Tuberculosis is caused by ***Mycobacterium tuberculosis.***
6. Cholera is caused by ***Vibrio cholerae.*** It can be treated by oral rehydration and administration of drugs.
7. Anthrax is caused by ***Bacillus anthracis*** and can be treated by antibiotics.
8. Leprosy is caused by **Mycobacterium leprae** and can be treated by drugs.
9. Leptospirosis is treated by antibiotics.
10. AIDS is caused by HIV. It has symptoms.
11. Diagnosis is done by ELISA test and confirmation by Western Blot technique.

APPOLO STUDY CENTRE

4. Diseases caused by viruses

Viruses cause a variety of diseases in plants and animals. In plants, they cause discolouration, stunted growth, necrosis (group of dead tissue) and gal (tumourous growth). In animals, they cause rabies in dog, foot and mouth disease and cowpox in cattle. In human beings diseases like common cold, measles, mumps, small pox, jaundice, polio and AIDS are caused by viruses. Let us see the common cold and AIDS in some detail.

(1) **Common cold :** It is one of the most common diseases. The most frequent cause of common cold is Rhinovirus. It is an RNA virus. It causes upper respiratory tract infection. Symptoms of common cold include sneezing, headache, sore throat and watery discharge from nose. It is transmitted through direct contact, contaminated articles and inhalation of airborne droplets from infected person. It has an incubation period (time required for the virus to show symptoms in a person after infection) of 2 to 4 days. It resolves without treatment in 7 to 10 days. Secondary infection by bacteria is prevented by taking antibiotics.

(2) **AIDS :** It is one of the most dreaded diseases. AIDS stands for Acquired Immuno Deficiency Syndrome. It is caused by the Human Immunodeficiency Virus (HIV). It is an RNA virus with a lipid envelope. It shows non-specific symptoms like chronic diarrhoea, weight loss, fever and fatigue. It destroys the immune system of the person and exposes them to opportunistic infections (TB, Leishmaniasis and fungal infections are common in AIDS patients). AIDS is transmitted from person to person through direct exposure to infected body fluid (blood, semen), sexual contact and sharing unclean hypodermic needles. It is also transmitted from a pregnant woman to her foetus. It has an incubation period of 6 months to 7 years. Vaccines that give total protection against AIDS and medicines that completely cure AIDS have not yet been found. Hence AIDS prevention is very essential.

APPOLO STUDY CENTRE

10.4. Medical Entomology

You will be aware of a number of insects that bite or cause nuisance to us. But do you know that they also transmit many deadly diseases? Diseases like malaria and cholera are transmitted by such insects. Despite many efforts, these insects have not been totally eradicated. So it is essential to know their organization so that you can adopt suitable preventive measures in your locality. This could greatly reduce the risk of many deadly diseases.

1. Insect Vectors

An insect which is capable of transmitting or spreading disease is called an insect vector. They may also cause discomfort or injury to humans and his animals. Let us see some of the important insect vectors.

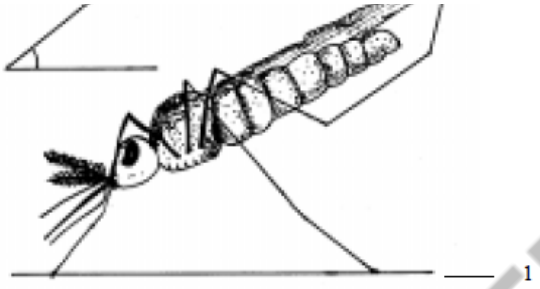
(1) **Anopheles :** It is one of the mosquitoes that bite us at night. It is only the females that bite man. The male Anopheles lives on plant sap. The body of mosquito is divided into head, thorax and abdomen. Head bears the mouth parts that enable them to pierce the skin and suck blood. On either side of the

10.11 Distinguishing features of Anopheles Head Showing Long Palpus

1. Palpus 2. Proboscis 3. Antenna 4. Eye

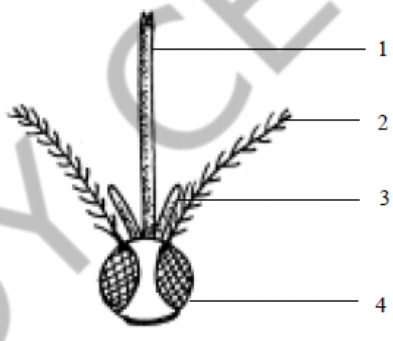
Fig. 10.12 Distinguishing features of Anopheles Larva Floating Parallel to Water Surface

1. Water Surface



10.13 Distinguishing features of Anopheles Abdomen Pointing Upwards While Biting

1. Body Surface



10.14 Distinguishing features of Culex Head Showing Short Palpus

1. Proboscis 2. Antenna 3. Palpus 4. Eye

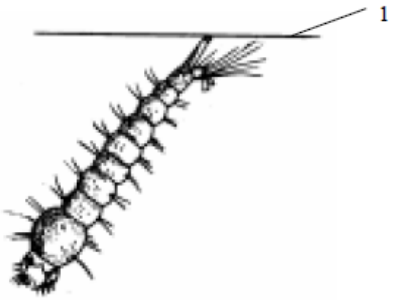
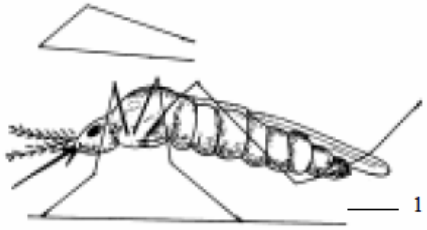


Fig. 10.15 Distinguishing features of Culex Larva Floating with head pointing downwards.

1. Water Surface



10.16 Distinguishing features of Culex Abdomen Parallel while biting

1. Body Surface

APPOLO STUDY CENTRE

mouth parts, Anopheles bears a long palpus. The thorax bears a pair of wings for flying and a pair of halters for balancing. The halters are actually small wings. The Anopheles lays its egg in water. A larva emerges from the egg. It floats parallel to the water surface. It then develops into an adult mosquito through a pupal stage. While biting, Anopheles can be identified by the abdomen that points upward. Anopheles chiefly transmits malaria from one person to another.

(2) **Culex :** It is also a mosquito that bites during night. It can be differentiated from the Anopheles by its short palpus. Its larva floats inclined to the water surface with its head downward. While biting, the abdomen of Culex points parallel to the body. It flies with a humming sound, while Anopheles flies quietly. Culex chiefly transmits filarial worm from one person to another.

(3) **Aedes :** They are mosquitoes that rest in wooded areas and prefer to bite during day time. Head bears short palpus. Each segment on the abdomen shows pale band at the base. The larvae are found in a wide variety of natural and artificial containers containing water including rock holes and used tyres. They transmit diseases like Yellow fever and Dengue

Fig. 10.17 Distinguishing Feature of Aedes

from one person to another.

(4) **Phlebotomus :** It is shaped as a mosquito. Body is covered with dense hair (hairy insect). It can be identified by its wings which are held vertically up while at rest. It also shows characteristic hopping movement. Mouth parts in female are adapted to pierce for taking blood. It bites at night. In males,

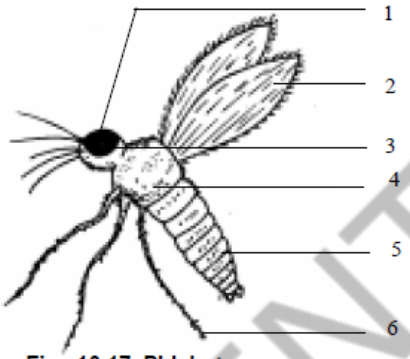


Fig. 10.17 Phlebotomus

1. Eye 2. Wing 3. Head 4. Thorax 5. Abdomen 6. Leg

the mouthparts are poorly developed. It lives on plant and fruit juices. The female spreads a disease called Leishmaniasis. The disease manifests in a cutaneous (skin) form or in a visceral (internal organ) form. Cutaneous leishmaniasis is characterized by skin sores. It lasts from weeks to years. It eventially develops into a scar with raised edges and a central crater. Visceral leishmaniasis causes fever, weight loss, enlargement of liver and spleen and aneamia. In India visceral leishmaniasis is more common.

(5) **Bed bug (Cimex) :** Bedbugs are small (about 8 mm long), nocturnal creatures with a world wide distribution. They feed only on blood. They do not, as far as is known, serve as vectors for any

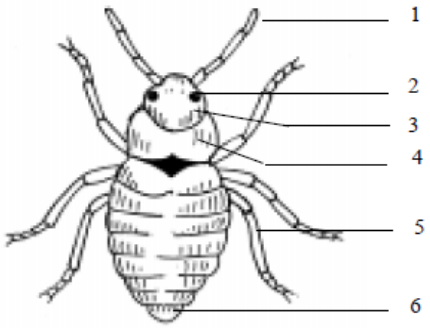


Fig. 10.18 Bed Bug (Cimex)

1. Antenna 2. Eye 3. Head 4. Thorax 5. Leg 6. Abdomen

human disease. Their bite often result in an allergic reaction. When bitten many times, a person will lose considerable

APPOLO STUDY CENTRE

sleep. It may also lead to iron and / or haemoglobin deficiencies due to loss of blood. Because of their small size, bedbugs can be transported from one house to another in furniture, clothing and a variety of other ways. Bedbugs can hide almost anywhere. They tend to be found around the bed, under furniture and even behind wallpaper. Control of bedbug requires careful use of pesticides. Bedbugs can survive more than a year without feeding. So you cannot "starve" the bedbugs out of your house by simply leaving for a few days.

(6) **Head louse (Pediculus) :** Head louse are cosmopolitan parasites of humans. It is a dorsoventrally flattened wingless insect. Body is divisible into a head, thorax and abdomen. Head bears mouth parts adapted for biting and sucking blood. The thorax bears three pairs of

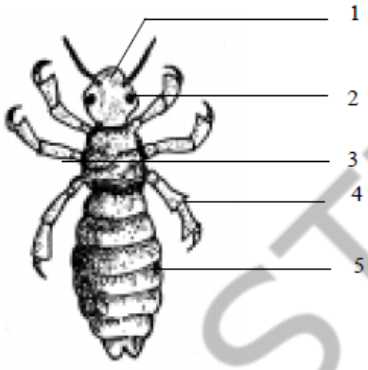


Fig. 10.18 Head louse

1. Head 2. Eye 3. Thorax 4. Leg 5. Thorax

legs. The legs are adapted to hold the hair of the host. Head louse serves as vector for typhus (caused by Rickettsia prowazekie), trench fever (caused by Rochalinaea quintana) and relapsing fever (caused by a spirochete, Borrelia recurrentis). Lice are spread from human to human often by direct contact or contact with contaminated clothing.

Lice can be controlled by treating the hair with medicines like pyrethrins - permethrin or malathian and then combing with a fine-toothed comb. This should be done only after consulting your doctor. Clothing and bed lining should also be washed to prevent recurrence. All members of the family should be observed for head louse and treated simultaneously. This treatment should be repeated after 7 to 10 days.

Prevention

(1) Avoid head to head contact with others

(2) Do not share clothing such as scarves and ribbon.

(3) Do not share your comb.

2. Vector borne diseases

Now let us see some of the diseases that are transmitted by vectors and the organisms that cause those diseases.

(1) **Malaria :** Malaria is caused by a parasite called Plasmodium. It has two cycles of development, one in man and the other in the Anopheles mosquito. The cycle in man is the asexual phase.

When the mosquito bites a person, the sporozoite enters and starts a new infection. The malarial parasite may block the capillaries in the brain. It is called Cerebral malaria. Death occurs if treatment is not given immediately.

(2) **Filariasis :** It is caused by the parasitic worm, Wuchereria bancrofti. The adult worm is white in colour and hair like in form. Male and female worms are generally found coiled together at the dilated lymph nodes. The female worm gives birth to embryos called microfilariae. They normally circulate at night in the peripheral blood. They are taken up by the Culex mosquito while biting an infected person. In the mosquito they pierce the stomach wall and are transformed into infective forms. When the infected mosquito again bites a man, the larvae enter his lymphatic vessels. Here they settle down and attain sexual maturity.

Occassionally the adult parasites cause obstruction to the free flow of lymph. The lymph vessels and glands become swollen and thickened. The affected part grows larger and is called Elephantiasis. The lower extremities,

APPOLO STUDY CENTRE

the scrotum and the hands are some of the organs that are commonly swollen.

(3) **Dengue fever :** Dengue is a viral disease caused by Flavivirus. It causes haemorrhage and fever. It is transmitted by the Aedes mosquitoe. Dengue appears as an epidemic and affects many people. The epidemic gradually dies down before reappearing after an interval. Once a person gets the disease, he becomes immune from further attacks. There are four types of the dengue virus. Thus a person can have four dengue infections during his life time.

(4) **Brain fever :** Brain fever or Japanese encephalitis is caused by a virus. Children in the 2 to 14 years age group are the most vulnerable. Symptoms include headache, reduced consiousness and fits. Culex mosquitoes that breed in rice fields are the carriers of the disease. The virus increases in number in pigs, horses and wild birds. The proximity of pigs to humans increase the chance of transmission. Brain fever occurs mainly during the monsoon season, 10% to 30% of those with brain fever die and about half of the survivors are left with neurological damage. There is no antiviral medicine for the disease. However a vaccine is available that gives immunity against the disease.

(5) **Cholera :** Cholera is an infection of the intestine by the bacterium Vibrio cholerae. Severe cholera causes profuse watery diarrhoea, vomitting and leg cramps. Rapid loss of body fluids leads to dehydration and shock. Without treatment, death can occur within hours. A person may get cholera by drinking water or eating food contaminated with the cholera bacterium. The source of contamination is usually the faeces of an infected person. The disease can spread rapidly in areas with inadequate treatment of sewage and drinking water. Houseflies, sitting on food, can also transfer the bacterium from the facces. Cholera is treated simply by immediate replacement of the fluid and salts lost through diarrhoea. Patients can be treated with oral rehydration solution, a prepackaged mixture of sugar and salts to be mixed with water and drunk in large amounts. Severe cases also require intravenous fluid replacement. Antibiotics can shorten the course and diminish the severity of the illness. Cholera can be prevented by drinking boiled water and eating well cooked food that is still hot.

3. Vector Control

As mentioned earlier, it is very difficult to totally eradicate the insect vector. Its control requires a coordinated effort of several measures. It includes vector surveillance, breeding source prevention and reduction, biological and chemical control and public education.

Mosquitoes can be controlled by spraying the inside surfaces of walls and roof with residual insecticide eg. DDT, organophosphate or carbamate insecticides (eg. malathion, bendiocarb) and pyrethroids. Bednets and screens that are soaked in pyrethroid solution provide good protection. Larvivorous fish (fishes that eat larva eg. Gambusia) can be introduced in water bodies to control mosquito breeding. The toxin extracted from the bacteria, Bacillus thuringiensis, can also be sprayed at breeding sites.

Permethrin is highly effective as an insecticide and as a repellant. Permethrin treated clothing repels and kills ticks, mosquitoes and other arthropods. Repellants containing N.N - diethylmetatoluamide (DEET) repels mosquitoes and other insects when applied to skin. (Avoid DEET near eyes, mouth, cuts, wounds or irritated skin. It is toxic when ingested).

Instead of trying to control the vector, the disease causing organism can be targeted for eradication. Then the vector becomes harmless as it cannot transmit any disease. This was the objective of the National Malaria Eradication Programme (NMEP). It was implemented from 1958. Under the NMEP,

APPOLO STUDY CENTRE

the mosquito population was reduced considerably by applying DDT for two years. During this period, those with malaria were also treated intensively. Thus the lifecycle of Plasmodium, the causative organism of malaria, was broken. After two years, DDT application was stopped. The mosquito population regained its numbers, but there was no Plasmodium to transmit. Though malaria was not totally eradicated, it helped to drastically reduce the incidence of malaria.

In India Vector Control Research Centre (VCRC) was established as a centre of excellence for research and training in vector borne diseases and control. It was established in 1975 at Pondicherry. It develops strategies for prevention and control of vector borne diseases. It works to develop methods for rapid response and disaster management with reference to vector borne disease outbreaks. It also promotes healthy environment by educating people on how to reduce the risk of vector borne disease transmission.

APPOLO STUDY CENTRE