

APPOLO STUDY CENTRE

6th to 10th General Science Zoology

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6th Term I

Unit 6 – Health & Hygiene

- As defined by World Health Organization (WHO), it is a "State of complete physical, mental, and social well being, and not merely the absence of disease or infirmity." Health is a dynamic condition resulting from a body's constant adjustment and adaptation in response to stresses and changes in the environment for maintaining an inner equilibrium called homeostasis.
- Hygiene is a science of the establishment and maintenance of health conditions or practices (as of cleanliness) conducive to health has poor personal hygiene. Brushing your teeth regularly is an important part of good oral hygiene. Hygiene is the practice of keeping yourself and your surroundings clean, especially in order to prevent illness or the spread of diseases.

Components of Food

- The Chemical constituents of food which give us energy, help to build our body and protect us from diseases are called Nutrients.
- Carbohydrate
- Proteins
- Fats
- Vitamins
- Minerals

➤ Water

Carbohydrates

Carbohydrates are energy giving component of the food.

S.No	Form of Carbohydrates	Sources
1	Sugar	Fruits, Honey, Cane Sugar, Sugar Beet
2	Starch	Rice, Wheat, Maize, Potato, etc.
3	Dietary fibre	Whole grain, nuts, etc.

Fats

- Fat is also an energy-giving food and provides more energy than Carbohydrates. Some important sources of fats are butter, ghee, milk, cheese, paneer, nuts, meat, fish, egg yolk etc. Apart from giving energy, they insulate our body and protect the cells

PROTEIN

Body Building Foods

- Proteins are necessary for our growth and repair, as well as for regulating various body functions such as digestion. The sources of proteins are pulses, eggs, fish, milk, chicken, soya bean, nut, grams etc, Proteins are body building foods.

Soyabean is the highly rich source of protein

Vitamins

- Vitamins are required for carrying out various biochemical reactions in our body. Fruits, vegetables, grains, meat products are good sources of vitamins. Vitamins are called as protective food. There are six major vitamins A, B, C, D, E and K. Vitamins B and Vitamins C are water soluble, Vitamins A, D, E and K are fat soluble.

Vitamin	Found abundantly in	Disease we get if deficient in this	Symptoms
Vitamin A	Fish oil, egg, milk, ghee, carrot, corn, Yellow fruits, greens	Night blindness	Poor vision, difficulty in seeing in dim light
Vitamin B	Whole grain, unpolished rice, milk, fish, meat, peas, lentils Green Vegetables	Beriberi	Nervous weakness, fatigue.
Vitamin C	Oranges, Gooseberry, Greenchilly, Tomato	Scurvy	Bleeding gums

Vitamin D	Fish oil, milk and eggs. It is also made in our skin using sunlight	Rickets	Weak, flexible bones.
Vitamin E	Vegetable oils, Green Vegetables, whole wheat, Mango, apple, greens	Nervous weakness, dimming of eyesight	Childlessness, lack of resistance power to illnesses
Vitamin K	Green Vegetables, Tomato, cabbage, eggs, milk products.	Weakness of the bones, teeth etc.	Even a small cut bleeds profusely.

Gooseberries contains nearly 20 times the vitamin C than Orange

Minerals

- Minerals are required for growth as well as for the regulation of normal body function. Green leafy vegetables like spinach, pulses, eggs, milk, fish and fruits are important sources of minerals in our diet. Minerals are also a protective foods.

Minerals	Functions
Calcium	Strong bones and teeth, clotting of blood
Phosphorus	Strong bones and teeth
Iodine	Synthesis of thyroid hormone
Iron	Formation of haemoglobin and brain development

80% of the world production of Moringa Leaves is in India. The Major countries which import Moringa Leaves are China, US, Germany, Canada, South Korea and European countries

Water

- Our body needs an adequate supply of water in order to maintain good health. Any human being should take minimum eight tumblers (2 Litres) of water every day.

Health

- Health is a state of complete physical, mental and social well-being and not merely absence of diseases. Eating a healthy diet keeps you physically and mentally fit. When you are physically healthy, you feel confident you are more outgoing and have a greater capacity for enjoying life.
- Unhealthy food choices lead to obesity and illness, preventing you from socializing with friends and family. So choose your diet carefully.

Balanced Diet

- A diet should contain adequate amount of all the necessary nutrients required for healthy growth and activity.
 - An increased capacity to work
 - Good physical and mental health
 - Increased capacity to resist diseases.
 - Help in proper growth of the body.
- A balanced diet contains sufficient amount of various nutrients to ensure good health. Food should also provide the appropriate amount of energy and adequate amount of water.

Malnutrition:

- Malnutrition occurs when all the nutrients that the body needs are not obtained in the proper proportions from the diet. The word malnutrition refers to the condition that results when a person does not take a balanced diet. Malnutrition leads to deficiency disease. The diseases that are caused due to lack of Nutrients in the diet are called Deficiency Diseases.

India has the second highest number of obese children in the world after China, according to a study that has found that 14.4 million children in the country have excess weight.

Protein and Mineral Deficiency Diseases

Protein Diseases	Symptoms
Kwashiorkar	Stunted growth, swelling of face and limbs, Diarrhoea.
Marasmus	Skinny appearance, slow body growth.

Mineral	Deficiency Disease
Calicum	Rickets
Phosphorus	Osteomalatia
Iodine	Cretinism (in child) Goitre (in adult)
Iron	Anaemia

Physical Exercise and Rest

- Physical exercise is any bodily activity that enhances or maintains physical fitness and overall health and wellness. It is performed for various reasons, including

- increase in growth and development,
- strengthening muscles and the cardiovascular system,
- developing athletic skills, weight loss or maintenance, and enjoyment.
- Physical exercise may help to decrease some of the effects of childhood and adult obesity.

Deep sleep seems to be one of the most critical time for body repair

REST

- Proper amount of rest is essential for physical and mental health. Rest is as important as nutrition and physical activity for growth and development and good health.

Personal Cleanliness

- Hygiene is a set of practices performed to preserve health. According to the World Health Organization (WHO), “Hygiene refers to conditions and practices that help to maintain health and prevent the spread of diseases.”
- **Personal hygiene** involves those practices performed by an individual to care for one’s bodily health and well being, through cleanliness. It includes such personal habit choices as how frequently to bathe, wash hands, trim fingernails, and change clothing. It also includes attention to keep surfaces in the home and workplace, including bathroom facilities, clean and pathogen-free.

Introduction of Microbes

- The diseases or conditions caused by microorganism due to the negligence of personal hygiene.
 - Diarrhoea
 - Tooth decay
 - Athlete’s foot(Madurai’s foot)
 - Dandruff.

Most of the microbes belong to four major groups:

- Bacteria
- Virus
- Protozoa
- Fungi

Bacteria

- Bacteria are very small prokaryotic microorganisms.
 - Bacterial cells do not have nucleus and do not usually have membrane bound organelles.
- Bacteria can exist either as independent organisms or as parasites
 - They invade tissues
 - They produce pus or harmful wastes

Bacterial Diseases

S.No	Bacterial diseases	Mode of transmission
1	Cholera	Contaminated water
2	Pneumonia	Inhalation of airborne droplets from a sneeze or cough
3	Tetanus	Contamination of wounds with the bacteria.
4	Tuberculosis	Inhalation of airborne droplets from sneeze or cough
5	Typhoid	Contaminated food or water

Disease

Disease is a definite pathological process having a characteristic set of signs and symptoms.

Disorder

Disorder is a derangement or abnormality of function.

Virus

- Virus is an acellular agent that replicates only inside the cells of other living organisms. Virus can infect all types of life forms plant, animals and microorganisms. They invade living normal cells and use their cell machinery to multiply. They can kill damage or change the cells and make you sick.

Diseases Caused By Virus

- Common cold
- Influenza
- Hepatitis
- Polio
- Smallpox
- Chicken pox
- Measles

Microscopes help to study the structure of the microorganisms

7th Term I

Unit 6 - Health & Hygiene

- Health is the best wealth. If you have good health, you will have a sound mind and you will gain good knowledge and wealth also. To maintain good health, you should follow good hygiene, eat nutritious food, do exercise, take rest and have a sound sleep.
- It also refers to a state of a sound mind and body free from any sickness or ailment, stress and problems. In simple words, health refers to the physical, emotional and psychological well-being of a person.
- Hygiene refers to the good habits and their practices which is followed to prevent diseases, maintain good health, especially through cleanliness, consumption of safe drinking water and proper disposal of sewage. It refers to all those activities that are done for improving and maintaining good health and sound mind.

Cleanliness

- Cleanliness refers to the maintenance of personal and environmental hygiene. In simple words, It refers to the state of being clean which is essential for good health. To protect us from diseases it is essential to maintain good health by taking regular bath, cleaning the clothes and surroundings and also avoiding unhygienic food consumption.
- Personal hygiene is defined as “the branch of health which is concerned with the individual’s adjustment to the physiological needs of the body and mind for the attainment of the maximum level of health, it also refers to the cleaning and grooming of the body.
- Colds and the flu are common communicable diseases. It is caused not only by bacteria but also by virus. When you have cold and flu, you may also have running nose, cough, sore throat, and sometimes fever or pain in the joints. For some, this condition may also lead to mild diarrhoea.
- Secretions oozing out from the nose may contains the bacteria or virus. When the patient touch the nose and some other object or someone else the virus is transferred. When the patient sneezes or coughs the virus comes out with the droplets and become airborne. Hence it is a good practice for the patientwith cold and flu to use a handkerchief to blow the noses and also wash the hands often to ensure that they do not accidentally spread the virus to others.

Community Hygiene

- A community is formed by a group of people living together in a particular area. If the people in a community wish to lead a healthy life, they should maintain basic community hygiene. It can be done by adopting the following measures.
 - The surroundings should be kept clean.
 - Drains should be covered properly.
 - The domestic wastes should be segregated and properly disposed off safely in separate dust bins provided by the Government (Green and Blue).
 - Used water from houses should not be let out into open drains or open areas

Dengue is spread by mosquitoes of *Aedes aegypti* caused by DEN-1, 2 virus belonging to the type- flavivirus. It decrease counting of the blood platelets of human blood and it has a maximum flight range of 50–100 meters in and around the places.

Care of the body

- A human body is a massive miracle. It consists of organs and systems, which functions day in and out. Our body in compared to a machine. The human body systems work well with proper maintenance and guidance. For smooth functioning, all the parts of the body should work in unison. The digestive system, circulatory and muscular system is the core systems that should be in synchronization and functioning well. So keep them well by proper care.

Dental Care

- Dental care or broadly speaking oral hygiene is an important aspect of the personal health of an individual. Good oral hygiene implies sound teeth and healthy gums with healthy surrounding tissues. The physical act of chewing food promotes saliva and gastric secretions which helps digestion. The act of chewing and tasting is called 'mastication'. It gives pleasure and emotional satisfaction of eating food. Teeth is essential for good appearance and clear speech also.
 - When you brush two times a day, it will prevent the formation of tartar and plaque on your teeth and gums.
 - When you Floss, it will remove food particles, plaque, and bacteria which build up between your teeth. When you start flossing, your gums may bleed a little bit, but after few days that will be stopped. It should be started only with proper medical guidance.

Diseases affecting the teeth

- Diseases affecting the teeth and gums, their causative agents and remedial measure are given below:

S.No	Name of the Diseases	Causative Agents	Impacts/ Consequences	Remedial measures
1	Bleeding Gums	Vitamin C deficiency	Bleeding of the gums	Eating citrus fruits.
2	Tooth decay	Bacteria in plaque	Bacteria produce acids	Brushing and flossing the teeth can prevent decay.
3	Periodontitis	Tobacco chewing	Severe form of gum disease ruin the bones, gums, and other tissues.	Chewing type of tobacco should be avoided. Eat a well - balanced diet.

Eye Care

- Eyes are an important organ of our body. They are considered as “windows to the world”. Eyesight is the most important sense. 80% of what we perceive comes through the sense of sight. The protection of the eyes, can reduce the odds of blindness and vision loss. we protection of our eye from the diseases, surroundings, climate condition.

Diseases affecting Eye

Disease affecting the eye and their remedial measure are given below:

Hair Care

- The condition of the hair reflects to some extent the nutritional status and general health of the body. Thin, sparse hair and the loss of hair indicates a poor nutritional status. The deficiencies in diet, physical and mental illness of various kinds may also leads to premature graying of hair.
- The hair follicles from which the hair grows produce oil which keeps the hair smooth. The sweat and the dead skin cells come off the scalp.
- The oil, sweat and dead cells all add together and can make the hair greasy and look dirty unless it is washed regularly.

S.No	Name of the Disease	Causative Agents	Impacts/ Consequences	Remedial measures
1	Night Blindness	A lack of vitamin A, a disorder of the	Makes it hard to see well at night or in poor light.	Eat food rich in anti - oxidant, vitamins and

		cells in your retina		minerals.
2	Conjunctivitis (Pink eye)	Caused by a virus and bacteria	One or both eyes can be affected. Highly contagious; can be spread by contamination and sneezing	Antibiotic eye drops or ointments, home remedy.
3	Color blindness	Genetic condition	Difficulty distinguishing between colours Inability to see shades or tones of the same colour.	There is no known cure for colour blindness. contact lenses and glasses with filters

To keep the hair clean and healthy:

- The regular hair wash and massage of the scalp will remove the dead skin cells, excess oil and dust.
- Rinsing the hair well with clear water and using good toothed comb for hair dressing is highly essential for their maintenance.

Diseases

- A disease is the functional or physical change from a normal state that affects the health of a person by causing disability or discomfort. The following are reasons that could leads to the development of disease in an individual.
 - Infection caused by disease-causing microbes
 - Lack of balanced diet
 - Poor lifestyle and unhealthy habits
 - Malfunctioning of one or more body parts or organs.

Different kinds of sickness and their causes

- The prevention and treatment of sickness can be considered in two groups for their better understanding. They are, communicable and non-communicable disease.

Communicable Diseases

- Communicable diseases are those that spread from one person to another. Healthy persons must be protected from people with communicable diseases. Diseases spread through contaminated air, water, food or vectors (insects and other animals).



Diseases Caused by Bacteria

- Communicable disease (like tuberculosis, Cholera and Typhoid), which are caused by microbes and spread through air, water and some other organisms also.

Tuberculosis:

- TB is caused by Mycobacterium tuberculae and spreads from one person to another person through air by spitting and prolonged contact with sharing materials of the patient. The symptoms are fever, weight loss, chronic cough, bloody spitting and difficulty in breathing.

Prevention and treatment

- BCG vaccination,
- Giving special attention to the patient,
- Regular medication like DOT

Cholera:

- Cholera is caused by Vibrio cholera and spread through the consumption contaminated food or water. The symptoms of Cholera is Vomiting, severe diarrhea and cramps in legs

Prevention and treatment

- Good hygienic practices like, washing hands before eating.
- Avoid eating uncovered food from street vendors.
- Drinking boiled water.
- Getting Vaccination against cholera

Typhoid:

- Typhoid is caused by Salmonella typhi and spreads by contaminated food and water. The symptoms are Anorexia, headache, rashes on abdomen, dysentery and high fever up to 104°F.

Prevention and treatment

- Drinking boiled clean water
- Proper disposal of sewage
- Vaccination

Disease Caused by Virus

- Viral diseases are extremely widespread infections caused by many type of viruses. In this lesson you will learn about some disease caused by viruses like, Hepatitis, Chickenpox and Rabies.

Hepatitis

- Hepatitis is one of the most dangerous and fatal diseases caused by Hepatitis virus- A, B, C, D, E. Its mode of transmission is Contaminated water, sharing of needles and blood transfusion. The symptoms of hepatitis is loss of appetite, (Anorexia), vomiting, eyes and urine in yellow color.

Prevention and treatment

- Drinking boiled water,
- Proper cleaning of hands

Chickenpox

- Chickenpox (chicken pox), also known as varicella, is a highly contagious infection caused by the varicella zoster virus. . This disease spreads through air and contact with an infected person. Its symptoms is appearance of rashes on the whole body, fever, headache and tiredness.

Prevention and treatment

- The chickenpox (varicella) vaccine is the best way to prevent chickenpox
- Special attention should be given to the infected persons

Rabies

- Rabies is a fatal disease. Which is transmitted by the bite of the infected dog, rabbit, monkey, cat etc. The virus present in the saliva of dog enters the brain via neurons. The symptoms of rabies is hydrophobia (extreme fear for water), fever for 2 - 12 weeks and exaggerations in behavior.

Prevention and treatment

- In early stages rabies is very difficult to detect
- After an animal is bitten it usually takes two to twelve weeks to shows any symptoms and it may take as long as two years also.
- Fatality can be prevented by timely vaccination before the onset of symptoms.

Vaccine

A vaccine is a biological preparation that provides active acquired immunity to a particular disease. Vaccines like (BCG, Polio, MMR) are given at early child wood to protect from other diseases

Non-Communicable diseases

- Communicable diseases do not spread from person to person. They are caused by other factors. Therefore, it is important to know which sickness are communicable and which are not. They are never caused by germs, bacteria, or other living organisms that infect the body. Antibiotics, or medicines that fight against germs do not help to cure non-communicable diseases.

Problems caused by wearing out of body parts:

- Rheumatism, heart attack, epileptic seizures, stroke, migraine headach. Cataract and cancer

Problems caused by external harmful agents entering the body:

- Allergies, asthma, poisons, snakebite, cough from smoking, stomach ulcer, alcoholism.

Problems caused by a lack of trace elements in the body:

- Anemia, pellagra, night blindness and xerophthalmia, goiter and hypothyroidism.

Problems caused by Malnutrition.

- Nutritious food is needed for a person to grow well, work hard, and stay healthy. Many common sicknesses are caused by malnutrition.

Leucoderma is a non - communicable diseases caused by partial or total loss of pigmentation in the skin. (melanin pigment). This condition affects any age, gender and ethnicity. There is no cure. It does not spread by touching, sharing food and sitting together.

Specific health problems of children

Anaemia

- It is caused by eating food with less iron content and can also caused due to feeding some other foods instead of breast milk. Severe anemia in children may leads to hookworm infection, chronic diarrhoea and dysentery. In recent day school going children, especially the girls are affected by anemia. The Government of Tamil Nadu provides weekly iron folic tablets to all the girls in the schools of all areas.

The signs of anemia are:

- Pale or transparent skin, The inner surface of eye lids are pale, white fingernails, pale gums, weakness and fatigue.
- In severe cases, face and feet may be swollen, the heartbeat is rapid and with shortness of breath.
- Children and women who eats mud are usually anemic.

Consuming iron containing food Sources

- **Food** – Moringa leaves, Dates, Liver (Sheep and Chicken), Green, green leafy vegetables like beans, peas, lentils and Greed banana.
- **Pills** - Cod liver oil tablet, Ferrous sulfate

As a general rule, iron supplements should be given orally, not to be injected, because it leads to dangerous

Safety and First Aid

- First aid is the immediate treatment given to the victim of trauma or sudden illness before medical help is made available.

The first aid is

- To save the life
- To prevent further bleeding and determine the condition of the patient
- To relieve the pain
- To provide a medical care available at the earliest

Burns

- The tissue damage caused by heat, chemical, electricity, sunlight or nuclear radiation is known as Burns. Mostly burns are caused by scalds, building fires, flammable liquid and gases. There are three types of burns, according to degree of burning.
- First-degree burns affect only the outer layer (called the epidermis) of the skin
- Second-degree burns damage the epidermis and the layer beneath it (called the dermis)
- Third-degree burns involve damage or complete destruction of the skin to its full depth and damage to underlying tissues also. People who experience such burns often require skin grafting.

First Aid for Burning

- In case of minor burns, the affected area should be washed with cold water and an antiseptic cream should be applied. In case of severe burns, where deeper layers of tissues get destroyed and blisters appear, use of water should be avoided. The burnt area should be covered with a clean non- sticking cloth or bandages. Larger burns need immediate medical attention.

Cut and Scratches

- Cuts and scratches are areas of damage on the surface of the skin. A cut is a line of damage that can go through the skin and into the muscle tissues below, whereas a scratch is surface damage that does not penetrate the lower tissues.
- Cuts and scratches may bleed or turn red, become infected and leave scars.

First aid for cuts

- For minor cuts, the affected area should be washed with cold running water and cleaned with an antiseptic liquid. Then apply an antiseptic cream on the wound and sterilized bandage should be tied to prevent infection. If the cut is deep, a clean cotton pad should be placed on the cut and pressed, and the injured person should be taken to a doctor immediately.

Basic cleanliness and protection.

- The most important thing is to help anybody, but you must also protect yourself from HIV and other blood-borne diseases when you help someone who is bleeding. You should wear gloves or a clean plastic bag on your hands.
- Be careful not to prick yourself with needles or other sharp objects around the person you are helping.

9th book
Unit 21- Nutrition & Health

Introduction

- Food is the basic necessity of life. Food is defined as any substance of either plant or animal origin consumed to provide nutritional support for an organism. It contains essential nutrients that provide energy, helps in normal growth and development, repair the worn out tissues and protect the body from diseases. Food contamination with microorganisms is a major source of illness either in the form of infections or poisoning. Food safety is becoming a major concern these days.
- Adulteration of foodstuffs is commonly practiced in India by traders. Food is contaminated or adulterated from production to consumption for financial gain. The physiological functions of a consumer are affected due to either addition of a deleterious substance or the removal of a vital component. Food laws have come into existence to maintain the quality of food produced in our country.

Classes of Nutrients

Nutrients are classified into the following major groups as given below.

- Carbohydrates
- Proteins
- Fats
- Vitamins
- Minerals

Carbohydrates

- Carbohydrates are organic compounds composed of carbon, hydrogen and oxygen. Carbohydrate is an essential nutrient which provides the chief source of energy to the body. Glucose, sucrose, lactose, starch, cellulose are examples for carbohydrates.
- Carbohydrates are classified as monosaccharide (Glucose), disaccharide (Sucrose) and polysaccharide (Cellulose). The classification is based on the number of sugar molecules present in each group.

Proteins

- Proteins are the essential nutrients and also the building blocks of the body. They are essential for growth and repair of body cells and tissues. Proteins are made of amino acids.

- Essential amino acids are those that cannot be biosynthesized by the body and must be obtained from the diet. The nine essential amino acids are phenylalanine, valine, threonine, tryptophan, methionine, leucine, isoleucine, lysine and histidine.

Fats

- Fat in the diet provides energy. They maintain cell structures and are involved in metabolic functions.
- Essential fatty acids cannot be synthesized in the body and are provided through diet. Essential fatty acids required in human nutrition are omega fatty acids.

Vitamins

- Vitamins are the vital nutrients, required in minute quantities to perform specific physiological and biochemical functions.

Human skin can synthesize Vitamin D when exposed to sunlight (especially early morning). When the sun rays falls on the skin dehydrocholesterol is converted into Vitamin D. Hence, Vitamin D is called as Sunshine vitamin. Vitamin D improves bone strength by helping body to absorb calcium.

Minerals

- Minerals are inorganic substances required as an essential nutrient by organisms to perform various biological functions necessary for life. They are the constituents of teeth, bones, tissues, blood, muscle and nerve cells.
- The macrominerals required by the human body are calcium, phosphorus, potassium, sodium and magnesium. The microminerals required by the human body also called trace elements are sulfur, iron, chlorine, cobalt, copper, zinc, manganese, molybdenum, iodine and selenium.

Dietary sources of major foodstuffs

Major food Stuffs	Dietary sources	Daily requirements (grams)
Carbohydrates	Honey, Sugarcane, fruits, whole grains, starchy vegetables, rice	150-200
Proteins	Legumes, pulses , nuts, soya bean, green leafy vegetables, fish, poultry products, egg, milk and dairy products	40
Fats	Egg Yolk, saturated oil, meat	35

Vitamins-Dietary sources, Deficiency disorders and Symptoms

Vitamins	Dietary sources	Deficiency disorders	Symptoms
Fat Soluble Vitamins			
Vitamin A (Retinol)	Carrot, Papaya, leafy vegetables, fish liver oil, egg yolk, liver, dairy products	XerophthalmiaNyctalopia (Night blindness)	Dryness of Cornea unable to see in the night (dim light) scaly skin.
Vitamin D (Calciferol)	Egg, liver, dairy products, Fish, Synthesized by the skin in sunlight	Rickets (in children)	Bow legs, defective ribs, development of pigeon chest.
Vitamin E (Tocopherol)	Whole Wheat, meat, vegetable oil, milk.	Sterility in rats, Reproductive abnormalities	Sterility
Vitamin K (Derivative of Quinone)	Leafy vegetables, Soyabeans, milk	Blood Clotting is prevented	Excessive bleeding due to delayed blood clotting.
Water Soluble Vitamins			
Vitamin B1 (Thiamine)	Whole grains, Yeast, eggs, liver, sprouted pulses	Beriberi	Degenerative changes in the nerves, muscles become weak, Paralysis.
Vitamin B2 (Riboflavin)	Milk, eggs, liver, green vegetables, whole grains	Ariboflavinosis (Cheilosis)	Irritation in eyes, dry skin, inflammation of lips, fissures in the corners of the mouth.
Vitamin B3 (Niacin)	Milk, eggs, liver, lean meat, ground nuts, bran	Pellagra	Inflammation of skin, loss of memory, diarrhoea
Vitamin B6 (Pyridoxine)	Meat, fish, eggs, germs of grains and cereals, rice polishings.	Dermatitis	Scaly skin, nervous disorders.
Vitamin B12 (Cyanocobalamine)	Milk, meat, liver, pulses, cereals, fish	Pernicious anaemia	Decrease in red blood cell production, degeneration of spinal cord.
Vitamin C (Ascorbic acid)	Leafy vegetables, sprouts, citrus fruits like	Scurvy	Swollen and bleeding gums, delay in healing of

	gooseberry (Amala), lemon, orange		wounds, teeth and bones malformed.
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Minerals - Dietary sources, Functions and Deficiency disorders

Minerals	Sources	Functions	Deficiency disorders
Macro nutrients			
Calcium	Dairy Products, beans, cabbage, eggs, fish	Constituent of bones and enamel of teeth, clotting of blood and controls muscle contraction.	Bone deformities, poor skeletal growth, Osteoporosis in adults.
Sodium	Common Salt	Maintains fluid balance and involved in neurotransmission	Muscular cramps, nerve impulses do not get transmitted.
Potassium	Banana, Sweet Potato, nuts, whole grains, citrus fruits	Regulates nerve and muscle activity	Muscular fatigue, nerve impulses do not get transmitted.
Micro nutrients			
Iron	Spinach, dates, greens, broccoli, whole cereals, nuts, fish, liver	Important component of haemoglobin	Anaemia
Iodine	Milk, Seafood, Iodised salt	Formation of thyroid hormones.	Goitre

Protein Energy Malnutrition (PEM)

- Absence of certain nutrients in our daily diet over a long period of time leads to deficiency diseases. This condition is referred as Malnutrition. Deficiency of proteins and energy leads to severe conditions like: Kwashiorkar and Marasmus.
- **Kwashiorkar:** It is a condition of severe protein deficiency. It affects children between 1-5 years of age, whose diet mainly consists of carbohydrates but lack in proteins.
- **Marasmus:** It usually affects infants below the age of one year when the diet is poor in carbohydrates, fats and proteins.

Food Hygiene

- Poor personal hygiene may allow pathogenic microorganisms to cause food spoilage. Food spoilage is an undesirable change in the normal state of food and is not suitable for human consumption. Signs of food spoilage include a changes in appearance, colour, texture, odour and taste. Factors responsible for Food Spoilage are given below.

- **Internal factors:** It include enzymatic activities and moisture content of the food.
- **External factors:** It include adulterants in food, contaminated utensils and equipment, unhygienic cooking area and lack of storage facilities.

Food Preservation

- Food preservation is the process of prevention of food from decay or spoilage, by storing in a condition fit for future use. Food is preserved to:
 - increase the shelf life of food
 - retain the colour, texture, flavour and nutritive value
 - increase food supply
 - decrease wastage of food

Methods of Food Preservation

The various method of food preservation are explained below

- **Drying:** Drying is the process of preservation of food by removal of water/moisture content in the food. It can be done either by sun-drying, (e.g. cereals, fish) or vacuum drying (e.g. milk powder, cheese powder) or hot air drying (e.g. grapes, dry fruits, potato flakes). Drying inhibits the growth of microorganism such as bacteria, yeasts and moulds.
- **Smoking:** In this process, food products like meat and fish are exposed to smoke. The drying action of the smoke tends to preserve the food.
- **Irradiation:** Food irradiation is the process of exposing food to optimum levels of ionizing radiations like x-rays, gamma rays or UV rays to kill harmful bacteria and pests and to preserve its freshness.
- **Cold storage:** It is a process of storing the perishable foods such as vegetables, fruits and fruit products, milk and milk products etc. at low temperature. Preserving the food products at low temperature slows down the biological and chemical reactions and prevents its spoilage.
- **Freezing:** Freezing is one of the widely used methods of food preservation. This process involves storing the food below 00C at which microorganisms cannot grow, chemical reactions are reduced and metabolic reactions are also delayed.

Pasteurization: Pasteurization is a process of heat treatment of liquid food products. e.g. For preservation of milk and beverages. This process also involves boiling of milk to a temperature of 63°C for about 30 minutes and suddenly cooling to destroy the microbes present in the milk.

Bananas are best stored at room temperature. When it is kept in a refrigerator, the enzyme responsible for ripening becomes inactive. In addition, the enzyme responsible for browning and cell damage becomes more active thereby causing the skin colour change from yellow to dark brown

- **Canning:** In this method of food preservation, most vegetables, fruits, meat and dairy products, fruit juices and some ready-to-eat foods are processed and stored in a clean, steamed air tight containers under pressure and then sealed. It is then subjected to high temperature and cooled to destroy all microbes.

Addition of Preservatives

- Food can be preserved by adding natural and synthetic preservatives.

Natural preservatives

- Some naturally available materials like salt, sugar and oil are used as food preservatives.
- **Addition of salt:** It is one of the oldest methods of preserving food. Addition of salt removes the moisture content in the food by the process of osmosis. This prevents the growth of bacteria and reduces the activity of microbial enzymes. Meat, fish, gooseberry, lemon and raw mangoes are preserved by salting. Salt is also used as a preservative in pickles, canned foods etc.
- **Addition of sugar:** Sugar/Honey is added as a preservative to increase the shelf life of fruits and fruit products like jams, jellies, squash, etc. The hygroscopic nature of sugar/honey helps in reducing the water content of food and also minimizing the process of oxidation in fruits.
- **Addition of oil:** Addition of oil in pickles prevents the contact of air with food. Hence microorganisms cannot grow and spoil the food.

Synthetic preservatives

- Synthetic food preservatives like sodium benzoate, citric acid, vinegar, sodium meta bisulphate and potassium bisulphate are added to food products like sauces, jams, jellies, packed foods and ready- to- eat foods. These preservatives delay the microbial growth and keep the food safe for long duration.

Food Adulteration

- Adulteration is defined as the addition or subtraction of any substance to or from food, so that the natural composition and the quality of food substance is affected. Adulterant is any material which is used for the purpose of adulteration.

- Some of the common adulterated foods are milk and milk products, cereals, pulses, coffee powder, tea powder, turmeric powder, saffron, confectionary, non-alcoholic beverages, spices, edible oils, meat, poultry products etc. The adulterants in food can be classified in three categories:
 - Natural adulterants
 - Incidental/unintentionally added adulterants
 - Intentionally added adulterants.

Natural adulterants

- Natural adulterants are those chemicals or organic compounds that are naturally present in food. e.g. toxic substances in certain poisonous mushrooms, Prussic acid in seeds of apples and cherry, marine toxins, fish oil poisoning, environmental contaminants.

Incidental/unintentionally added adulterants

- These types of adulterants are added unknowingly due to ignorance or carelessness during food handling and packaging. It includes:
 - Pesticide residues
 - Droppings of rodents, insects, rodent bites and larva in food during its storage
 - Microbial contamination due to the presence of pathogens like Escherichia coli, Salmonella in fruits, vegetables, ready-to-eat meat and poultry products.

Intentionally added adulterants

- These adulterants are added intentionally for financial gain and have serious impact on the health of the consumers. These types of adulterants include:
 - Additives and preservatives like vinegar, citric acid, sodium bicarbonate (baking soda), hydrogen peroxide in milk, modified food starch, food flavours, synthetic preservatives and artificial sweeteners.
 - Chemicals like calcium carbide to ripen bananas and mangoes.
 - Non certified food colours containing chemicals like metallic lead are used to give colours to vegetables like green leafy vegetables, bitter gourd, green peas etc. These colours are added to give a fresh look to the vegetables.
 - Edible synthetic wax like shellac or carnauba wax is coated on fruits like apple, pear to give a shining appearance.

Health Effects of Adulterated Foods

- Consumption of these adulterated foods may lead to serious health effects like fever, diarrhoea, nausea, vomiting, gastrointestinal disorders, asthma, allergy, neurological disorder, skin allergies, immune suppression, kidney and liver failure, colon cancer and even birth defects.

Food Quality Control

- The government always ensures that pure and safe food is made available to the consumers. In 1954, the Indian Government enacted the Food Law known as Prevention of Food Adulteration Act and the Prevention of Food Adulteration Rules in 1955 with the objective of ensuring pure and wholesome food to the consumers and protect them from fraudulent trade practices.
- Minimum standards of quality for food and strict hygienic conditions for its sale are clearly outlined in the Act

A slogan From farm to plate, make food safe was raised on World Health Day (7th April 2015) to promote and improve food safety.

Food Quality Control Agencies

- ISI, AGMARK, FPO, FCI and other health departments enforce minimum standards for the consumer products. FCI (Food Corporation of India) was set up in the year 1965 with the following objectives:
 - Effective price support operations for safeguarding the interest of farmers.
 - Distributing food grains throughout the country.
 - Maintaining satisfactory levels of operational and buffer stock of food grains to ensure national security.
 - Regulate the market price to provide food grains to consumers at reliable price.

10th book
Unit - 18 -Heredity

Gregor Johann Mendel - Father of Genetics

- Mendel (1822-1884) was an Austrian monk who discovered the basic principles of heredity through his experiments. His experiments are the foundation for modern genetics. He was born in 1822 to a family of farmers in Silesian of Czechoslovakia. After finishing his high school at the age of 18, he entered the Augustinian Monastery at Brunn as a priest. From there he went to the University of Vienna for training in physics, mathematics and natural science. Mendel returned to the monastery in 1854 and continued to work as a priest and teach in high school. In his leisure time he started his famous experiments on the garden pea plant. He conducted his experiments in the monastery for about nine years from 1856 to 1865. He had worked on nearly 10000 pea plants of 34 different varieties. Mendel noted that they differ from one another in many ways.

Mono hybrid Cross - Inheritance of One Gene

- crosses involving inheritance of only one pair of contrasting characters are called monohybrid crosses. For example it is a cross between two forms of a single trait like cross between tall and dwarf plant

Mendel 's Explanation of Monohybrid Cross:

- Parental generation: Pure breeding tall plant and a purebreeding dwarf plant
F1 generation: Plant raise from the seeds of pure breeding parental cross in F1 generation were tall and monohybrids.
- **F2 generation:**
Selfing of th F1 monohybrids resulted in talland dwarf plants respectively in the ratio of 3:1.The actual number of talland dwarf plants obtained by Mendel was 787 tall and 277 dwarf External expression of a particular trait is known as phenotype. So the phenotypic ratio is 3:1.
 - In the F2 generation 3 different types were obtained:
 - Tall Homozygous - TT(Pure) - 1
 - Tall Heterozygous - Tt -2
 - Dwarf Homozygous - tt- 1
 - So the genotypic ratio 1:2:1.A genotype is the genetic expression of an organism.

Mendal 's Interpretation on Monohybrid cross

- Based on these observations it was confirmed by Mendel that 'factors' are passed on from one generation to another, now refered to as genes. Tallness and Dwarfnessare

determined by a pair for contrasting factors, tall plant possess a pair of factors (represented by T- taking the first letter of the dominant character) and a plant is dwarf because it possess factors for dwarfness (represented as t- recessive character). These factors occur in pairs and may be alike as in pure breeding tall plants (TT) and dwarf plants (tt). This is referred to as homozygous. If they are unlike (Tt) they are referred to as heterozygous.

- Two factors making up a pair of contrasting characters are called alleles or allelomorphs. One member of each pair is contributed by one parent
- When two factors for alternative expression of a trait are brought together by fertilization only one expresses itself, (tallness) masking the expression of the other (dwarfness). The character which expresses itself is called dominant condition and that which is masked is called recessive condition.
- The factors are always pure and when gametes are formed, the unit factors segregate so that each gamete gets one of the two alternative factors. It means that factors for tallness(T) and dwarfness(t) are separate entities and in a gamete either T or t is present. When F1 hybrids are self crossed the two entities separate and then unite independently, forming tall and dwarf plants.

Dihybrid Cross- Inheritance Two Genes and Law of Independent Assortment:

- Dihybrid cross involves the inheritance of two pairs of contrasting characteristics (or contrasting traits) at the same time. The two pairs of contrasting characteristics chosen by Mendel were shape and colour of seeds: round-yellow seeds and wrinkled-green seeds.
- Mendel crossed pea plants having round-yellow seeds with pea plants having wrinkled-green seeds. Mendel made the following observations:
- Mendel first crossed pure breeding pea plants having round-yellow seeds with pure breeding pea plants having wrinkled-green seeds and found that only round-yellow seeds were produced in the first generation (F1). No wrinkled-green seeds were obtained in the F1 generation. From this it was concluded that round shape and yellow colour of the seeds were dominant traits over the wrinkled shape and green color of the seeds.
- When the hybrids of F1 generation pea plants having round-yellow seeds were cross-bred by self pollination, then four types of seeds having different combinations of shape and color were obtained in second generation or F2 generation. They were round yellow, round-green, wrinkled yellow and wrinkled-green seeds.
- The ratio of each phenotype (or appearance) of seeds in the F2 generation is 9:3:3:1. This is known as the Dihybrid ratio.

- From the above results it can be concluded that the factors for each character or trait remain independent and maintain their identity in the gametes. The factors are independent to each other and pass to the offsprings (through gametes).

Results of a Dihybrid Cross:

Mendel got the following results from his dihybrid cross

- **Four Types of Plants:**
A dihybrid cross produced four types of F₂ offsprings in the ratio of 9 with two dominant traits, 3 with one dominant trait and one recessive trait, 3 with another dominant trait and another recessive trait and 1 with two recessive traits.
- **New Combination:**
Two new combinations of traits with round green and wrinkled yellow had appeared in the dihybrid cross (F₂ generation).

Mendel's Laws

- Based on his experiments of monohybrid and dihybrid cross, Mendel proposed three important laws which are now called as Mendel's Laws of Heredity.

Law of Dominance:

- "When two homozygous individuals with one or more sets of contrasting characters are crossed, the characters that appear in the F₁ hybrid are dominant and those that do not appear in F₁ are recessive characters".

Law of Segregation or Law of purity of gametes:

- "When a pair of contrasting factors or genes or allelomorphs are brought together in a heterozygote or hybrid, the two members of the allelic pair remain together without mixing and when gametes are formed, the two separate out, so that only one enters each gamete."

Law of independent assortment:

- "In case of inheritance of two or more pairs of characters simultaneously, the factors or genes of one pair assort out independently of the other pair."

Down's syndrome

- This condition was first identified by a doctor named Langdon Down in 1866.
- It is a genetic condition in which there is an extra copy of chromosome 21 (Trisomy 21). It is associated with mental retardation, delayed development, behavioural problems, weak

muscle tone, vision and hearing disability are some of the conditions seen in these children.

Gene or point mutation

- Gene mutation is the changes occurring in nucleotide sequence of a gene. It involves substitution, deletion, insertion or inversion of a single or more than one nitrogenous base. Gene alteration results in abnormal protein formation in an organism.

Sickle cell anaemia is caused by the mutation of a single gene. Alteration in the gene brings a change in the structure of the protein part of haemoglobin molecule. Due to the change in the protein molecule, the red blood cell (RBC) that carries the haemoglobin is sickle shaped.



Unit - 19 - Origin & Evolution of Life

Theories on Origin of Life:

- Many theories have been postulated to explain the origin of life. The views on the origin of life has been putforth as

Special creation:

- This idea embodies that life on Earth is a divine creation and also attributes to supernatural event at a particular time in the past. It also emphasizes that life has not changed ever since its origin.

Spontaneous generation (Abiogenesis):

- According to this theory life originated spontaneously from lifeless matter. It was believed that fishes originated from mud, frogs from moist soil and insects from decaying matter.

Biogenesis:

- It was speculated by Louis Pasteur (1862) that life originates from pre-existing life. He showed that pre-sterilised flasks kept closed airtight, with killed yeast, did not give rise to any life form, while in another flask kept open to air living organisms arose from killed yeast.

Extraterrestrial or Cosmic origin:

- Some scientists still believe that life came from outer space. This states that units of life called spores (Panspermia) were transferred to different planets including earth. This is still an idea of some astronomers.

Chemical Evolution of Life:

- This idea was developed by Oparin (1922) and Haldane (1929). They proposed that with the conditions prevailing on earth, life arose by a series of sequential chemical reactions. The first form of life could have come from pre-existing non-living inorganic molecules which gave rise to formation of diverse organic molecules which are transformed into colloid system to produce life. The modern concept on chemical evolution regarding origin of life was accepted.

Evidences from Morphology and Anatomy

- The comparative study of morphology and anatomy of animals, reveal that they possess common set of characteristics.

Homologous organs:

- The homologous organs are those which have inherited from common ancestors with similar developmental pattern in embryos. The fore limbs of mammals are homologous structures. A human hand, a front leg of a cat, flipper of a whale and a bat's wing look dissimilar and adapted for different functions. Their mode of development and basic structure of bone are similar.

Analogous organs:

- The analogous organs look similar and perform similar functions but they have different origin and developmental pattern. The function of the wings of a bat, the wings of a bird and wings of an insect are similar, but their basic structures are different.

Vestigial organs:

- The degenerated and non-functional organs of animals are called vestigial organs. The same organs are found to be well-developed and functional, in some of the related forms. Some of the vestigial organs in man are vermiform appendix, nictitating membrane, caudal vertebra, coccyx etc.

Atavism:

- The reappearance of ancestral characters in some individuals is called atavism. e.g. Presence of rudimentary tail in new born babies, presence of thick hair on the human body.

Evidences from Embryology

- The study of comparative embryology of different animals, supports the concept of evolution. The embryos from fish to mammals are similar in their early stages of development. The differentiation of their special characters appear in the later stages of development.
- **Biogenetic law** or **Recapitulation theory** was given by Ernst Haeckel. According to this theory, Ontogeny recapitulates Phylogeny. The stages of development of the individual animal repeats the evolutionary history of the entire race of the animal.

Evidences from Palaeontology:

- Palaeontology deals with the study of fossils. Leonardo da Vinci is called the Father of Palaeontology. The study of fossils helps us to understand the line of evolution of many invertebrates and vertebrates. Fossil records show that the evolution has taken a gradual

process from simple to complex organisms. The origin of modern birds is supported by the evidences from palaeontology.

Archaeopteryx:

- Archaeopteryx is the oldest known fossil bird. It was an early bird-like form found in the Jurassic period. It is considered to be a connecting link between reptiles and birds. It had wings with feathers, like a bird. It had long tail, clawed digits and conical teeth, like a reptile.

Theories of Evolution

- Life had evolved along with evolution of earth towards the end of 18th century. Evolution is the gradual change occurring in living organisms over a period of time. Formation of new species due to changes in specific characters over several generations as response to natural selection, is called evolution. The natural changes occurring is explained through the theories of evolution as proposed by Lamarck and Darwin.

Lamarckism:

- Jean Baptiste Lamarck (1744-1829) was a French naturalist, well known for his theory of evolution. Lamarck's theory of evolution was published in 'Philosophic Zoologique' in the year 1809. It is popularly known as 'Theory of inheritance of Acquired Characters' or "Use and Disuse theory" or Lamarckism.

Principles of Lamarckism

I. Internal vital force

- Living organisms or their component parts tend to increase in size continuously. This increase in size is due to the inherent ability of the organisms

II. Environment and new needs

- A change in the environment brings about changes in the need of the organisms. In response to the changing environment, the organisms develop certain adaptive characters. The adaptations of the organisms may be in the form of development of new parts of the body.

III. Use and disuse theory

- Lamarck's use and disuse theory states that if an organ is used constantly, the organ develops well and gets strengthened. When an organ is not used for a long time, it gradually degenerates.

- The ancestors of giraffe were provided with short neck and short forelimbs. Due to shortage of grass, they were forced to feed onleaves from trees. The continuous stretching of their neck and forelimbs resulted in the development of long neck and long forelimbs which is an example for constant use of an organ. The degenerated wing of Kiwi is an example for organ of disuse.

IV. Theory of Inheritance of acquired characters

- When there is a change in the environment, the animals respond to the change. They develop adaptive structures. The characters developed by the animals during their life time, in response to the environmental changes are called acquired characters. According to Lamarck, the acquired characters are transmitted to the offspring by the process of inheritance.

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Unit - 20 - Breeding & Biotechnology

Mutation Breeding

- Mutation is defined as the sudden heritable change in the nucleotide sequence of DNA in an organism. It is a process by which genetic variations are created which in turn brings about changes in the organism. The organism which undergoes mutation is called a mutant.
- The factors which induce mutations are known as mutagens or mutagenic agents. Mutagens are of two types namely physical mutagens and chemical mutagens.

Physical mutagens

- Radiations like X-rays, α , β and γ -rays, UV rays, temperature etc. which induce mutations are called physical mutagens

Chemical mutagens

- Chemical substances that induce mutations are called chemical mutagens. e.g. Mustard gas and nitrous acid. The utilisation of induced mutation in crop improvement is called mutation breeding.

Hybridization

- Hybridization may be defined as the process of crossing two or more types of plants for bringing their desired characters together into one progeny called hybrid. Hybrid is superior in one or more characters to both parents. Hybridization is the common method of creating genetic variation to get improved varieties.

Hybridization Experiment: Triticale (The first man - made cereal)

- Triticale is the first man- made cereal hybrid. It is obtained by crossing wheat (*Triticum durum*, $2n = 28$) and rye (*Secale cereal*, $2n = 14$). The F1 hybrid is sterile ($2n = 21$). Then the chromosome number is doubled using colchicine and it becomes a hexaploid Triticale ($2n = 42$).
- The cycle of crop raising and selection continues till the plants with the desired characters are finally obtained. The development of new varieties is a long-drawn process. Two main aspects of hybridization are to combine the characters of two plants in one plant and to utilize hybrid vigour.

Genetic Engineering

- Genetic engineering is the manipulation and transfer of genes from one organism to another organisms to create a new DNA called as recombinant DNA(rDNA). The term recombinant is used because DNA from two different sources can be joined together. Hence, genetic engineering is also called as recombinant DNA technology.

Techniques of Genetic Engineering - Basic Requirements

Important discoveries that led to the stepping stone of rDNA technology were

- Presence of plasmid in bacteria that can undergo replication independently along with chromosomal DNA.
- Restriction enzymes cuts or break DNA at specific sites and are also called as molecular scissors.
- DNA ligases are the enzymes which help in ligating (joining) the broken DNA fragments.

Gene Cloning

- What reminds to your mind when you hear the word clone? Of course, 'DOLLY' the cloned sheep. The carbon copy of an individual is often called a clone. However, more appropriately, a clone means to make a genetically exact copy of an organism.
- In gene cloning, a gene or a piece of DNA fragment is inserted into a bacterial cell where DNA will be multiplied (copied) as the cell divides. A brief outline of the basic steps involved in gene cloning are:
 - Isolation of desired DNA fragment by using restriction enzymes
 - Insertion of the DNA fragment into a suitable vector (Plasmid) to make rDNA
 - Transfer of rDNA into bacterial host cell (Transformation)
 - Selection and multiplication of recombinant host cell to get a clone
 - Expression of cloned gene in host cell.

Using this strategy several enzymes, hormones and vaccines can be produced

Biotechnology in Medicine

- Using genetic engineering techniques medicinally important valuable proteins or polypeptides that form the potential pharmaceutical products for treatment of various diseases have been developed on a commercial scale.

Pharmaceutical Products developed by rDNA technique

- Insulin used in the treatment of diabetes.
- Human growth hormone used for treating children with growth deficiencies
- Blood clotting factors are developed to treat haemophilia.
- Tissue plasminogen activator is used to dissolve blood clots and prevent heart attack.
- Development of vaccines against various diseases like Hepatitis B and rabies.

Gene Therapy

- Gene therapy refers to the replacement of defective gene by the direct transfer of functional genes into human to treat genetic disease or disorder. The genetic makeup of the patient's cell is altered using recombinant DNA technology. It was first successfully implemented in 1990.

Somatic gene therapy is the replacement of defective gene in Somatic cells.

- **Germ line gene therapy** replacement of defective gene in germ cell (Egg and Sperm) targeted only somatic (non-reproductive) cells. Correction of genetic defects in Somatic cells may be beneficial to the patient but the Corrected gene may not be carried to the next generation.

Stem Cells

- Our body is composed of over 200 specialised cell types, that can carry out specific functions. eg. neurons or nerve cell that can transmit signals, or heart cells which contract to pump blood or pancreatic cells to secrete insulin. These specialised cells are called as differentiated cell. In contrast to differentiated cells.
- In Contrast to differentiated cells, stem cells are undifferentiated or unspecialised mass of cells. The stem cells are the cells of variable potency. Potency refers to the number of possible fates that a cell can acquire. The two important properties of stem cells that differentiate them from other cells are:
 - Its ability to divide and give rise to more stem cells by self-renewal
 - Its ability to give rise to specialised cells with specific functions by the process of differentiation.

Types of stem cells

- **Embryonic stem cells** can be extracted and cultured from the early embryos. These cells are derived from the inner cell mass of blastocyst. These cells can be developed into any cell in the body.
- **Adult stem cell** or somatic stem cell are found in the neonatal (new born) and adults. They have the ability to divide and give rise to specific cell types. Sources of adult stem cells are amniotic fluid, umbilical cord and bone marrow.

Stem-cell therapy

- Sometimes cells, tissues and organs in the body may be permanently damaged or lost due to genetic condition or disease or injury. In such situations stem cells are used for the treatment of diseases which is called stem-cell therapy. In treating neurodegenerative disorders like Parkinson's disease and Alzheimer's disease neuronal stem cells can be used to replace the damaged or lost neurons.

DNA Finger Printing Technology

- The human genome has 3 billion base pairs. Did you know that the DNA pattern of two individuals cannot be same except for identical twins. Each person's DNA sequence is unique due to the small difference in the base pairs. Therefore, if we want to compare the genetic difference among the two individuals, DNA fingerprinting is the easier and quicker method. This technique was developed by Alec Jeffrey.
- The technique analyses each individual's unique DNA sequences and provides distinctive characteristics of individual which helps in identification. Variable number of tandem repeat sequences (VNTRs) serve as molecular markers for identification.
- In human beings, 99 % of the DNA base sequences are the same and this is called as bulk genomic DNA. The remaining 1 % DNA sequence differs from one individual to another. This 1 % DNA sequence is present as small stretch of repeated sequences which is known as satellite DNA. The number of copies of the repeat sequence also called as VNTRs differs from one individual to another, and results in variation in the size of the DNA segment.

VNTRs illustration of three persons

- As shown in the illustration, the sequence AGCT is repeated six times in first person, five times in second person and seven times in third person. Because of this, DNA segment of third person will be larger in size followed by DNA segment of first person and then the second person. Thus, it is clear that satellite DNA bring about variation within the population. Variation in DNA banding pattern reveals differences among the individuals.

Applications of DNA Fingerprinting

- DNA fingerprinting technique is widely used in forensic applications like crime investigation such as identifying the culprit. It is also used for paternity testing in case of disputes.
- It also helps in the study of genetic diversity of population, evolution and speciation.

Genetically Modified Organisms (GMOs)

- One of the most tremendous development of genetic engineering is the production of genetically modified (GM) plants and animals. Genetic modification refers to the alteration or manipulation of genes in the organisms using rDNA techniques in order to produce the desired characteristics. The DNA fragment inserted is called transgene. Plants or animals expressing a modified endogenous gene or a foreign gene are also known as transgenic organisms.
- The transgenic plants are much stable, with improved nutritional quality, resistant to diseases and tolerant to various environment conditions. Similarly transgenic animals are used to produce proteins of medicinal importance at low cost and improve livestock quality.

Genetically Modified Plants

Objective	Gene inserted	Achievement
Improved nutritional quality in Rice	Beta carotene gene (In humans, Beta carotene is required for the synthesis of Vitamin A)	Golden Rice (Genetically modified rice can produce beta carotene, that can prevent Vitamin A deficiency)
Increased crop production	Bt gene from bacteria <i>Bacillus thuringiensis</i> . (Bt gene produces a protein that is toxic to insects)	Insect resistant plants (These plants can produce the toxin protein that kills the insects which attack them)

Genetically Modified Animals

Objective	Gene inserted	Achievement
Improved wool quality and production	Genes for synthesis of amino acid, cysteine	Transgenic sheep (gene expressed)
Increased growth in fishes	Salmon or Rainbow trout or Tilapia growth hormone gene	Transgenic fish (gene expressed)

10th Full Book

Unit 21 - Health & Disease

Introduction

- Abuses occur in a variety of forms and are deeply rooted in cultural, social and economic practices. Solving this global problem however requires a much better understanding of its occurrence, causes and consequences with context to sexual and childhood abuse, this is followed by substance abuse. Are people leading healthier lives in today's modern world than their generations did in the past? For instance, smoking cigarettes, alcohol addiction, use of drugs, eating high fat and cholesterol rich diets, excessive intake of junk foods, reduced physical activity are some of the risk factors for illness and early death. The role of behaviour in health has been receiving increased attention in countries around the world. The health habits of the individuals and their behaviour influence the development of chronic and fatal diseases such as diabetes, obesity, heart disease, cancer and AIDS. These conditions can be substantially reduced by adopting lifestyles that promote wellness and protect their health by taking nutritious diet, regular exercise and by avoiding drugs, alcohol and smoking.

Abuse and Types of Abuse

- Abuse refers to cruel, violent, harmful or injurious treatment of another human being. It includes physical, emotional or psychological, verbal, child and sexual abuses. Abuse can occur within the family and with people who are not associated with the family.
- These days the use of drugs, alcohol and tobacco has been increasing especially among teenagers and adolescents for adventure, excitement, curiosity and experimentation

Child Abuse

- Child abuse constitutes all forms of physical or emotional ill treatment, sexual abuse, exploitation resulting in child's ill health, survival and development. Physical abuse of a child is defined as those acts that cause physical harm such as threatening, beating, kicking and hitting the child.

Sexual Abuse

- Sexual harassment is a form of power and dominance of one person over another, which can result in harmful consequence to the victim. It refers to inappropriate or forced sexual contact. Adolescent girls and women encounter sexual harassment in different forms. Sexual abuse is more common at work places. Verbal remarks, comments, gestures and looks are the most common forms of abuse. This results in psychological distress, physical illness and eating disorders in the affected individuals.

Child Sexual Abuse

- Children are considered soft targets for sexual abuse because they may not realize that they are being abused. Commonly, abusers are persons well known to the child, may even be living in the same locality. Abusers also bribe (use chocolates and toys) to lure children and take advantage of the child's innocence.
- Sexually abused children show symptoms of genital injury, abdominal pain, frequent urinary infection and behavioural problems.

Approaches for Protection of an Abused Child

- Measures adopted for monitoring and assessment of abused child who have undergone signs and symptoms of distress are:
 - ✓ **Child Helpline:** The Child Helpline provides a social worker who can assist the child by providing food, shelter and protection.
 - ✓ **Counselling the child:** Psychologists and social workers should provide guidance, counselling and continuous support to a victimized child.
 - ✓ **Family support:** The victimized child should be supported by the family members. They should be provided with proper care and attention to overcome their sufferings.
 - ✓ **Medical care:** A child victim of sexual offences should receive medical care and treatment from health care professionals to overcome mental stress and depression.
 - ✓ **Legal Counsel:** The family or the guardian of the child victim shall be entitled to free assistance of a legal counsel for such offence.
 - ✓ **Rehabilitation:** Enrolling in schools and resuming their education is an important step towards rehabilitation of the child. It is essential that the child's life is gradually returned to normal after the incidence of abuse.
 - ✓ **Community based efforts:** Conducting awareness campaign on child abuse and its prevention.

Prevention of child sexual abuse

- The most important social policy proclaimed universally is the prevention of child abuse. Taking steps to prevent childhood sexual abuse is parental and institutional responsibility. Instructions to be given by parents and teachers to the child are.
 - Do not talk to any suspected person or strangers and to maintain a distance.
 - Not to be alone with unknown person.

- To be careful while travelling alone in public or private transport.
- Not to receive money, toys, gifts or chocolates from known or unknown person to them without the knowledge of their parents.
- Not to allow known or unknown person to touch them.
- It is the responsibility of every individual living in a society to ensure a safe and protected environment for our children to enable them to live with dignity and free from any form of violence.

Drug, Alcohol and Tobacco Abuse

- The physical and mental dependency on alcohol, smoking and drugs is called addiction. The addictive potential of these substances pulls an individual into a vicious cycle leading to regular abuse and dependency. This is of serious concern because abuse of tobacco, alcohol or drugs produce many harmful effects in an individual, to the family and even to the society. This dangerous behavior pattern among youth can be prevented through proper guidance.

Drug Abuse

- Drugs are normally used for the treatment of disease on advice of a physician and withdrawn after recovery. A person who is habituated to a drug due to its prolonged use is called drug addict. This is called drug addiction or drug abuse.
- A drug that modifies the physical, biological, psychological or social behaviour of a person by stimulating, depressing or disturbing the functions of the body and the mind is called addictive drug. These drugs interact with the central nervous system and affect the individual physically and mentally.

Types of Drugs

- There are certain drugs called psychotropic drugs which acts on the brain and alter the behaviour, consciousness, power of thinking and perception. They are referred as mood altering drugs.

Drug Dependence

- Persons who consume these drugs become fully dependent on them, they cannot live without drugs. This condition is referred as drug dependence.
- **Physical and mental dependence**
- Dependence on the drug for normal condition of well being and to maintain physiological state.

➤ **Psychological dependence** is a feel that drugs help them to reduce stress.

- International Day against Drug Abuse and Illicit Trafficking - June 26.
- Narcotic Drugs and Psychotropic Substances Act was introduced in 1985.

Behavioural Changes of Drug Users

- Adverse effects of drug use among adolescents are
 - Drop in academic performance, absence from school or college.
 - Lack of interest in personal hygiene, isolation, depression, fatigue and aggressive behaviour.
 - Deteriorating relationship with family and friends.
 - Change in food and sleeping habits
 - Fluctuation in body weight and appetite
 - Always looking out for an easy way to get money for obtaining drugs.
 - Prone to infections like AIDS and Hepatitis-B.

World Health Organization (WHO) 1984 suggested the use of the term drug dependence in place of drug addiction or drug abuse

Drug De-addiction

- Management of de-addiction is a complicated and difficult task. The path to recovery of drug addicts is long and often slow.
- Family members, friends and society on the whole have a very important role to play.
 - ✓ **Detoxification:** The first phase of treatment is detoxification. The drug is stopped gradually and the addict is helped to overcome the withdrawal symptoms. The addict undergoes severe physical and emotional disturbance. This is taken care by specific medication.
 - ✓ **Psychotherapy:** Individual and group counselling is given by psychologists and counsellors. The treatment includes efforts to reduce the addict's stress, taught new ways to solve everyday's problems, adequate diet, rest and relaxation.

- ✓ **Counselling to family members:** Social workers counsell family members in order to change the attitude of rejection so that the addict is accepted by the family and the society.
- ✓ **Rehabilitation:** They are given proper vocational training so that they can lead a healthy life and become useful members of the society.

Tobacco Abuse

- Tobacco is obtained from the tobacco plant *Nicotianatobaccum* and *Nicotianarustica*. The dried and cured leaves of its young branches make the commercial tobacco used worldwide. Addiction to tobacco is due to 'nicotine' an alkaloid present in it. Nicotine is a stimulant, highly harmful and poisonous substance.

Tobacco Use

- Tobacco is used for smoking, chewing and snuffing. Inhaling tobacco smoke from cigars, cigarettes, bidis, pipes, hukka is called smoking. Tobacco in powder form is chewed with pan. When powdered tobacco is taken through nose, it is called snuffing.

Smoking Hazards and Effects of Tobacco

- When smoke is inhaled, the chemicals get absorbed by the tissues and cause the following harmful effects
 - **Benzopyrene** and **polycyclic hydrocarbons** present in tobacco smoke is carcinogenic causing lung cancer.
 - Causes inflammation of throat and bronchi leading to conditions like bronchitis and pulmonary tuberculosis.
 - Inflammation of lung alveoli, decrease surface area for gas exchange and cause emphysema.
 - Carbon monoxide of tobacco smoke binds to haemoglobin of RBC and decreases its oxygen carrying capacity causing hypoxia in body tissues.
 - Increased blood pressure caused by smoking leads to increased risk of heart disease.
 - Causes increased gastric secretion which leads to gastric and duodenal ulcers.
 - Tobacco chewing causes oral cancer (mouth cancer).

Prevention of Smoking

- Knowing the dangers of smoking and chewing tobacco adolescents and the old people need to avoid these habits. Proper counselling and medical assistance can help an addict to give up the habit of smoking.

Alcohol Abuse

- The consumption of alcohol is a social evil practiced by the wealthier and poorer sections of the society. The dependence of alcohol is called alcoholism and the addict is termed as alcoholic. It is called alcohol abuse. Drinking of alcohol impairs one's physical, physiological and psychological functions.

Harmful Effects of Alcohol to Health

- Prolonged use of alcohol depresses the nervous system, by acting as a sedative and analgesic substance. Some of the harmful effects are
 - Nerve cell damage resulting in various mental and physical disturbances
 - Lack of co-ordination of body organs
 - Blurred or reduced vision, results in road accidents
 - Dilation of blood vessels which may affect functioning of the heart
 - Liver damage resulting in fatty liver which leads to cirrhosis and formation of fibrous tissues
 - Body loses its control and consciousness eventually leading to health complications and ultimately to death.

Rehabilitation Measures for Alcoholics

- ✓ **Education and counselling:** Education and proper counselling will help the alcoholics to overcome their problems and stress, to accept failures in their life.
- ✓ **Physical activity:** Individuals undergoing rehabilitation should be channelized into healthy activities like reading, music, sports, yoga and meditation.
- ✓ **Seeking help from parents and peer groups:** When a problematic situation occurs, the affected individuals should seek help and guidance from parents and peers. This would help them to share their feeling of anxiety, wrong doing and get rid of the habit.

- ✓ **Medical assistance:** Individual should seek help from psychologists and psychiatrists to get relieved from this condition and to lead a relaxed and peaceful life.
- Alcohol de-addiction and rehabilitation programmes are helpful to the individual so that they could get rid of the problem completely and can lead a normal and healthy life.

Diseases and Disorders due to Lifestyle Modifications

- Diseases are prevalent in our society due to our improper way of living, conditions of stress and strain. These diseases are non-communicable and affect the person who are suffering from particular symptoms. It is an impairment of the body tissue or organ, disturbances in metabolic function which require modification of an individual's normal life.

Diabetes Mellitus

- Diabetes mellitus is a chronic metabolic disorder. In Greek (Diabetes - running through; mellitus- sweet). It is characterised by increased blood glucose level due to insufficient, deficient or failure of insulin secretion. This is the most common pancreatic endocrine disorder. The incidence of Type-1 and Type-2 diabetes is increasing worldwide.

Type-1 Insulin Dependent Diabetes Mellitus (IDDM)

- IDDM accounts for 10 to 20% of the known diabetics. The condition also occurs in children (juvenile onset diabetes) and young adults, the onset is usually sudden and can be life threatening. This is caused by the destruction of β -cells of the pancreas. It is characterized by abnormally elevated blood glucose levels (hyperglycemia) resulting from inadequate insulin secretion.

Causes: Genetic inheritance and environmental factors (infections due to virus, acute stress) are the cause for this condition.

Type-2 Non-Insulin Dependent Diabetes Mellitus (NIDDM)

- This is also called as adult onset diabetes and accounting for 80 to 90% of the diabetic population. It develops slowly, usually milder and more stable. Insulin production by the pancreas is normal but its action is impaired. The target cells do not respond to insulin. It does not allow the movement of glucose into cells.

Causes: The causes are multifactorial which include increasing age (affecting middle aged and older people), obesity, sedentary life style, overeating and physically inactive.

Symptoms: Diabetes mellitus is associated with several metabolic alterations. The most important symptoms are

- Increased blood glucose level (Hyperglycemia)

- Increased urine output (Polyuria) leading to dehydration
- Loss of water leads to thirst (Polydipsia) resulting in increased fluid intake
- Excessive glucose excreted in urine (Glycosuria)
- Excess hunger (Polyphagia) due to loss of glucose in urine.
- Fatigue and loss of weight

According to WHO recommendation, if the fasting blood glucose is greater than 140 mg/dl or the random blood glucose is greater than 200 mg /ml on more than two occasions, diagnosis for confirming diabetes is essential.

Prevention and Control of Diabetes

- Diet, hypoglycemic drugs, insulin injection and exercise are the management options based on the type and severity of the condition. The overall goal of diabetes management is to maintain normal blood glucose level.

Differences between Type-1 and Type-2 Diabetes Mellitus

Factors	Type-1 Insulin Dependent Diabetes Mellitus (IDDM)	Type-2 Non-Insulin Dependent Diabetes Mellitus (NIDDM)
Prevalence	10-20%	80 - 90%
Age of onset	Juvenile onset (<20 Years)	Maturity onset (>30 Years)
Body Weight	Normal or underweight	obese
Defect	Insulin deficiency due to destruction of β - cells.	Target cells do respond to insulin
Treatment	Insulin administration is necessary	Can be controlled by diet, exercise and medicine

- ✓ **Dietary management:** Low carbohydrate and fibre rich diets are more appropriate. Carbohydrates should be taken in the form of starch and complex sugars. Refined sugars (sucrose and glucose) should be avoided. Diet comprising whole grains, millets (jowar, bajra, ragi), green leafy vegetables, wheat and unpolished rice should be included in diet regularly. Carbohydrates is maintained to about 50- 55% of the total calories. High protein content of 10-15% of the total intake is required to supply essential amino acids. Fat content in the diet should be 15-25% of the total calories. Saturated fat intake should be reduced. Polyunsaturated fatty acid content should be higher.

- ✓ **Management with insulin:** Commercially available insulin preparations (short and long acting) are also used to maintain blood glucose levels.
- ✓ **Physical activity:** Exercise plays an important role in facilitating a good control of diabetes, in addition to strengthening and toning up the muscles.
- ✓ **Education and Awareness:** People with diabetics should be educated on the nature of disease they have and the possibility of complications of the disease, if blood sugar is not kept under control. Instructions regarding diet, exercise and drugs should be explained.

Obesity

- Obesity is the state in which there is an accumulation of excess body fat with an abnormal increase in body weight. Obesity is a complex multifactorial chronic disease developing from influence of social, behavioural, psychological, metabolic and cellular factors.
- Obesity occurs if intake of calories is more than the expenditure of energy. Over weight and obesity are conditions where the body weight is greater than the mean standard weight for age and height of an individual. Body mass index (BMI) is an estimate of body fat and health risk.

$$\text{BMI} = \text{Weight (kg)} / \text{Height (m)}^2$$

Causes and risk factors: Obesity is due to genetic factors, physical inactivity, eating habits (overeating) and endocrine factors. Obesity is a positive risk factor in development of hypertension, diabetes, gall bladder disease, coronary heart disease and arthritis.

Prevention and Control of Obesity

- **Diet Management:** Low calorie, normal protein, vitamins and mineral, restricted carbohydrate and fat, high fiber diet can prevent overweight. Calorie restriction for weight reduction is safe and most effective.
- **Physical exercise:** A low calorie diet accompanied by moderate exercise will be effective in causing weight loss. Meditation, yoga and physical activity can also reduce stress related to overeating.

Heart Disease

- Cardiovascular disease (CVD) is associated with diseases of the heart and blood vessels. Coronary heart disease (CHD) is the most common form and is caused by deposition of cholesterol in the blood vessels.
- It usually develops slowly over many years beginning from childhood, they may form a fatty streak to a fibrous complicated plaque. It leads to the narrowing of blood vessels

leading to atherosclerosis in the large and medium sized arteries that supply the heart muscle with oxygen. It leads to sudden ischemia (deficient blood supply to heart muscle) and myocardial infarction (death of the heart muscle tissue).

- **Risk factors:** Hypercholesterolemia (High blood cholesterol) and high blood pressure (Hypertension) are the major causes and contributing factors for heart disease and if untreated may cause severe damage to brain, kidney and eventually lead to stroke.
- **Causes:** Heredity (family history), diet rich in saturated fat and cholesterol, obesity, increasing age, cigarette smoking, emotional stress, sedentary lifestyle, excessive alcohol consumption and physical inactivity are some of the causes.
- **Symptoms:** Shortness of breath, headache, tiredness, dizziness, chest pain, swelling of leg, and gastrointestinal disturbances.

HDL (High Density Lipoprotein) or "good" cholesterol lowers risk of heart disease while LDL (Low Density Lipoprotein) or "bad" cholesterol increases risk of heart disease.

Prevention and Control of Heart Disease

- **Diet management:** Reduction in the intake of calories, low saturated fat and cholesterol rich food, low carbohydrates and common salt are some of the dietary modifications. Diet rich in polyunsaturated fatty acids (PUFA) is essential. Increase in the intake of fibre diet, fruits and vegetables, protein, minerals and vitamin are required.
- **Physical activity:** Regular exercise, walking and yoga are essential for body weight maintenance
- **Addictive substance avoidance:** Alcohol consumption and smoking are to be avoided.

Cancer

- Cancer causes about 4 million deaths annually throughout the world. In India more than one million people suffer from cancer. Cancer is derived from Latin word meaning crab. The study of cancer is called Oncology (Oncos- Tumor).
- Cancer is an abnormal and uncontrolled division of cells that invade and destroy surrounding tissue forming a tumor or neoplasm (new growth). It is a heterogenous group of cells that do not respond to the normal cell division.
- The cancerous cells migrate to distant parts of the body and affect new tissues. This process is called metastasis. The frequent sites of metastasis are lungs, bones, liver, skin and brain.

Types of Cancers

- Cancers are classified on the basis of the tissues from which they are formed.
- Carcinomas arise from epithelial and glandular tissues. They include cancers of skin, lung, stomach and brain. About 85% of the tumours are carcinomas
- Sarcomas are occur in the connective and muscular tissue. They include the cancer of bones, cartilage, tendons, adipose tissue and muscles. These form 1% of all tumours.
- Leukaemia are characterized by an increase in the formation of white blood cells in the bone marrow and lymph nodes. Leukaemia are called blood cancers. Most common type of cancer which also affect children below 15 years of age.

Carcinogenic Agents

- Cancer causing agents are called carcinogens. They are physical, chemical agents, ionizing radiations and biological agents.
 - ✓ **Physical Irritant:** Heavy smoking causes lung cancer and cancers of oral cavity, pharynx (throat) and larynx. Betel and tobacco chewing causes oral cancer. Excessive exposure to sunlight may cause skin cancer.
 - ✓ **Chemical agents:** Nicotine, caffeine, products of combustion of coal and oil, pesticides, asbestos, nickel, certain dyes and artificial sweeteners induce cancer
 - ✓ **Radiations:** Ionizing radiations like X-rays, gamma- rays, radioactive substances and non-ionising radiations like UV rays cause DNA damage leading to cancer.
 - ✓ **Biological agents:** Cancer causing viruses are called oncogenic viruses.

Treatment of Cancer

The treatment of cancer involves the following methods:

- **Surgery:** Tumours are removed by surgery to prevent further spread of cancer cells.
- **Radiation therapy:** Tumour cells are irradiated by lethal doses of radiation while protecting the surrounding normal cells.
- **Chemotherapy:** It involves administration of anticancerous drugs which prevent cell division and are used to kill cancer cells.
- **Immunotherapy:** Biological response modifiers like interferons are used to activate the immune system and help in destroying the tumors.

Preventive measures for Cancer

- Cancer control programmes should focus on primary prevention and early detection.
- To prevent lung cancer tobacco smoking is to be avoided and protective measures to be taken against exposure to toxic pollutants of industries. Excessive exposure to radiation is to be avoided to prevent skin cancer.

AIDS (Acquired Immunodeficiency Syndrome)

- AIDS is a severe viral disease and caused by Human Immunodeficiency Virus (HIV). It is a condition in which immune system fails and suppress the body's disease fighting mechanism. They attack the lymphocytes and the affected individual is prone to infectious diseases.

Dr.Suniti Solomon, pioneered HIV research and treatment in India. She set up the first voluntary testing and counselling centre and an AIDS Research group in Chennai during 80's. Her team was the first to document evidence of HIV infection in India in 1985 (First Indian AIDS patient in Chennai).

Transmission of HIV

- AIDS virus has been found in urine, tears, saliva, breast milk and vaginal secretions. The virus is transmitted by an infected patient who comes in contact with blood of a healthy person. HIV/AIDS is not transmitted by touch or any physical contact. It spreads through contact of body fluids or blood.

HIV is transmitted generally by

- Sexual contact with infected person
- Use of contaminated needles or syringes especially in case of intravenous drug abusers
- By transfusion of contaminated / infected blood or blood products
- From infected mother to her child through placenta.

Symptoms and Treatment of AIDS

Symptoms: Infected individuals become immunodeficient. The person becomes more susceptible to viral, bacterial, protozoan and fungal infections. Swelling of lymph nodes, damage to brain, loss of memory, lack of appetite and weight loss, fever, chronic diarrhoea, cough, lethargy, pharyngitis, nausea and headache.

Diagnosis: The presence of HIV virus can be confirmed by Western Blot analysis or Enzyme Linked Immunosorbent Assay (ELISA)

Treatment: Anti-retroviral drugs and immunestimulative therapy can prolong the life of the infected person.

Prevention and Control of AIDS

- The following steps may help in controlling and prevent the spreading of HIV infection
 - Screening of blood from blood banks for HIV before transfusion.
 - Ensuring the use of disposable needles and syringes in hospitals and clinics.
 - Advocating safe sex and advantages of using condoms.
 - Creating awareness campaign and educating people on the consequences of AIDS.
 - Persons with HIV/AIDS should not be isolated from the family and society.

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