

Chapter - 8

Biology in Human welfare.

classmate

Date _____

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- Discovery of blood circulation - William Harvey
- Health - A state of complete physical, mental and social well being.
- To maintain good health - balanced diet, personal hygiene, & regular exercise, awareness of disease, vaccination
- disease - When functioning of one or more organs or systems of the body is adversely affected, characterised by appearance of various signs and symptoms

Disease

Infectious

- Transmitted from one person to another
- very common
- Everyone suffer from this at sometime
eg AIDS

Non-infectious.

- Do not transmit from one person to other
- not common
- eg: cancer (major cause of death)

Common disease in humans.

- Bacteria, viruses, fungi, protozoa, helminths could cause disease in man.
- pathogen - disease causing organism.
- parasite - cause harm to host by living in them (most are pathogen)
- Pathogen :-
 - Enter body by various means, multiply and interfere with normal vital activities, results in morphological and functional damage.
 - pathogen have to adapt to life within environment of the host.

Typhoid -

- Pathogen - *Salmonella typhi* causes typhoid fever in human being.
- Enter through - contaminated food and water.
- Enter in small intestine then migrate to other organs through blood.
- Symptoms - Sustained High fever (39°C - 40°C), Weakness, Stomach pain, constipation, headache, loss of appetite.
- Severe case - Intestinal perforation & death in severe case.
- Test - Widal test - for typhoid confirmation.

Pneumonia -

- Bacteria - *Streptococcus pneumoniae*, *Haemophilus influenzae*.
- pneumoniae infect in humans infect alveoli of the lungs.
- alveoli get filled with fluid leading to severe problems in respiration.
- symptoms - fever, chills, cough, Headache.
- In severe condition lips and finger nails may turn grey to bluish in color.
- Enter through - inhaling the droplets/aerosols released by an infected person.
- Dysentery, plague, diphtheria - Some common disease in man.

Common cold -

- Pathogen - Rhinovirus
- Infect nose and respiratory passage of human.
- Symptoms - nasal congestion and discharge, sore throat, hoarseness, cough, headache, tiredness.
- last for 3-7 days.
- Transmit through - droplets resulting from cough and sneeze of an infected person either inhaled directly or transmitted from contaminated objects.

Malaria -

- caused by protozoa plasmodium vivax, p. malaria, p. falciparum.
- Malignant malaria caused by p. falciparum.

Infected Female mosquito bites humans and sporozoites are injected with bite.

↓
Sporozoites reach the liver through blood

↓
The parasite reproduces asexually in liver cells, bursting the cell and releasing into blood.

↓
Parasite reproduce asexually in RBCs, bursting the RBCs and causing cycle of fever and other symptoms. Released parasite infect new RBC

↓
Sexual stage - gametocytes develop in RBCs. (Female, male)

↓
Female mosquito take up gametocytes with blood.

↓
Fertilisation and development takes place in mosquito's gut.

↓
Mature infective stages (sporozoites) escape from gut & migrate to the mosquito salivary glands.

- rupture of RBC - release toxic substance - hemozoin - responsible for chills and High fever recurring every three to four days.

Amoebiasis -

- Caused by *Entamoeba histolytica*.
- Symptoms - constipation, abdominal pain, cramps, mucus & bloody stool,
- carrier - House Flies transmit parasite from feces to food and food products.
- Source of infection - contaminated food and water.

Ascariasis -

- Caused by *Ascaris* the common round worm and *Wuchereria*, the filarial worm.
- it is intestinal parasite
- symptoms - bleeding, muscular pain, fever, anemia, blockage of intestinal passage.
- transmitted from feces which contaminate soil, water, plants.
- source of infection - contaminated water, fruit, vegetables.

Elephantiasis or filariasis -

- *Wuchereria* the filarial worm cause a slowly developing chronic inflammation of the organ in which they live for many years. usually the lymphatic vessels of the lower limb, genital organs affected.
- transmitted through a bite of female mosquito.

Ringworm -

- Causative agent - Fungi belonging to genera *Microsporum*, *Trichophyton*, *Epidermophyton*
- symptoms - Appearance of dry, scaly lesions on various parts of the body, intense itching,
- grow in warm and humid environment mainly in skin folds.
- Acquired from soil or by using towel, comb of infected person.

Prevention of diseases -

- Maintain personal as well as public Hygiene
- keep body clean, consume clean drinking water, food, vegetables fruits
- Proper disposal of waste and excreta, periodic cleaning and disinfection of water reservoir.
- Contact with infected person should be avoided
- avoid stagnation of water around residential areas. introduce fish like Gambusia in ponds that feed on mosquito larva.
- Use vaccine and immunisation programme

Immunity

- Immunity - ability of the host to fight the disease causing organisms
- Immunity is of two types :
- i) Innate Immunity
 - ii) Acquired Immunity.

Innate immunity -

- ~~is~~ non specific type of defence present at the time of birth.
- consist of 4 types of barrier.

1) physical barrier - skin or our body prevent entry of microorganism. Mucus coating of the epithelial lining the respiratory, gastrointestinal and urogenital tract also help in trapping microbes entering our body.

2) physiological barrier - Acid in stomach, saliva in the mouth, tears from eyes - all prevent microbial growth.

3) cellular barrier - leukocytes (WBC), polymorphonuclear leukocytes (PMNL - neutrophils), monocytes and NK cells in the blood as well as macrophages in tissue can phagocytose & destroy microbes.

4) cytokine barriers - virus infected cells secrete protein called interferons which protect non infected cells from further viral infections.

Acquired immunity -

- pathogen specific
- primary immune response - Body encounters pathogen for the first time. It is of low intensity.
- Secondary immune response - Body encounters pathogen for the second time. It is highly intensified, by body appears to have a memory of first encounter.
- Both responses are carried out by T and B lymphocyte.
- B-lymphocyte - produce antibodies
- T-lymphocyte - Help B cells to produce antibodies
- Antibody molecule - has four peptide, two small called light chain and two longer called heavy chain. (H_2L_2)
- Antibody produced - IgG, IgA, IgM, IgE, IgD.
- Antibodies found in blood - Hence it is Humoral immune response.
- T lymphocyte mediated immune response - cell mediated immunity.

Active and passive immunity -

- Active immunity: Antibodies are produced against antigen in the host body (antigen may be living or dead microbes or protein form) - slow & take time to get effective response.
- passive immunity - When readymade antibodies directly given to protect the body against foreign antigens
- Why mother's milk is essential for newborn? The yellowish fluid colostrum secreted by mother during initial days of lactation has abundant antibodies (IgA) to protect the infant. foetus also receive some antibodies from their mother through the placenta during pregnancy. This is an example of passive immunity.

Vaccination & Immunization:

- In vaccination, preparation of antigenic protein of pathogen or inactivated/weakened pathogen (vaccine) are introduced in the body. then antibodies produced in the body against this antigen. It neutralises the infection.
- vaccination generate - memory B & T cells that recognise pathogen quickly on subsequent exposure
- In tetanus, snakebite direct antibodies are injected in Humans. is called passive immunization.
- recombinant DNA technology is used for vaccine production.

Allergies:

- The exaggerated response of the immune system to certain antigen present in the environment is called allergy.
- The substance to which immune response is produced - Allergens
- antibody produced - IgE
- eg - mites in dust, pollens, animal danders,
- symptoms - sneezing, watery eyes, running nose, difficulty in breathing,
- Allergy is due to release of chemical compounds like Histamine, serotonin from mast cell.
- drug used - antihistamine, adrenaline, steroids. (lowers immunity)

Autoimmunity:

- sometimes due to genetic and other unknown reason. the body attacks self cells. this results in the damage to body and is called autoimmune disease.
- Body produces antibodies against self antigen.
- eg: Rheumatoid arthritis.

Immune system in the body:

- Immune system consist of - lymphoid organs, tissues, cells and soluble molecules like antibody.
- Play imp role in allergic reaction, autoimmune disease & organ transplantation.
- Lymphoid organ: organs where origin and/or maturation & proliferation of lymphocytes occur.
- primary lymphoid organ - bone marrow and thymus.
- immature lymphocyte \rightarrow antigen sensitive lymphocyte \rightarrow lymphocyte migrate to secondary lymphoid organ like spleen, lymphnode, tonsils, peyer's patch \rightarrow Secondary lymphoid organs provide the site for interaction of lymphocytes with the antigen. \rightarrow proliferate to become effector cell.
- Main lymphoid organ - bone marrow - lymphocytes are produced.
- Thymus & bone marrow provide microenvironment for development and maturation of T lymphocytes.
- Spleen - bean shaped, contain lymphocyte and phagocyte. act as a filter of blood by trapping blood borne microorganisms. it is large reservoir of erythrocytes.
- lymph node - trap antigen, activate lymphocytes.

AIDS:

- Acquired immunodeficiency syndrome.
- caused by Human Immunodeficiency virus (~~retro~~ retrovirus group)
- Enveloped virus containing the RNA genome.
- transmission generally occurs by sexual contact with infected person, blood transfusion with infected blood - by sharing infected needles, from infected mother to children through placenta. individuals who have multiple sexual partner.
- Virus enters into macrophage RNA genome converts into DNA with the help of enzyme reverse transcriptase.

- macrophage continue to produce virus & become virus factory. viruses released in the blood attack helper T cell & reduces its numbers.
- symptom - bouts of fever, diarrhoea, weight loss.
- patient become immunodeficient
- diagnosis test - Enzyme linked immunosorbent assay (ELISA)
- Treatment - antiretroviral drug (partially effective)
- prevention - educate people about AIDS, making blood safe from HIV, use of only disposable needles and syring in public and private hospital, free distribution of condoms, controlling drug abuse advocating safe sex, regular check up.

Concancer -

- In normal human body cell growth and differentiation is highly controlled and regulated. normal cells show property of contact inhibition (contact with other cells inhibit their uncontrolled division)
- cancer cells appear to have lost contact inhibition property.
- cancer cell continue to divide giving rise to mass of cells called neoplastic or tumor cells. grows rapidly. invading and damaging the surrounding normal tissue.
- Benign tumor - do not spread to other part of the body, & cause little damage.
- Malignant - mass of proliferating cells. also called neoplastic tumor cells.
It starve normal cells by competing for nutrients.
- Metastasis - cancer spread to different body parts from where it started.
- Causes - Contact with carcinogens, X-rays, gamma rays, non ionizing radiations, UV rays, oncogenic virus, cellular oncogen, protooncogen.

- Cancer detection and diagnosis
- early detection is essential for successful treatment.
- biopsy, histopathological study of tissue, microscopy, X ray, CT scan, MRI
- Treatment - surgery, radiation therapy, immunotherapy, & interferon treatment which activate immune system & help destroying tumor.

Drug and alcohol abuse -

1) opioids -

opioid receptor present in CNS & GIT

e.g: Heroin (diacetylmorphine) white, odourless, bitter crystalline compound.

morphine acetylation → diacetylmorphine.

extracted from latex of poppy plant *Papaver Somniferum*

Heroin is depressant & slow down body function.

2) Cannabinoids.

- Cannabinoids receptor present in brain
- obtain from inflorescences of the plant *cannabis sativa*
- Flower tops, leaves and resins of cannabis plant are used in various combinations to produce marijuana, hashish, choras, ganja.
- generally taken by inhalation and oral ingestion.
- effects on cardiovascular system of body.

3) cocaine -

- obtained from coca plant *Erythroxylum coca*.
- interfere with transport of neurotransmitters dopamine.
- Stimulate CNS producing a sense of Euphoria & increased energy.

- Excessive dosage cause hallucination
- ↳ similar drugs - barbiturates, amphetamines, benzodiazepines, cope with mental illness like depression and insomnia.
- Morphine - effective sedative and pain killer.
- ↳ Tobacco - smoked, chewed or used as a snuff.
 - contain nicotine an alkaloid.
 - nicotine raise bp and increase heart rate
 - associated with increased risk of cancer of lungs, urinary bladder, and throat.
 - smoking increases carbon monoxide content in blood, & cause O_2 deficiency in body.

Adolescence & Drug/alcohol abuse -

- period and a process during which a child become mature in terms of his/her attitude and beliefs for effective participation in society.
- Adolescence period - 12-18 years.
- linking bridge between childhood and adulthood.
- child's natural curiosity, adventure, excitement motivate youngsters towards experiments.
- first time use of drug may be due to curiosity but later the child starts using these to escape facing problems.
- reason - stress, pressure to excel in academics, television, movies, newspaper, internet promote alcohol consumption.

Addiction and dependance:

- Addiction is physiological attachment to certain effects - such as euphoria and a temporary feeling of well being associated with drugs and alcohol.
- repeated use of drug - tolerance level of body increases, leading to greater intake and addiction.

- dependence is the tendency of the body to manifest characteristic and unpleasant withdrawal syndrome. if regular dose of drugs/alcohol is abruptly discontinued.
- characterised by anxiety, shakiness, nausea & sweating.

Effects of drug/Alcohol abuse:

- manifest in the form of reckless behaviours vandalism & violence.
- excessive dose may lead to coma and death due to respiratory failure or cerebral hemorrhage.
- drop in academic performance, unexplained absence, from school/college, lack of interest in personal hygiene, withdrawal, isolation, depression, fatigue, aggressive and rebellious behavior deteriorating behavior with family, change in sleeping and eating habits, fluctuation in weight, appetite.
- abuse may turn to stealing.
- Intravenous drug taking - may occur infection of AIDS, Hepatitis.
- Chronic use of drugs and alcohol damages nervous system and liver.
- The (mis)use of narcotic analgesics, anabolic steroids diuretics in sport to increase muscle strength, it increases aggressiveness.
- side effect of anabolic steroids in female - mood swings, depression, abnormal menstrual cycle, excessive hair growth

Prevention and control -

- i) Avoid under peer pressure - child should not be pushed unduly to perform beyond threshold limits.
- ii) Education and counselling - educate to face problems, stress, failure, to accept disappointment
- iii) Seeking help from parents and peers -
- iv) looking for danger signs - notice parents if anyone is using drug
- v) Seeking professional and medical help - help children ~~to~~ to come out from addiction. (rehabilitation, psychologist)