

NEET CRASH COURSE

Human Health and Diseases



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HUMAN HEALTH AND DISEASES

HEALTH ✓

The state of complete physical, mental and social well beings is called health.
Health simply does not simply means disease-free condition or physical fitness.
Health is affected by-

- a. Genetic disorders – the defect which child inherits from it parents.
- b. Infection from microbes or other organisms.
- c. Lifestyle- includes food and water we take, exercise and rest.

Good health can be maintained by

- Balanced diet. ✓
- Personal hygiene ✓
- Regular exercise ✓
- Awareness about the disease and their effect
- Immunization against the infectious disease DPT, BCG, OPV

Tuberculosis



HUMAN HEALTH AND DISEASES

DISEASE

Diseases can be broadly grouped into infectious and non-infectious.

✓ a) Infectious disease - Diseases which are easily transmitted from one person to another, are called infectious diseases e.g. AIDS, common cold, malaria, tuberculosis etc

✓ b) Non-infectious disease – Diseases which cannot be transmitted from one person to another, are called non-infectious diseases e.g. cancer, hypertension, diabetes etc.

NCERT Common Diseases in Humans: ⇒

- The disease-causing microorganisms like bacteria, virus, fungus, protozoa, helminthes are called pathogen.
- The pathogen can enter the body by various means and multiply and interfere with normal vital activities resulting in morphological and functional damage.

HUMAN HEALTH AND DISEASES

Name of disease /test	Causal organisms	Symptoms	Effects
✓ Typhoid / Widal test	Salmonella typhi ✓ <u>Bacteria</u>	Sustained <u>high</u> <u>fever</u> , <u>weakness</u> , stomach pain,	
✓ Pneumonia	Streptococcus pneumoniae and Haemophilus influenzae (Bacteria)	Fever, chills, cough and headache.	Alveoli get filled with fluid leading to severe problems in respiration.
✓ Common cold	Rhino viruses (Virus)	Nasal congestion and discharge, sore throat, cough and headache.	Infect the nose and respiratory passage.
✓ Malaria	Plasmodium (P. vivax, P. malaria and P. falciparum) <u>oocyst</u> <u>Haemozoin</u> (Protozoan)	The <u>chill</u> and <u>high</u> <u>fever</u> recurring 3 to 4 days. <u>Sweating</u>	Parasite multiply within liver cells and then attack the RBCs.
✓ Amoebiasis or Amoebic dysentery (Loose motion vomiting)	Entamoeba histolytica (Protozoan) <u>Faecal</u>	Constipation, abdominal pain, cramps, stool with <u>mucous</u> and blood clot.	Infect the large intestine.
✓ Ascariasis	Ascaris (Helminthes)	Internal bleeding, muscular pain, fever, anemia etc.	Healthy person get infected through water, vegetable etc.
✓ Elephantiasis or filariasis	Wuchereria (W. bancrofti and W. malayi) <u>Culex</u> ♀	Inflammation in the <u>lower limb</u> and <u>genital organs</u> .	<u>Lymphatic vessels</u> of lower limbs get blocked.
✓ Ring worms	Microsporum, Trichophyton and Epidermophyton	Appearance of dry, scaly lesions on various <u>part</u> of body. <u>Groin</u> , <u>Arm</u> , <u>leg</u>	Infects the skin, nail and scalp.

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MALARIA-caused by *Plasmodium*
spread by female Anopheles mosquito

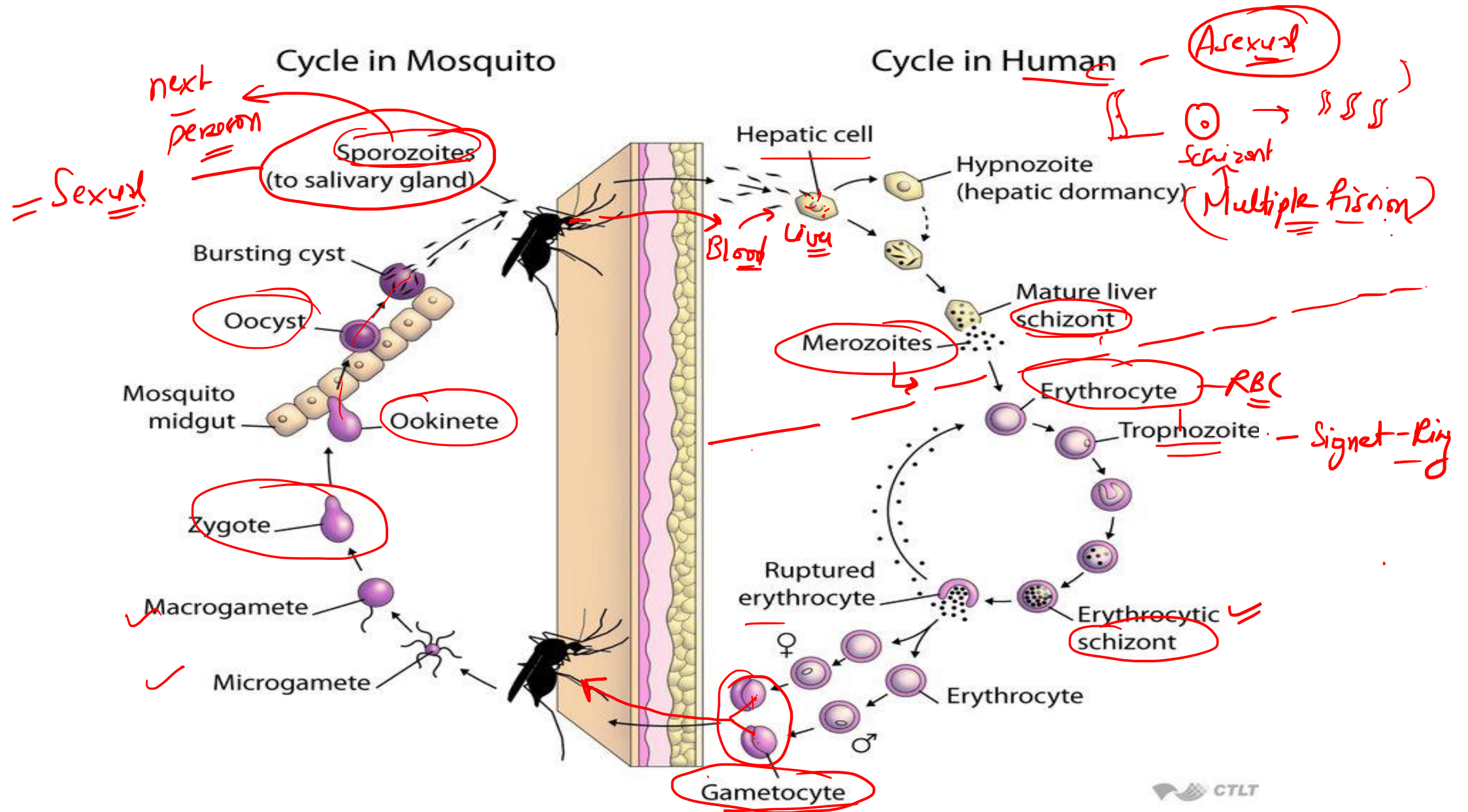
➤ **Life cycle of *Plasmodium*** : Plasmodium enters the human body as small sporozoites through the bite of infected female anopheles mosquito and multiplies within the liver cells.

Later attacks the RBCs resulting the rupture with release of toxic substance, haemozoin, which is responsible for high fever and chill recurring every three to four days.
14 days
=
symptoms

Malarial parasite requires two hosts, human and anopheles mosquito to complete their life cycle.
Sigmoidic

Female anopheles is vector of this disease to human beings.

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✓ IMMUNITY

The ability of host cells to fight the disease causing microorganism due to immune system is called immunity. There are two types of immunity-

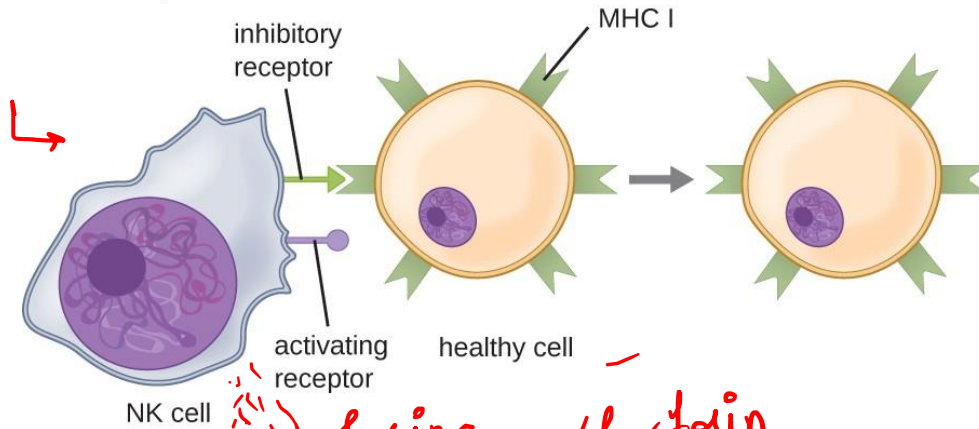
① **Innate immunity** – non-specific types of defence presents at the time of birth and provide different kinds of barriers to the entry of foreign agents into the body. it consists of four types of barrier-

- a. **Physical barrier**- skin, mucus coating of epithelium lining the respiratory, gastrointestinal and urogenital tract. =
- b. **Physiological barrier**- acid in stomach and saliva in mouth. lysozyme tear
- c. **Cellular barrier**- leucocytes, neutrophils, monocytes. WBC
- d. **Cytokine barriers**- virus infected cells secretes protein called interferon.
→ virus-infected
→ Non-infected (via signalling)

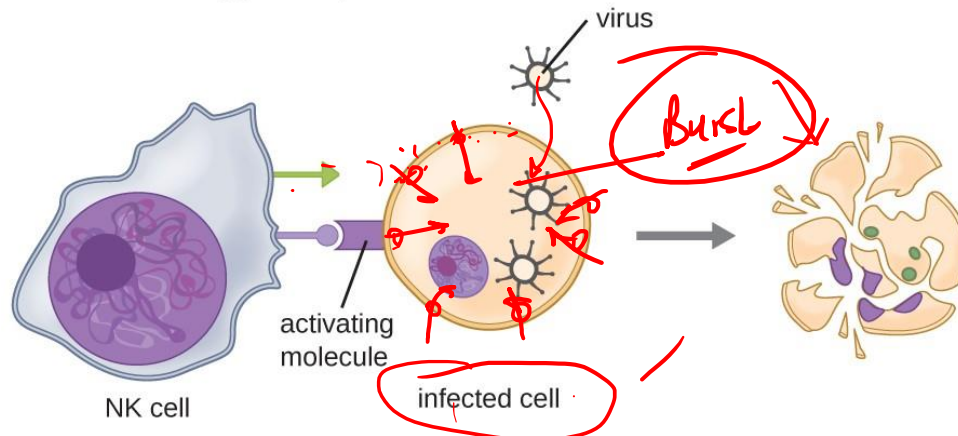
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Role of NK cells

A natural killer (NK) cell recognizes MHC I on a healthy cell and does not kill it.

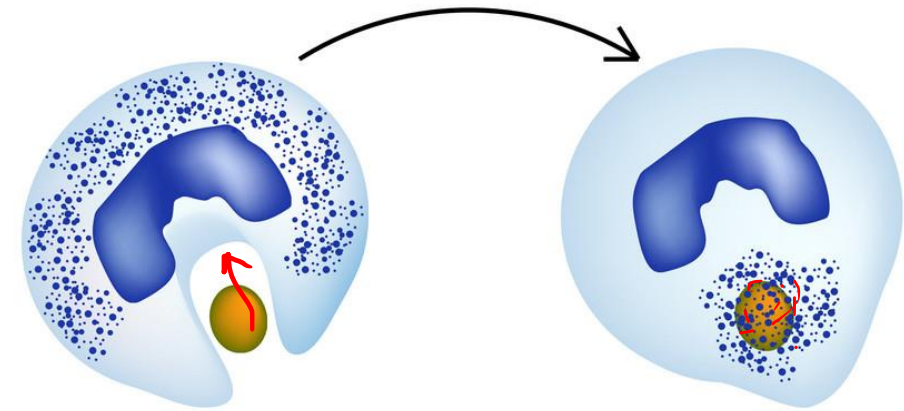


An infected cell does not present the MHC I, but does present ligands for the activating receptor. The NK cell will trigger a response that kills this cell.



Phagocytosis of leukocytes

Non-specific →



Leukocyte
absorbs
bacteria

Leukocyte
ingests
bacteria

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Specific

✓ **Acquired Immunity** - pathogen specific defence characterised by memory.

When our body encounters a pathogen first time produces a response called primary response of low intensity.

Subsequent encounter by same pathogen produce highly intensified response called secondary response or anamnestic response due to memory of first encounter.

✓ Primary and secondary responses are carried out with the help of B-lymphocytes and T-lymphocytes.

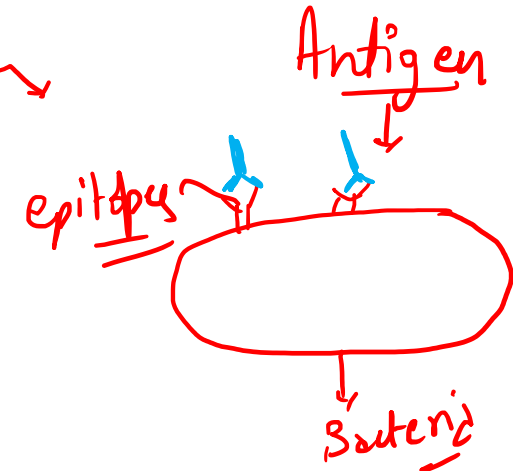
B-lymphocytes produce army of protein called antibodies.

It involves two types of lymphocytes –

• **B lymphocytes**: Show humoral immune response (HI)

• **T lymphocytes**: Show cell mediated immunity (CMI)

Self Non self Memory → Organ Rejection



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Role of B – lymphocytes:

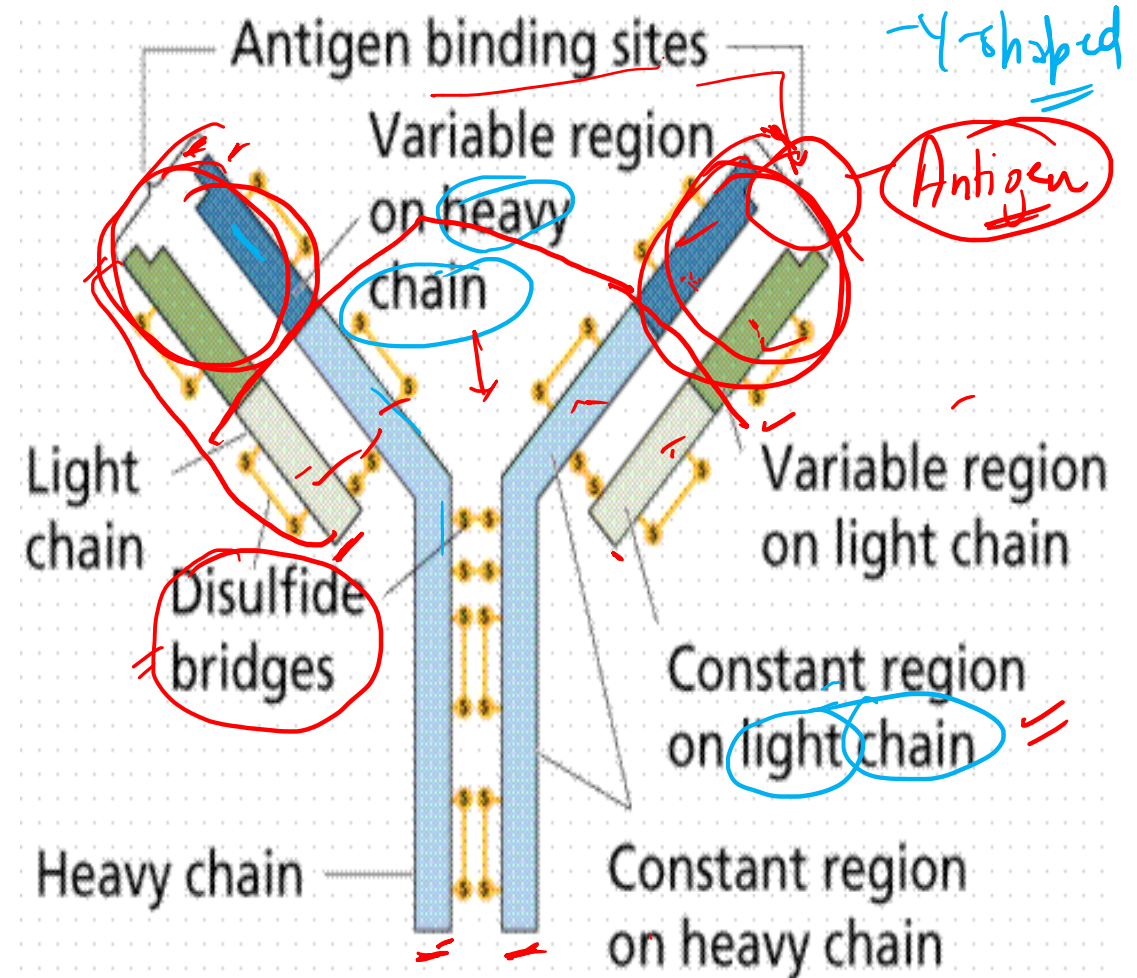
Bones

- The lymphocytes produced at bone marrow differentiates in bursa equivalent in to B – lymphocyte.
- When the antigen enters in to the body number of B – lymphocytes stimulated to produce antibody.
- Once the antigen specific antibody producing B – lymphocyte activated, it multiplies rapidly to produce number of cloned cells. → Monoclonal antibodies
- The cloned B – lymphocytes differentiates in to plasma cells. These cells produces specific antibody against antigen in large quantity. ➤
- The cloned B – lymphocyte that undifferentiated remains as memory B cells. When the same antigen enters again in future, memory cells response rapidly to destroy them.

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✓ Structure of an Antibody (Ig)

- The antibodies are protein molecules called immunoglobulins and are of various types like IgA, IgM, IgE, IgG.
- Each antibody molecule consists of four polypeptide chains, two are long called heavy chains and other two are short called light chains. Both are arranged in the shape of 'Y', hence an antibody is represented as H₂L₂.



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TYPES OF ANTIBODY(Immunoglobulin)

These are mainly classified in to 5 types.

- IgM is a pentamer and is a mega globulin. It is the first reaches the injured site. *largest*
- IgA is the secretory antibody passed to infants in the first milk i.e. Colostrum. *#1/1/1*
- IgD it binds to B - Lymphocytes and acts as a surface receptor.
- IgE play imp role in allergy.
- IgG crosses placenta and protects foetus. *Embryo*

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Role of T-lymphocytes:

- The lymphocytes produced at bone marrow differentiates in thymus into T-lymphocyte. It does not produce any antibody. It directly acts on antigen.
- When the antigen enters into the body, the antigen specific T-lymphocyte stimulated and becomes active.
- The activated T-lymphocyte multiplies rapidly to produce number of cloned cells.

According to function of T-lymphocyte, these are identified into

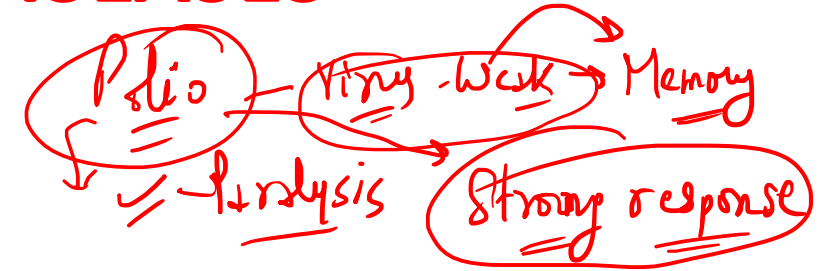
- ✓ **Killer T-cells:** These T-cells recognize specific pathogen and destroys by lyses.
- ✓ **Helper T-cells:** These T-cells help in stimulating antigen specific B-cells to produce antibody.
- ✓ **Suppressor T-cells:** These T-cells suppress the immune response of both B and T cells, when infection is controlled.
- ✓ **Memory T-cells:** These T-cells are programmed to recognize and respond to the specific antigen that enters in future.

Non-self
self

Immunosuppress - Cyclosporin

~~Burst~~ Burst

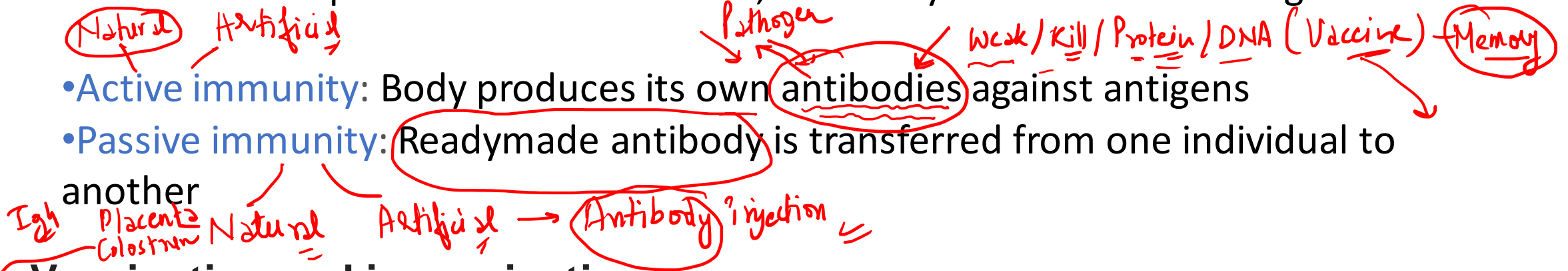
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ACTIVE and PASSIVE IMMUNITY

On the basis of production of antibodies, immunity can be further categorised as –

- **Active immunity:** Body produces its own antibodies against antigens
- **Passive immunity:** Readymade antibody is transferred from one individual to another



Vaccination and immunisation

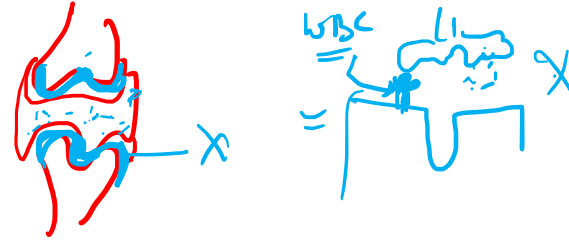
- Vaccination is the process of introduction of weakened or inactivated pathogens or proteins (vaccine) into a person to provide protection against a disease.
- Immunisation is a process by which the body produces antibodies against the vaccine (primary response) and develop the ability to neutralise pathogens during actual infection (secondary response), i.e. the body become immune to that antigen or infection.

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AUTOIMMUNITY

Human immune system can distinguish between self and foreign molecules or foreign bodies. Sometimes, due to genetic or unknown reasons, the body attack self-cells. This results in damage to the body and called auto-immune disease. Rheumatoid arthritis is due to this effect.

↳ IgM



ALLERGIES

The exaggerated response of immune system to certain antigens present in the environment is called allergy.

The substance to which such immune response is produced is called allergens. The antibodies produced due to these are IgE types.

Allergy is due to secretion of chemicals like histamine and serotonin from the mast cells.

WBC
↳ Baso phils → inflammation cause

Eosinophil =



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✓ IMMUNE SYSTEM

Human immune system includes lymphoid organs, tissue, cells and soluble molecules like antibodies.

WBC, Mature

✓ **1. Primary lymphoid organs:** bone marrow and thymus, production and maturation of lymphocytes take place.

Bone marrow is the main lymphoid organ where all blood cell including lymphocytes are produced.

Thymus is a bilobed organ located near the heart, beneath the breastbone.

T-lymphocytes are produced in bone marrow but matured in thymus.

✓ **2. Secondary lymphoid organs:** spleen, tonsil, lymph node, Peyer's patches of small intestine and appendix, where proliferation and differentiation of lymphocyte take place. After maturation lymphocytes migrate to secondary lymphoid organ. They provide the sites for interaction lymphocyte with antigens.

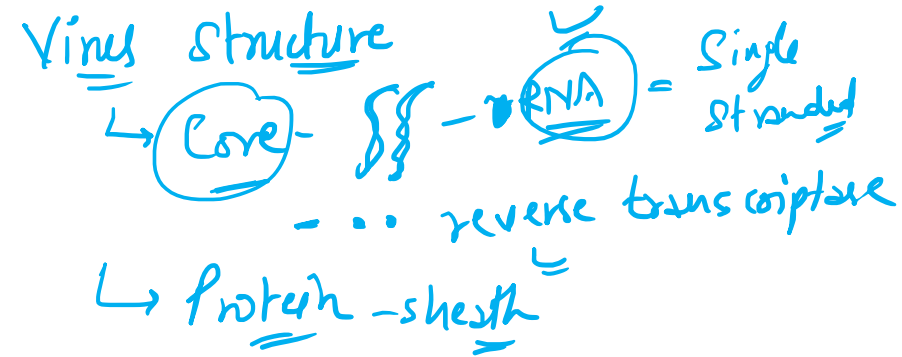
Ileum

There is lymphoid tissue also located within the lining of respiratory, digestive and urogenital tract called **mucosal associated lymphoid tissue (MALT)**. It constitute 50% of lymphoid tissues in human body

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AIDS (Acquired Immuno Deficiency Syndrome)

-It is caused by **HIV** (human Immuno deficiency virus), a retrovirus.



Transmission of HIV virus occurs by-

- Sexual contact with infected person
- Transfusion of contaminated blood and blood products
- Sharing infected needles as in intravenous drug abusers
- Infected mother to her child through placenta.

- Replication of retrovirus in Macrophages →
- AIDS/HIV does not spread by physical contact.
- It spread only through body fluids.

-There is always time lag between infection and appearance of symptoms that may vary from 5-10 years.

Diagnostic test for AIDS is **ELISA** (enzyme-linked Immuno-sorbent assay).

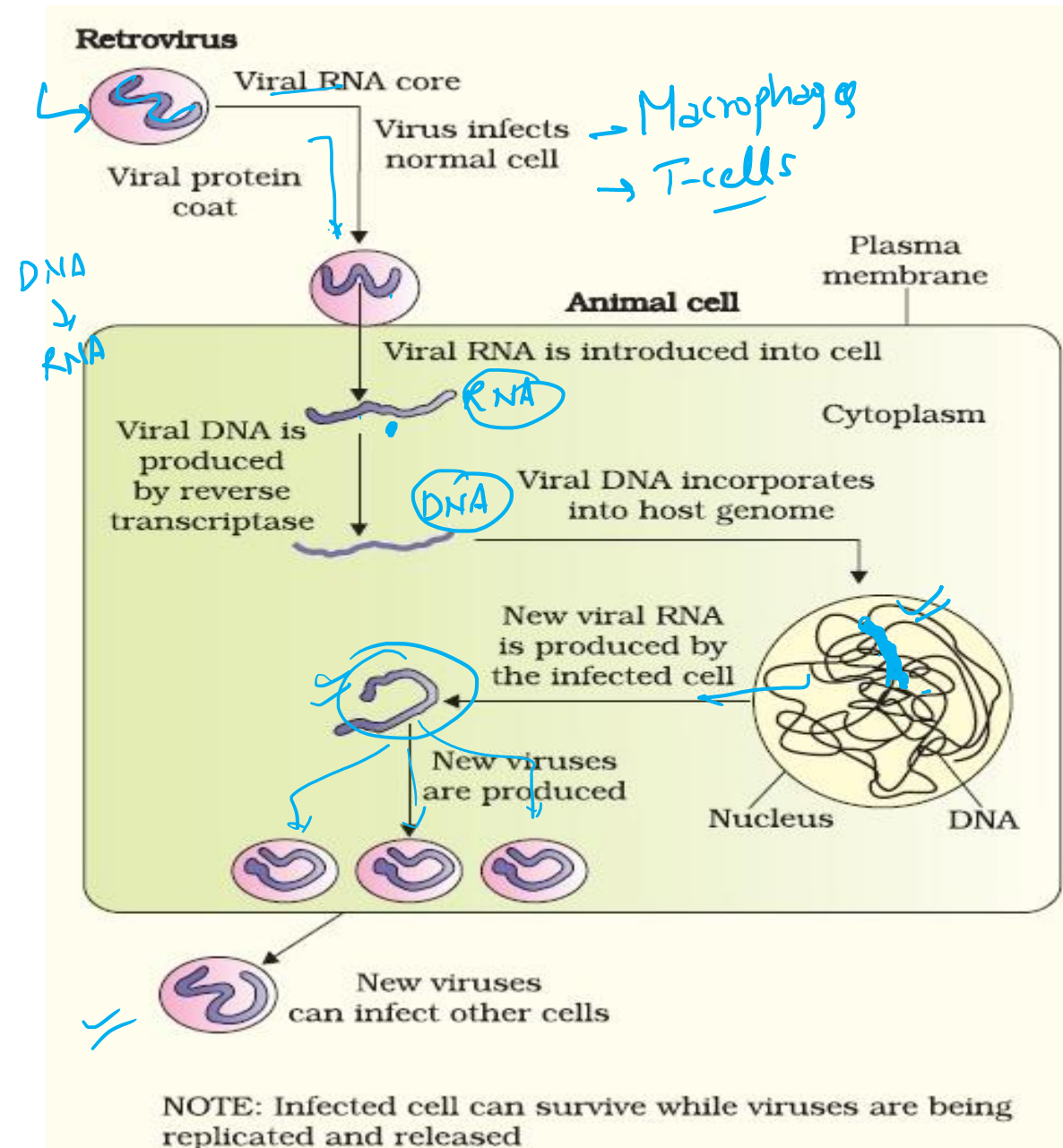
The treatment of this disease with anti-retroviral drug is partially effective and just prolonged the life but not prevents the death.

→ **AZT - Azidothymidine**

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Life cycle of HIV:

- After getting into the body the HIV enters into macrophages or T-helper cells.
- The viral RNA genome replicated to form viral DNA with the enzyme called reverse transcriptase.
 - The viral DNA gets incorporated into the host cell's DNA by an enzyme called integrase, and directs the infected cell s to produce virus particle.
- The macrophage continues to produce virus and acts as HIV factory.
- Virus released from macrophage attack T-helper cells.



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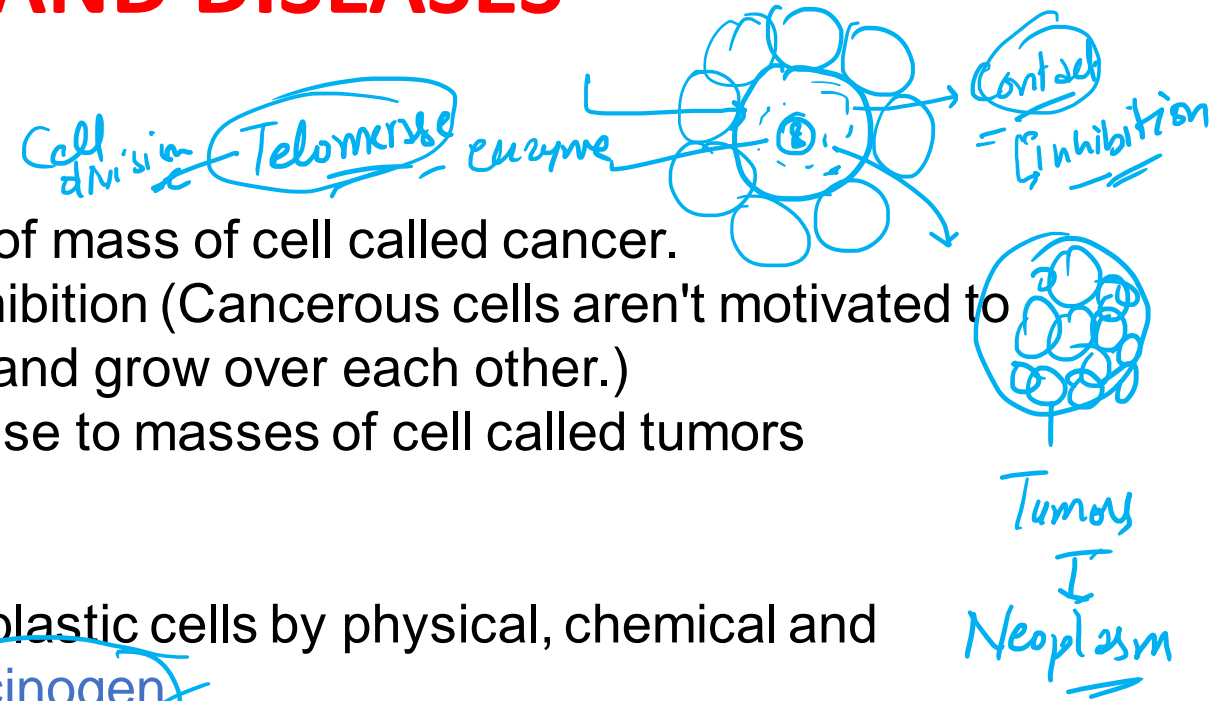
CANCER

- Uncontrolled cell division leads to production of mass of cell called cancer.
- Cancerous cell lost the property of contact inhibition (Cancerous cells aren't motivated to change direction upon contact, so they pile up and grow over each other.)
- Cancerous cell just continue to divide giving rise to masses of cell called tumors

Causes of cancer

- Normal cells transformed into cancerous neoplastic cells by physical, chemical and biological agents. These agents are called carcinogen.

- Physical agents: ionizing radiation like X-rays, gamma rays non-ionizing radiations like UV- rays.
- Chemical agents: Tobacco smoke, sodium azide, Methyl ethane sulphonate.
- Biological agents – Cancer causing viruses called oncogenic viruses have a gene called viral oncogenes, induce transformation of neoplastic cells.



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Cancerous cells continue to divide giving rise to masses of cells called tumors. There are two kind so tumors-

(a) Benign tumors

(b) Malignant tumors

Benign Tumor	Malignant Tumor
1.It remains confined to the affected organ.	1.It also spreads to other organs of the body.
2.Rate of growth is usually slow.	2.Rate of growth is usually rapid.
3.There is no latent stage.	3.There is latent stage.
4.It causes limited damage to the body.	4.The cancer cells migrate to other sites of the body.
5.There is no metastasis.	5.There is metastasis.
6.It is non-cancerous.	6.It is cancerous.

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Cancer detection and diagnosis-cancer detection is based on biopsy and histopathological study of the tissues, blood and bone marrow test for increased cell counts. Radiography, CT (computed tomography), MRI (magnetic resonance imaging) are very useful to cancers of internal organs.

Treatment of Cancer-

- ✓1. Surgical – cancerous tissues are surgically removed.
- ✓2. Radiotherapy – tumor cells are irradiated lethally by radiation.
- ✓3. Chemotherapy – drugs are used to kill cancerous cells, but shows side effects like hair loss, anemia, etc.
- ✓4. Immunotherapy – patients are given with alpha-interferon which activate their immune system and help in destroying the tumor

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Drugs and Alcohol Abuse

Commonly abused drugs include opioids, cannabinoids and coca alkaloids obtained from flowering plants and a few from fungi.

✓ **1. Opioids** are the drugs which bind to specific opioids receptors present in our central nervous system and gastrointestinal tract. *Morphine*

Heroin commonly called smack is chemically diacetylmorphine which is a white, odourless, bitter crystalline compound. *dium*

It is extracted from the latex of **poppy plant** (*Papaver somniferum*).

Generally taken by snorting and injection, **heroin is a depressant** and slows down body functions.

✓ **2. Cannabinoids** are a group of chemicals which interact with cannabinoid receptors present in the brain.

Natural cannabinoids are obtained from the inflorescence of the plant ***Cannabis sativa***.

They include **marijuana, hashish, charas and ganja**.

They generally taken by inhalation and oral ingestion, these are known for their effects on cardiovascular system of the body.

✓ **3. Coca alkaloid or cocaine** is obtained from coca plant ***Erythroxylum coca***, native to South America. *LSD*

It interferes with the transport of the neuro-transmitter dopamine.

Cocaine, commonly called coke or crack is usually snorted.

It has a potent stimulating action on central nervous system, producing a sense of euphoria and increased energy.

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Adolescence and Drug abuse

- Adolescence is the period during which the child becomes matured.
- It is between 12 – 18 years of age.

Causes of drug abuse –

- Curiosity
- Adventure
- Excitement
- Experimentation
- Stress or pressure to excel in examination

Effects of drug/alcohol abuse –

- Reckless behaviour
- Malicious mischief
- Violence
- Drop in academic performance
- Depression, isolation, aggressiveness, etc.

-Dependence is the tendency of the body to manifest a characteristic and unpleasant withdrawal syndrome if regular dose of drug/alcohol is abruptly discontinued that includes anxiety, shakiness, nausea and sweating.

Prevention avoid undue peer pressure, education & counselling, seeking helps from parents and peers, seeking professional and medical help etc

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Thank You