FREE NOTES · NCERT + NEET LEVEL

Human Health & Disease

Common diseases in humans (bacterial, viral, protozoan, fungal, helminth), immunity (innate, acquired, antibodies, vaccination, allergies, autoimmunity), immune system, AIDS, cancer, and drugs and alcohol abuse.

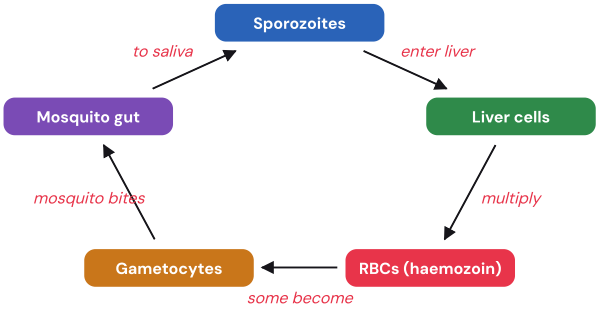
01 Health and common diseases
02 Malaria life cycle and prevention
03 Immunity
04 Active, passive, vaccination, allergy
05 Immune system and AIDS
06 Cancer and drugs
07 Extra: more diseases + tricks
08 Important Q&A
09 Common mistakes
10 Practice (NEET style)
11 Quick revision

01 Health and common diseases

Disease	Pathogen	Spread / symptoms
Typhoid	*Salmonella typhi* (bacterium)	Contaminated food/water; sustained high fever (39–40 °C), intestinal perforation; **Widal test**; "Typhoid Mary" carrier
Pneumonia	*Streptococcus pneumoniae*, *Haemophilus influenzae*	Droplets; alveoli fill with fluid; lips/nails grey-bluish
Common cold	Rhino viruses	Nose, respiratory passage; not lungs; 3–7 days
Malaria	*Plasmodium* (*P. vivax*, *P. malariae*, *P. falciparum* most serious, malignant)	Female *Anopheles*; **haemozoin** causes chill and high fever every 3–4 days
Amoebiasis	*Entamoeba histolytica*	Houseflies carry cysts; constipation, cramps, mucus and blood clots in stool
Ascariasis	*Ascaris* (roundworm)	Eggs in soil/water; internal bleeding, anaemia, blocked intestine
Filariasis (elephantiasis)	*Wuchereria* (*W. bancrofti*, *W. malayi*)	Female mosquito; lymphatic vessels of lower limbs, genital organs swell
Ringworm	*Microsporum*, *Trichophyton*, *Epidermophyton* (fungi)	Dry scaly lesions on skin, nails, scalp; heat and moisture help

02 Malaria life cycle and prevention

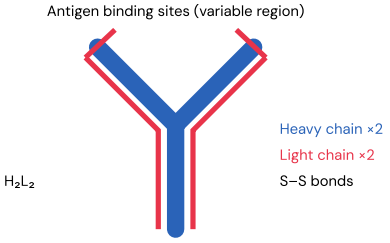
- *Plasmodium* needs two hosts: human (asexual, intermediate host) and female *Anopheles* (sexual reproduction, definitive host).
- Sporozoites (infective stage) enter human by mosquito bite → liver → RBCs → rupture releases haemozoin.
- Prevention: personal hygiene, clean drinking water, proper disposal of waste, avoid stagnant water, mosquito nets, introduce **Gambusia** fish (feeds on larvae), insecticides, screens.
- Vaccines and antibiotics have controlled smallpox (eradicated), polio, diphtheria, pneumonia, tetanus.



Life cycle of *Plasmodium*

03 Immunity

- **Innate** (non-specific, from birth): physical barriers (skin, mucus), physiological (stomach acid, saliva, tears), cellular (neutrophils/PMNL, monocytes, NK cells, macrophages), cytokine barriers (interferons from virus-infected cells).
- **Acquired** (pathogen-specific, with memory): primary response (low intensity) and secondary/anamnestic response (highly intensified).
- **B-lymphocytes**: antibodies (humoral immunity). **T-lymphocytes**: help B cells; cell-mediated immunity (CMI), responsible for graft rejection.
- Antibody = H_2L_2 (2 heavy, 2 light chains). Types: IgA, IgM, IgE, IgG.



Structure of an antibody

04 Active, passive, vaccination, allergy

- **Active immunity**: host makes antibodies on exposure (infection or vaccine); slow but long-lasting. **Passive**: ready-made antibodies given: colostrum (IgA), foetus gets antibodies via placenta, anti-tetanus serum, anti-venom.
- **Vaccination**: inactivated/weakened pathogen or antigenic proteins ⇒ memory B and T cells. Recombinant DNA vaccines (hepatitis B vaccine from yeast).
- **Allergy**: exaggerated response to allergens (mites in dust, pollen, animal dander); IgE; mast cells release histamine and serotonin; sneezing, watery eyes, running nose, difficulty in breathing. Drugs: anti-histamine, adrenalin, steroids. Modern lifestyle lowers immunity, raises allergy sensitivity.
- **Autoimmunity**: body attacks self cells (rheumatoid arthritis).

05 Immune system and AIDS

- Lymphoid organs: **primary** (bone marrow, thymus: lymphocytes formed and mature) and **secondary** (spleen, lymph nodes, tonsils, Peyer's patches of small intestine, appendix). **MALT** (mucosa-associated lymphoid tissue) ~50% of lymphoid tissue.
- **AIDS**: Acquired Immuno Deficiency Syndrome (first reported 1981). **HIV** is a **retrovirus** (RNA genome, reverse transcriptase). Spread: sexual contact, infected blood, sharing needles, mother to child via placenta. Not by touch.
- Cycle: HIV enters **macrophages** (act as HIV factory) → viral DNA via reverse transcriptase → enters **helper T cells (T_H)**, which fall in number ⇒ opportunistic infections (*Mycobacterium*, viruses, fungi, *Toxoplasma*). Incubation 5–10 years.
- Diagnosis: **ELISA**. Treatment: anti-retroviral drugs (partially effective). Prevention: NACO, safe blood, disposable needles, condoms, awareness; 1 December = World AIDS Day.

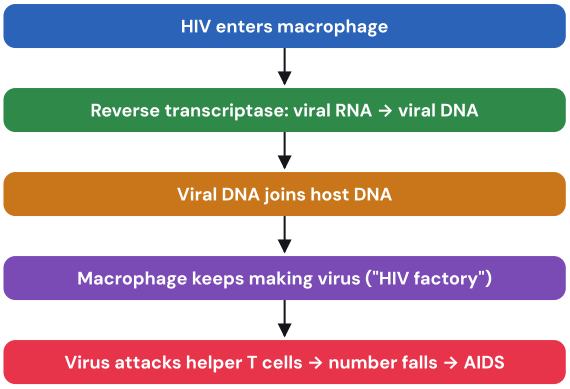
06 Cancer and drugs

- Normal cells show **contact inhibition**; cancer cells lose it ⇒ tumours. **Benign** (confined) vs **malignant** (invade; **metastasis**: spread via blood). Carcinogens: physical (X-rays, γ-rays, UV), chemical (tobacco smoke), biological (oncogenic viruses, viral oncogenes; proto-oncogenes/c-onc activated).
- Detection: biopsy, histopathology, blood and bone marrow tests (leukaemia), radiography (X-rays), CT, MRI; monoclonal antibodies. Treatment: surgery, radiotherapy, chemotherapy, immunotherapy (α-interferon).
- **Drugs**: opioids (heroin/smack = diacetylmorphine from morphine of poppy *Papaver somniferum*; depressant), cannabinoids (*Cannabis sativa*: marijuana, hashish, charas, ganja; affect cardiovascular system), coca alkaloid/cocaine (*Erythroxylum coca*; dopamine transport; euphoria, hallucinations). Hallucinogens: *Atropa belladonna*, *Datura*.
- Tobacco: nicotine stimulates adrenal gland, raises BP and heart rate; smoking ⇒ cancers of lung, bladder, throat; bronchitis, emphysema, CHD; raises CO in blood. Adolescence (12–18 years): curiosity, peer pressure. Effects: withdrawal symptoms, liver cirrhosis (alcohol), AIDS via needles. Prevention: avoid peer pressure, education, help from parents/peers, danger signs, professional help.

07 Extra: more diseases + tricks

Disease	Pathogen	Spread
Dengue	Dengue virus (flavivirus)	*Aedes* mosquito (day-biting)
Chikungunya	Chikungunya virus	*Aedes* mosquito
Cholera	*Vibrio cholerae*	Water (rice-water stools)
Tuberculosis	*Mycobacterium tuberculosis*	Air
Tetanus	*Clostridium tetani*	Wound (lockjaw)
Diphtheria	*Corynebacterium diphtheriae*	Air
Plague	*Yersinia pestis*	Rat flea
Rabies	Rabies virus	Dog bite
Sleeping sickness	*Trypanosoma*	Tsetse fly
Kala-azar	*Leishmania donovani*	Sand fly

- Vaccine generations: 1st = whole killed/weakened organism (polio, BCG); 2nd = subunit (hepatitis B recombinant); 3rd = DNA/recombinant vector vaccines.
- Cancer types: **carcinoma** (epithelium), **sarcoma** (connective tissue), **leukaemia** (blood cells), **lymphoma** (lymph tissue).
- Mosquito trick: **"A-D-C"** = *Aedes* → Dengue, Chikungunya; *Anopheles* → malaria; *Culex* → filariasis.



How HIV causes AIDS

08 Important Q&A

Q1. Why is HIV called a retrovirus? Which cells does it attack?

Its genome is RNA, copied to DNA by reverse transcriptase (reverse of normal flow). It attacks macrophages and helper T cells.

Q2. Differentiate active and passive immunity.

Active: own antibodies after antigen exposure; slow, long-lasting. Passive: ready-made antibodies given; quick, short-lived.

Q3. What causes the high fever in malaria?

Rupture of RBCs releases haemozoin, a toxin causing chill and high fever every 3–4 days.

09 Common mistakes

- Calling female Anopheles the intermediate host (it is definitive; human is intermediate).
- Saying common cold infects lungs.
- Writing antibody structure as H_2L (it is H_2L_2).
- Thinking AIDS spreads by touch or hugging.

10 Practice (NEET style)

1. Test for typhoid?
2. Fish used to control mosquito larvae?
3. Antibody in colostrum?
4. Test for HIV?
5. Source plant of morphine?

ANSWERS

1) Widal test · 2) Gambusia · 3) IgA · 4) ELISA · 5) *Papaver somniferum*

11 Quick revision: 5 minutes before the exam

DISEASES

- Typhoid: Salmonella, Widal
- Malaria: Plasmodium, haemozoin
- Filariasis: Wuchereria

IMMUNITY

- Innate vs acquired
- B humoral, T cell-mediated
- H_2L_2; IgE allergy

AIDS

- Retrovirus, reverse transcriptase
- Kills helper T cells
- ELISA

CANCER/DRUGS

- Contact inhibition lost
- Metastasis
- Heroin, cannabinoids, cocaine

Have a doubt? Ask the AI Doubt Solver at padhaiadda.netlify.app, or take the mock test on this chapter.