FUNDAMENTAL OF MICROBIOLOGY

- **MICROBIOLOGY**:
- **Louis Pasteur**
  - **Father of Microbiology**
  - Sterilization technique
  - Vaccine tern
- **Robert coach**
  - **Koch's postulates:** MOs –causative agent of infectious disease if
    - MO constantly associated with lesion of disease
    - Pure culture from lesion
    - Isolated pure culture- inoculated in lab animal- produce same disease
    - Re-isolate in pure culture from animal's lesion
  - **Koch's phenomenon**
    - Guniapig (infected with Tubercle bacillus)-exaggerated inflammatory response on injecting tubercle bacillus or its protein- hypersensitivity reaction
  - **Father of bacteriology**
  - Pure culture & staining technique
  - M. tuberculosis discovery
- **Edward Jenner**: First vaccine-small pox
- **Paul Ehrlich**: **Father of Chemotherapy** & Side chain theory of Antibiotic production
- **Robert hook-**
  - **Development of microscope**
- **THREE KINGDOM SYSTEM**
  - Plant
  - Animal
  - Protista- 2 groups
    1) Eukaryotes (Fungi, Algae except BGA)
    2) Prokaryotes (Bact. & BGA)
- **DIFFERENCE BETWEEN EUKARYOTES AND PROKARYOTES**

Structure	Prokaryotes	Eukaryotes
Nucleus		
Nuclear membrane	Absent	Present
Nucleolus	Absent	Present
Chromosomes	One	More than one
Deoxyrobonucleoprotein	Absent	Present
Division	Binary	mitosis
Cytoplasm		
Mitochondria, Golgi apparatus, lysosome, endoplasmic reticulum	All are Absent	All are Present
Chemical Composion		
Sterols	Absent	Present
Muramic acid	Present	Absent

☞ MICROSCOPY:

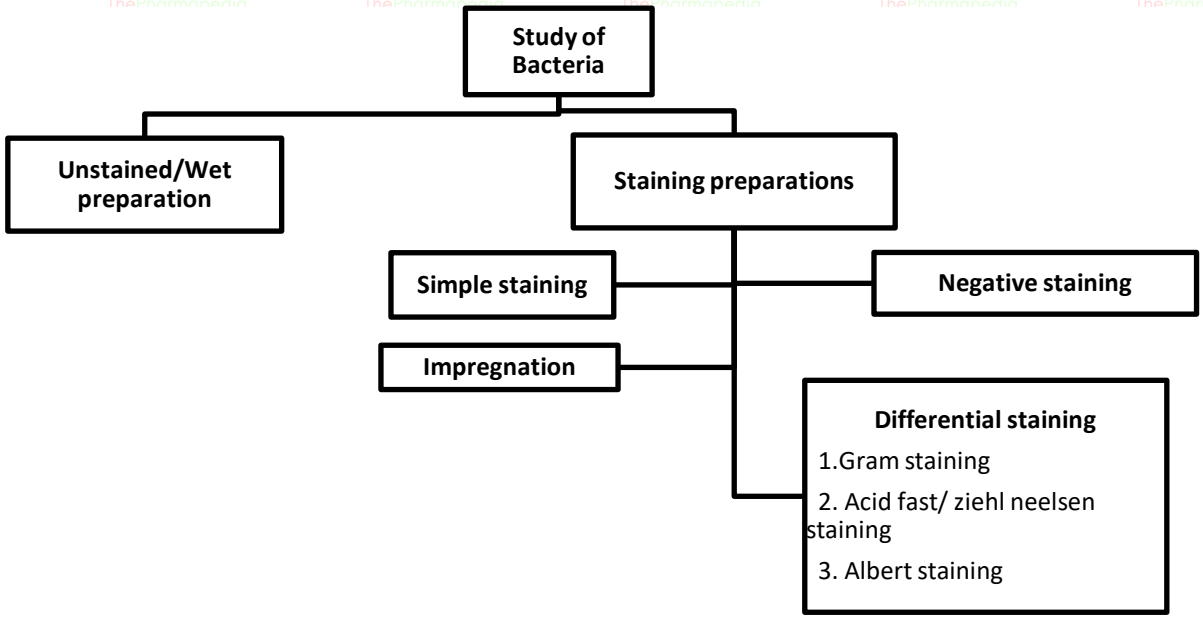
1) for magnification of an object,
2) maximization of resolution,
3) Optimisation of the contrast between structure, organism and background.

1. **Optical or light microscope**: light is transmitted through object
   - Objective lens
   - Eyes (fix)
   - Condenser: use to focuses light
   - Immersion oil used to increase reservation power
2. **Phase-contrast microscope**
   - **Refractive index is a principle** (Different thickness different refractive index)
3. **Dark field/ dark ground microscope**: reflected light is used instead of transmitted light
   - Light object/ microorganism- self Luminous against dark background
   - Benefit- increase resolution as compared to ordinary microscope
4. **Interference microscope**:- used to revealing cell organelles and quantitative measurement of chemical constituent of like liquid, Carbohydrate, protein, nucleic acid
5. **Fluorescent Microscope**:

   Light of shorter λ (UV) object stain with dye (auramine/rhodamine λ longer visible
   - Also used for detection of Antigen-Antibody rraction
6. **Electron microscope**

   Electron beam instead of light metal coated object/MOs (Shadow casting technique)
   - Others technique
     - Negative staining with phosphotungstic acid
     - 3D - scanning electron microscope
     - Fridge-etching technique- to examine living cell by Rapid cooling
   - Electron microscope is mainly used for **detection of viruses**

☞ STUDY OF BACTERIA



A. **Unstained/ wet preparation** : For bacterial motility (hanging drop preparation)

B. **Staining preparations:** to produce color contrast

i. **Simple stain-** methylene blue or basic fuchsin dyes. Impart the same colour to all the bacterial in smear

ii. **Negative staining**: Dyes such as Indai ink or nigrosin- background gets stained & unstained bacteria stand out in contrast.

- Eg. Demonstration of bacterial capsule which do not take simple stain

iii. **Impregnation method**: Bacterial cells and structure are two thin so these are thickened by impregnation of silver on the surface to make them visible.

- eg demonstration of bacterial flagella and spiral

iv. **Differential staining**: impart different colours to different bacteria or bacterial structure

a) **Gram staining technique**

- Primary stain-Crystal Violet for 1 minute (methyl violet or gentian violet may use as primary dye)
- Pour Gram Iodine For 1 minute
- Watch with water
- Decolorize with Acetone or alcohol for 10 to 30 second hand wash with water

- Counter stand with a dye safranin for 30 second (Dilute carbol fuchsin or neutral red also used as counter Stain)
    - **Gram positive**: Resist decolourisation and retain the colour of primary stain i.e Violet
    - **Gram negative**: decolourisation by acetone/ alcohol and take Counter Stain i.e red color

b) **Acid fast staining:** Staining of ***mycobacteria*** usually is done by this technique.

- Acid fast bacilli appear **red** in blue background of push/epithelial cells

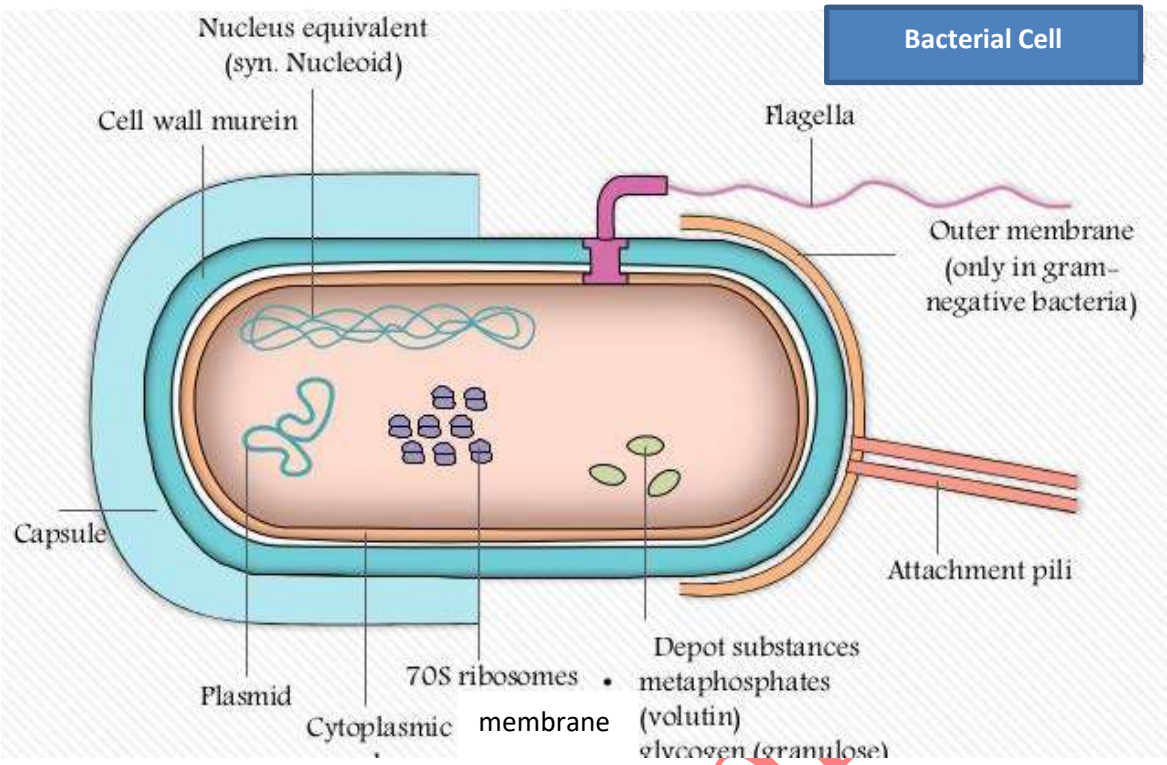
c) Alberts stain: Staining of ***C. diphtheria*** usually is done by this technique

☞ MORPHOLOGY OF BACTERIA

Depending on their shape,bacteria are classified as

1) **Cocci(means berry):** oval or spherical cells.
    - pairs (diplococci),
    - chains(streptococci),
    - clusters(staphylococci)
    - groups of four (tetrads)or eight(sarcina).
2) **Bacilli(bacillus,meaning rod):**
    - rod shaped cells.
    - Some peculiar arrangement or shape as follows:
        - Coccobacilli-length of bacteria is approximately same as its width e.g.Brucella.
        - Streptobacilli- arranged in chains e.g.Streptobacillus.
        - (Chinese letter or cuneiform pattern-arranged at angles to each other e.g.Corynebacterium.
        - Comma-shaped-curved appearance e.g.Vibrio.
        - Spirilla-rigid spiral forms e.g.Spirillum.
3) **Spirochaetes**(from spiera meaning coil;chaite meaning hair): slender,flexous spiral forms e.g.Treponema.
4) **Mycoplasma:** Bacteria without cellwall (no stable shape), small in size 50-300 nm)
5) **Rickettsiae & Chlamydiae:** small obligate bacteria parasites(not virus)

☞ **STRUTURE OF BACTERIA:** Bacterial cell possesses several components such as *the cell wall, cytoplasmic membrane, the nucleus, bacterial capsule, flagella, fimbriae and bacterial spore*.



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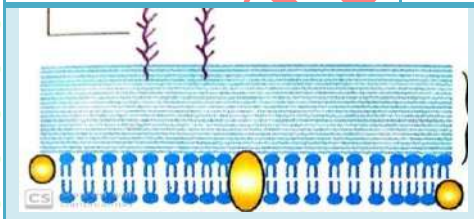
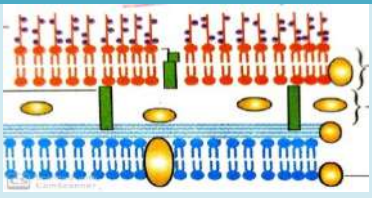
A. Cell wall:

- Function:
  - Shape of the cell & confers rigidity
  - Protection against Osmotic damage
  - Take part in cell division
  - Carries bacterial Antigen (target for Antibody, lysosomes)
- Composition:
  - **Peptidoglycan-** unique to Bacterial cell (Mucopeptide- Murein) composed alternative chain of NAG (N-Acetyl glucosamine) & NAM(N-Acetyl Muramic acid)
  - NAG & NAM chains are crossed linked by **Tetrapeptide** chaine (DI Exam)

Character	Gram Positive	Gram Negative
		
Thickness	**Thicker**	**Thinner**
Periplasmic space	**Absent**	**Present**
Lipids	**Absent or small**	**Present**
Techoic Acid	**Present**	**Absent**
Peptidoglycan	**16-80 nm**	**2 nm**

Surface Ag of bacteria → Gram +ve Teichoic Acid
Surface Ag of bacteria → Gram –ve LPS

B. Cytoplasmic membrane: Semipermeable

C. Cytoplsm:

- Ribosome(70S);
- Inclusion(like polymetaphosphate**(volutin**), lipid, polysaccharide/glycogen, sulphur granule) &
- Mesosomes /Chondroids : vesicular invaginations of plasma membrane (Respiratory enzyme); Analogous to Mitochondria of Eukaryotes.

D. Nucleus

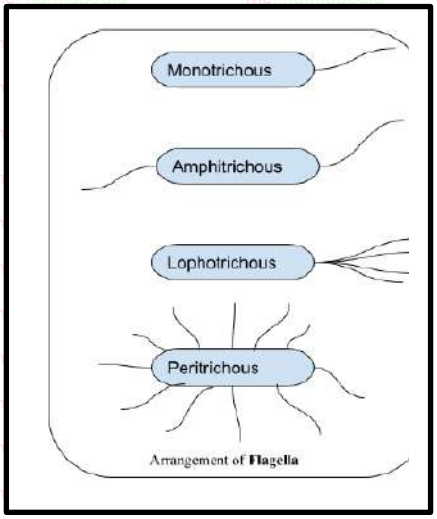
- No nuclear membrane or nucleolus
- DNA- one ds circular DNA
- Extranuclear genetic materials: Plasmid/episomes

E. Bacterial capsule & Slime layer

- India ink/negative staining
- Capsule enhance bacterial virulence by inhibiting phagocytosis

F. Flagella

- Cytoplasmic appendages made of Flagellin protein
- Locomotion
- Structure (Filament, Hook & Basal body)
- Arrangement:



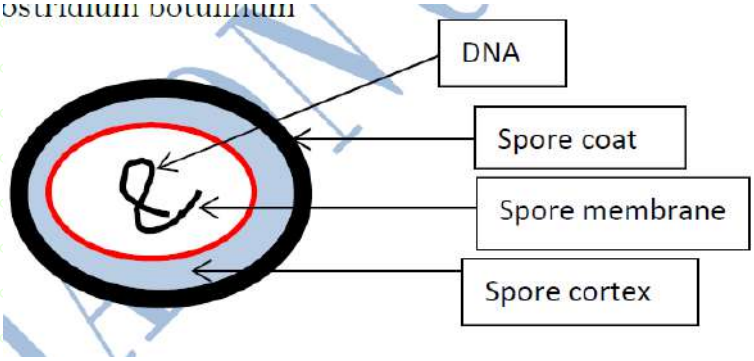
G. Fimbriae or pili

- Shortest thinner than pleasure
- Gram Negative bacteria
- Antigenic
- pilin protein
- Not related to motility
- Type (Common pili, F or Sex pili & Col I/Colicin pili)
- Functions: Adhension (increase virulence of bacteria); transfer of genetic material
- Demonstration/ detection buy electron microscope or haemagglutination

H. bacterial spore

- Most highly resistance Stage formed under unfavourable environment condition (high resistance due to high content of **calcium and dipicolinic acid** & low water)
- Sporulation: spore formation under nutritionally deprived condition
- Germination: conversion of spore into vegetative cell under suitable condition

- Destruction of spore: autoclave at 121 degree centigrade 15 min
- Use of spore: biological indicator of sterilization mathod
- Spore forming bacteria: bacillus anthracis and bacillus subtilis AND clostridium tetani and clostridium botulinum



- On the basis of requirement of oxygen, bacteria are divided into aerobes and anaerobes.
  - **Aerobes**: Require O_2 for their growth
    - **Obligate aerobes:** grow only in the presence of O_2. Eg P. aeruginosa,
    - **Facultative anaerobes:** ordinarily aerobes but can grow without O_2. Eg. Most pathogenic bacteria
    - **Microaerophilic:** can grow in trace amount of O_2 . Eg Campylobactor & Helicobacter
  - **Anaerobes** : The obligate anaerobes-grow only in the absence of O_2. Eg. C.tatani
- Some organisms require higher level of carbon dioxide (5-10 %) , for their growth, they are named as **capnophilic** bacteria.

- The minimum nutritional requirement for growth and multiplication of bacteria includes sources of carbon, nitrogen, hydrogen, oxygen and some inorganic salts.
- Bacterial cell division occurs by **binary fission**.
- The time required for the bacterium to give rise to two daughter cells under optimum conditions is known as the **generation time**.
- **Viable count** measures the number of living (viable) bacteria while total count indicates **total number** of bacteria in the specimen, irrespective of whether they are living or dead.
- Bacterial growth curve has four phases namely **lag phase, log phase, stationary phase and phase of decline.**

☞ **GENE TRANSFER IN BACTERIA:-**

A. Transformation (uptake of free naked DNA)

B. Transduction (transfer of genetic chromosome or plasmid through bacteriophage form one bacterium to another)

C. Conjugation :- transfer of genetic material form (through plasmid) one bacterium [donor or male] to another (recipient or female) by **mating or contact is called conjugation.**

- **Free F plasmid ->** Encoded sex pilus in F + cell -> donor cell or male
- **F - >** female cell / recipient cell
- **HFR :-** episome (integrated state of plasmid with most chromosome) -such cells are able to transfer also chromosomal DNA to recipient to high frequency.

D. Lysogenic conversion

☞ **RESISTANCE TRANSFER FACTOR (RTF) :-** Plasmid in responsible for the spread of **multiple drug resistance (MDR)** among Bacteria and transfer of plasmid is by conjugation method -> transferable or infections drug resistance

R – plasmid – R-factor can be transmitted animal to man.

Mutational drug resistance :- bacteria can acquire by mutation or gene transfer .

Mutational drug resistance	Transferable drug resistance
-> Resistance to a one drug at a time.	-> Multiple drug resistance.
-> Resistance is not transferable to other organism.	->Transferable to other organism via gene Transfer.
-> Resistance can be prevented by treatment combination with combination of drug .	->Cannot prevented with combination of drug.

☞ All hereditary characteristics are encoded in **DNA.**

☞ Genetic information is stored in the **DNA** as a code . Codon consists of a sequence of three nucleotide bases , i.e. the code is triplet.

☞ Besides the chromosomal **DNA**, some bacteria may also posses extra chromosomal **DNA** such as **plasmids** . These are circular **DNA** molecules and can replicate autonomously. They may carry properties of drug resistance, toxigenicity, conjugation and others.

☞ Mutation is a random , undirected heritable variation caused by change in nucleotide sequence of the **DNA** of the cell. The frequency of mutation ranges form 10 -2 to 10 -10 per bacterium per division.

☞ Mutation occurs spontaneously but its frequency may be enhanced by mutagens such as **UV** rays, alkylating agents 5- bromouracil and acridine dyes.

☞ **R-** factor is a plasmid responsible for the spread of **drug resistance among bacteria.** This plasmid is transferred from one bacterium to other **by conjugation**. **R factor has two components, resistance transfer factor (RTF) and resistance determinant (r)**. This mechanism of drug resistance is known as **transferable drug resistance**.

☞ Some bacteria may acquire drug resistance by mutation. It is known as mutational drug resistance. This type of resistance occurs in **M**. tuberculosis.

- Transposotion: Transfer of genetic material to one DNA molecules to anothers
- Transposable genetic elements are specific sequences of **DNA** segments that have the ability to move from one plasmid to another plasmid or from plasmid to chromosome and vice versa and also within the chromosome. They are also named as **jumping genes**.
- **DNA** prodes are radiolabeled or chromogenically labeled piece of single stranded **DNA** which can be used for the detection of homologous **DNA** by hybridization. Various diagnostic **DNA** probes have been developed for identification of different microorganisms.
    - **Southern blotting :-** DNA – DNA hybridization
    - **Northern blotting** :- RNA – RNA hybridization
    - **Western blot test** :- Identification of protein / immune blotting .
    - **Dot blotting**: for DNA & RNA
- **PCR** :-polymerage chain reaction (Amplifies of a specific DNA sequence or give or intrust
- Polymerase chain reaction (**PCR)** is a **DNA** amplification system that produces a large amount of **DNA** in vitro from small amounts of starting material. The **PCR** provides extremely rapid method for diagnosis of various infections agents.

- **DIFFERENCES BETWEEN EXOTOXINS AND ENDOTOXINS:**

Exotoxins	Endotoxins
➢ protein (polypeptides) M.W. 10000 to 90000.	➢ Lipopolysaccharide in nature.
➢ Heat labile (>60° C).	➢ Heat stable.
➢ Actively secreted by living cells Into medium.	➢ From integral part of the cell wall; released only on disruption of bacterial cell.
➢ Highly antigenic stimulates Formation of antitoxin which Neutralizes toxin.	➢ Weakly antigens; antitoxin is not formed but antibodies against polysaccharide are raised.
➢ Converted into toxoid by formaldehyde.	➢ Cannot be toxoided.
➢ Enzymic in action- protein – heat table.	➢ No enzymic action of all endotoxins.
➢ Specific pharmacological affect for each exotoxin.	➢ Non- specific action of all endotoxins.
➢ Very high potency.	➢ Low potency.
➢ Highly specific for particular tissue e.g.	➢ Non-specific in action.
➢ Don't produce fever in host.	➢ Usually produce fever.
➢ Produced manily by gram-positive Bacteria and also by some gram-negative bacteria.	➢ Produces by gram-negative bacteria.

- **LIST OF AUTOIMMUNE DISEASES:-**

Type	Disease	Autoantibody
A. Haemocytolytic diseases.	1. Autoimmune haemolytic Anaemia.	1. Anti-red blood cell Antibodies. 2. Antiplatelet antibodies.
B. Localised or organ specific	1. Grave's disease 2. Hoshimoto's Thyroiditis 3. Myasthenia Gravis. 4. Pernicious anaemia.	1. Anti-TSH receptor autoantibody. 2. Antibodies to thyroglobulin And to microsomal antigens. 3. Antiacetylcholine antibodies. 4. Antibody to gastric parietal Cells and to vitamin B-12

	5.Addison's diseases 6. Chronic active hepatitis.	Binding site of intrinsic factor. 5. Antibodies to adrenal cells. 6. Antinuclear antibodies;
C. Systemic diseases (non-organspecific)	1.Rheumtoid arthritis 2. Systemic lupus everthematosus antibodies. 3. Goodpasture's syndrome	1. Antigammaglobulin antibodies. 2. Antinuclear (anti DNA). 3. Antibasement membrane.

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☞ DISTRIBUTION OF ABO ANTIGENS ON THE RED CALLS:

Blood group	Antigen on red cells	Ispantibodies in serum
A	A	Anti-B
B	B	Anti-A
AB	AB	None
O	None	Anti-A and Anti-B

VIRUS

- Obligate intracellular infective agent.
- Only one type of nucleic acid (**DNA** or **RNA**).
- No metabolic activity of outside the living cell (lack the enzyme & cellular organization).

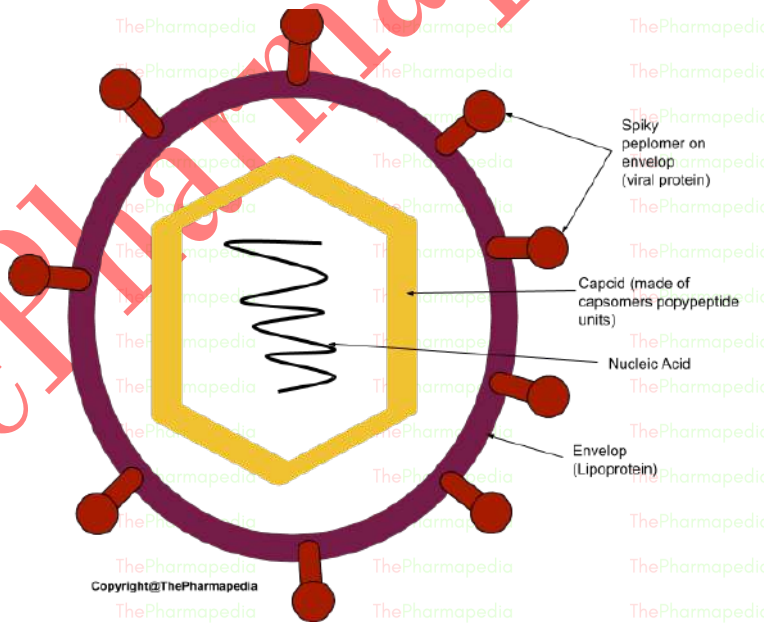
☞ **Difference b/w prokaryotes(Bacteria) and virus**

Property	Bacteria/pro	Virus
Cell wall	+	-
Ribosome and cellular enzyme	+	-
DNA & RNA	+	Only one
Binary fusion	+	-
Growth on inanimate media	+	-
Sensitivity to antibacterial antibiotic.	+	-
Sensitivity to interferon	-	+

Largest virus :- small pox(300nm).

Smallest virus :- papo virus (20nm).

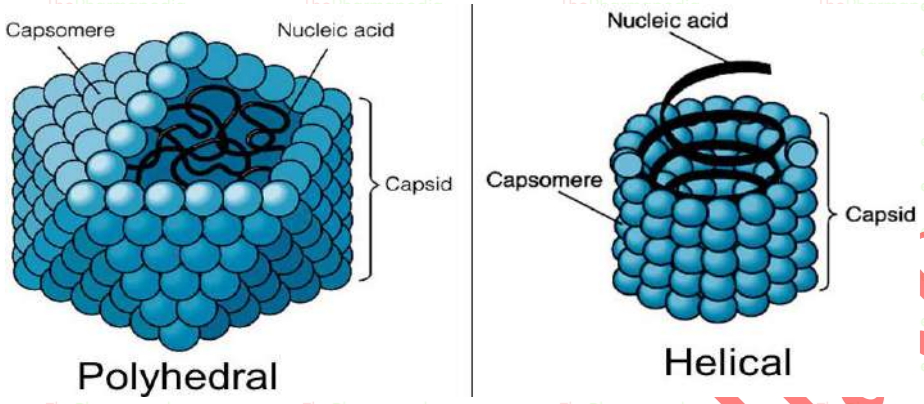
☞ **Structure of Virus:**



- Virion (Extracellular infections virus particles) with {nucleic acid + coat capsid=Nucleocapcid}
- Capcid made of copsomers (polypeptide)
- Function of capcid :- Impenetable shell around nucleic acid introduce viral genome into most cells.
- **Envelope** -Lipoprotein in nature
  - Protein (Viral encoded/derived)
  - Lipid part (Derived from most cell membrane or nuclear membrane)

☞ **Symmetry of virus:**

1. **Icosahedral (cubical) symmetry**
   - Rigid structure
   - Polygon with 12 vertice/corner & 20 facets (equilateral triangular)
2. **Helical symmetry**: helical or spiral tube (Capsomers & Nucleic acid wound together)
3. **Complex; eg** Pox virus



DNA virus (Trick HHAPPPy)	RNA Virus
H=Herpes#	Togo
H=Hepadna	Corna
P=Adeno	Picorna
P=Parvo	Orthomyxo
P=Pox#	Paramyxo
#=Enveloped	Rhabdo
	Bunya
	Arena
	Fibo
	Ritro (HIV)

☞ **REPLICATION CYCLE OF VIRUSES** :

1. Attachment /Adsorption:-

➢ Virion attach to host cells surface via ligands. **HIV:** Attachment b/w viral surface glycoprotein (gp 120) & CD-4 receptor on host cells .

2. Penetration & uncoating

➢ **Enveloped virus**: Envelop fuses with host cell membrane & enter into cell.

➢ **Non-enveloped virus**/ Naked virus:
   - In bacterial Cell: Inject nucleic acid into host cell & leaving capcid outside the cell .
   - In Eukaryotes cell:- By endocytosis – entire nucleocapcid gain entrance into host cell & capcid is being removed in cytoplasm of host cell.

➢ **Uncoating** – Process of stripping the virus nucleic acid from outer layer & capcid by lysosome enzyme of host cells.

3. Synthesis : Viral genume directs host machinery to shut down the normal cellular metabolism & direcd to synthesis of viral components & viral nucleic acid .

4. Assembly /maturation :- Virl nucleic acid & capcid assemble together to form daughter virus/virions .

5. Release :- Newly formed virions/viruses are released from host cell by budding process (enveloped virus) or lysing the host cell (Bacteriophage).

☞ **CUCTIVATION OF VIRUS:** (multiply only in living cells & cannot be grown on any of the inanimate culture medium.

1. Animal inoculation
2. Embryonated egg inoculation of hen

-> Choriollantoic membrane [CAM] – pox virus grow

-> Allantoic cavity (Influenza virus vaceins)

-> Amniotic Sac – influenza virus isolation.

-> Yolk Sac Inoculation (Chlamydia & rickettsiae)

3. Tissue culture

i. Organ culture
ii. Explant culture
iii. cell -> (Primany, diploid & cont. cell culture)

☞ **Viroids:-** ss circular RNA molecules lacking a protein coat (mostly Plant pathogenic)

☞ **Prions:**

- Infectious protein without nucleic acid
- Highly resistant to physical & chemical agents .
- Produce slow infection with long incubation period .
- Destruction of prions
  - Heat 360^0 C for 1 hrs
  - Steam – 134-138^0 C for 18 mints.
  - Chemicals – Sor. Hypochloride for 1 hrs
  - Other – bleach , phono 190% & I_2

☞ **VIRUSES & CANCER:**

- Oncoviruses are Associated with the development of cancer.
- Oncovirus produces a protein that bind to host tumor suppressor proteins & inactivation them.
- Tumor suppressor proteins : regulate growth & initiate apoptosis.

☞ **Virus** – host interaction may cause different effects, ranging from no apparent cellular damage to rapid call destruction.

☞ Some viruses (e.g. poliovirus) cause cell death (cytocidal infection). Other may cause cellular proliferation or malignant transformation (oncognic viruses). In some instancse, viruses remain as latent infections (herpes simplex virus) whereas other produce some morphological change in cell to from inclusion bodies (rabies virus).

- Inclusion bodies are virus-specific intracellular globular masses which are produced during replication of virus in host cells.
- Viruses may enter the body through respiratory tract, skin, genital tract, conjunction, of congenitally.
- Interferons (IFNs) are a family of Glycoprotein produced by host cell on induction of viral microorganisms : These interferons have antiviral activity . They are classified into three types namely IFN-α, IFN-β and IFN-γ.
- Laboratory diagnosis of viral infections depends on direct demonstration of virus and its components, isolation of virus, and detection of the specific antibodies.
- Poxviruses are the largest and the most complex of all viruses. They are brick-shaped.
- Retroviruses:- RNA [Characteristic Reverse transcriptase enzyme & prepare DNA copy form RNA genome]
- **AIDS:**Acquired immunodeficiency syndrome virus, enveloped.
    - HIV-1 - Worldwide
    - HIV-2- African country

- **HIV Virus:**
    - Enveloped; 2 identical copies of ss, +ve sense RNA & Reverse transcriptase enzyme.
    - Structural gene – gog,pol& env
    - Envelop – gp 120
    - Nucleocapsid – p24
- **Malignancies associated with HIV** :-
    - Kaposi's sarcoma
    - β – cell lymphoma/Non- Hodgkin lymphoma
- Retroviruses possess reverse trancriptase (RNA directed DNA polymerase) enzyme which prepares a DNA copy of the RNA genome in host cell. The presence of enzyme reverse transcriptase is a characteristic feature.
- Human immunodeficiency virus (HIV), the causative agent of AIDS, belongs to retroviruses.
- HIV genome contains the three structural genes (gag, pol and evn). Five non-structural genes (tat , rev , nef, vif and upr) are present in both HIV-1 and HIV-2. Other these, HIV – 1 contains vpu and HIV-2 has vpx. The products of these genes, both structural and non-structural , act as antigens. Infection person's serum contains antibodies to these antigens. Detection of these antigens and antibodies is of great importance in the diagnosis and prognosis of HIV infections.
- There are three modes of transmission of HIV infection. These are sexual contact, parenteral and perinatal.
- HIV infects principally the CD4 lymphocytes. The infection causes damage to T helper (T4) lymphocytes. T4 cells are depleted in numbers and the T4:T8 (helper: suppressor) ratio is reversed.
- When CD4+ cell fall down below 200 per mm^3, the titer of virus increases markedly and there is irreversible breakdown of immune defence mechanisms . most of the patients with HIV disease die of infections other than HIV e.g. opportunistic infection and malignancies. AIDS is the end stage of HIV infection.
- Laboratory diagnosis of HIV infection includes specific tests for HIV and tests for immunodeficiency. Specific tests include antigen (p24) detection, virus isolation , detection of viral nucleic acid and antibody detection .

- The p24 antigen is the earliest virus marked to appear in the blood. Virus isolation, detection of viral nucleic acid by polymerase chain reaction (PCR) and p24 antigen detection are useful for diagnosis in window period . HIV infection persons remain negative for antibodies during window period.
- Demonstration of antibodies is the simplest and most commonly employed technique for diagnosis. It may take several weeks to months for antibodies to appear after infection. The diagnosis of HIV infection is made by detecting serum antibodies to viral proteins, both core (p24) or envelope (gp120, gp41). There are two types of serological tests available for antibody detection – screening tests and supplemental tests and supplemental tests.
- Screening (E/R/S) tests include ELISA, rapid tests and simple tests. Western blot test and indirect immunofluoresecnce test are supplemental tests used for HIV antibody detection.
- ELISA is the method most commonly used.
- There are three strategies (strategy 1 to 3) for HIV testing in India.

MYCOLOGY (thallophyta phylum)

- Study of fungi – Mycology
- All fungi – Eukaryotic
- Obligate or facultative aerobe
- Chemotrophic – obtain nutrients from chemical in nature.
- Cell wall – chitin, mannan & polysaccharide.
- Divide by – Asexually, sexually, & both.
- Cytoplasmic memb. Contains – sterols
- May be unicellular (yeast) or multi-cellular.

☞ **Classification based on morphological -:**

1. Yeast => Unicellular, Budding emptococcus neo formans-pathe

2. Yeast like fungi – psedo hyphea of candied albicans crs – partly as yeast & party of chain of elongated budding cell.

3. Moulds -: Grow as branchins filament, cells hyphoe

Hyphoe -> Separalid

-> Non-separats – Aseptate hyphoe

Mycelium formation -> Arial

Vegetativs – grow in celluer

Reg. - Sexual & asexual

Ex. - Dematophfes

Phizi.pus, Aspergillus, Pemioillium

4.Dimorphic fungi =>

Exist -> In host – as yeast tissue & In celltore 37°C

➔ In soil – hyphal / Mycelial 22 – 25°C

Most syst. Infection due to dimorphic fungi

Ex. – Blasromyces dermatitidis, sporothrix schenckill , Paeacoccidirides,

drasiliensis, coccidirvides immitis

Fungal infection : 3 types –

- Superficial mycoses

- Sub cataneous mycoses

- Systems mycoses

Dermatophytes – Infect only superficial kerafinised tissue (Skin , hair & nails)

Madura foot or maduramycosis pr mycetorne – due to fungi s.c. Srenulomtous disies.

Laboratory dicgrosis of fungal infection :

1. Direct microscopy
2. Celltore on sabouraud's . dextrose agar SDA.
3. Brain heart infection (BNI) a ser
4. Tissue section

Gram positive bacteria	**Gram negative pacferes**
Micrococcus	Bordetella
Diplococcus	E-Coil-klebsicela
Streptococcus	Salmanella
Mycobacterium	Shigella
Staphylococcus	Vibrio
Enterococcus	Pseudomnas
Corynebacteriom	N.gonorhoea
Bacillus	Posteuraella
Closridium	Proteus
	Brucells, yersinia

Spirochete / spirochactales : Spiral shaped motile bacteria

> Flagella – endo cellular -> Axial fibris or axid filaments.

Eg.-> Treponema paelidum – syphieis

Borrelia recurrentis – relapsing fever

Borrelia burgdorferi – Lyme disease.

Leptospira – lepto spirosis disesse

Spirochaeta

- Based on the morphology, there are four main groups of fungi namely yeasts, yeasts like fungi, moulds and dimorphic fungi.
- Infections caused by fungus is known as mycoses. Fungal infection are of three principal clinical types: superficial mycoses, subcutaneous mycoses and systemic mycoses.
- Dermatophytes are a group of fungi that infect only superficial keratinized tissue (skin, hair and nails) without involving the living tissue. Three genera of dermatophytes include Trichophyton, Microsporum and Epidermophyton.
- Mycetoma is a chronic granulomatous infection of the subcutaneous tissue , usually affects the foot and rarely the other parts of body. The disease was first described from Madurai , south india. It is therefore commonly referred to as Madura foot or maduramycosis.
- Sporotrichosis is a nodular , ulcerating disease of skin and subcutaneous tissue . It is caused by sporothrix schenckii, a dimorphic fungus .
- Laboratory diagnosis of fungal infections consists of direct microscopy, culture on Sabouraud's dextrose agar (SDA) or brain heart infusion (BHI) agar, and to identify fungal elements in tissue sections.

Key points –:

1. Diarrthoea is defined as an increase in the frequency, fluidity of volume movements, relative to the usual habits of an individual. Passage of three or more motions a day can be diarrohea.

2. Dysentery means passage of blood and mucous, often associated with tenesmus.

3. The term food poisoning means an illness acquired through consumption of food or drink contaminated either with microorganisms, their toxins or contamination of food.

4. Vibrio cholera, Esch. Coil, Salmonellae are some important bacterial cases of diarrhoeal diseases. Rotavirus is the most important viral etiology of diarrhea.

5. Shigella spp. And Entamoeba histolytica cause bacillary dysentery and amoebic dysentery respectively.

6. Salmonella typhimurium and vibrio parahaemolyticus cause infective type of food poisoning while staphylococcus aureus is an example of toxic type of food poisoning.

7. Laboratory diagnosis of diarrhea, dysentery and food poisoning depends on isolation of organism from the relevant specimen.

Key points –:

1. Meningitis is an inflammation of the membranes surrounding the brain and spinal cord. Meningitis of bacterial origin may be caused by pyogenic organisms (acute pyogenic meningitis) or by M. tuberculosis (tuberculous meningitis).

Q. Relapsing discase is caused by

a. Spirochete b. Mycoplasma

c. viruses d. None

Table:- Viruses according to their genomes and envelopes

Genome	Envelope	Viruses
ds DNA	Yes	Herpes simplex viruses (type 1 and 2), varicella-zoster virus , cytomegalovirus (human herpesvirus 5), Human herpevirus 4, vaccine, variola, molluscum contagiosum virus ,hepatitis B virus (HBV).
	No	Human adenovirus , human papillomavirus , JC virus , BK virus.
ss DNA	No	Parvovirus B 19
ds RNA	No	Human reovirua , human rotavirus colarado tick fever virus.
ss RNA	Yes No	Yellow fever virus , dengue virus, Japanese encephalitis, hepatitis C virus , human corona virus , sindbis virus , semliki forest virus , ross river virus , eastern equine encephalitis virus , western equine encephalitis virus ,rubella virus,HTLV, HIV type 1, HIV type 2, simian immunodeficiency virus, influenza A virus , influenza B virus, influenza C virus, ebola virus , Marburg virus , rabies virus , lassa virus , hantaan virus Norwalk virus , hepatitis E virus,human poliovirus ,coxsackie A virus , coxsackie B virus , echovirus, enterovirus , human rhinovirus, hepatits A virus.