

Infectious Diseases

All living creatures share two basic purposes

1. survival
2. reproduction

*Organisms must take nutrients essential for growth and proliferation from the environment.

*In many conditions the contact between humans and microorganisms is benefit for both while in other conditions can produce harmful and potentially lethal consequences these consequences are collectively termed **infectious diseases.**

Terminology

- **Host:**

Any organism capable of supporting the nutritional and physical growth requirements of another organism.

- Not all contacts between microorganisms and humans are injurious.
- The human body (internal and external) normally and harmlessly inhabited by many kinds of microorganisms collectively are called **normal flora.**

- **Commensalism:**

The relationship between two organisms in which the host not affected (neither beneficially nor harmfully), while the second organism, its growth depends on the host.

- **Mutualism:**

this relationship between two organisms in which the benefit from this relation is for both. e.g. certain inhabitants of the human intestinal tract extract nutrients from the host and in turn, secrete essential vitamin (by-products of metabolism (e.g. vitamin. K) which are absorbed and used by host.

Parasitic relationship:

In which only the infecting organism benefits from this relation while the host is adversely affected.

- **Virulence:** means the potential or severity of the microorganisms.
- **Pathogen:** means the microorganism can produce disease in human.
- **Opportunistic pathogens:** these organisms are capable of producing an infectious disease when the health and immunity of the host have been severely weakened by illness or other cause.

Agents of infectious disease

The agents of infectious disease include;

1. viruses,
2. bacteria,
3. Mycoplasma,
4. Rickettsiae, and Chlamydiae,
5. fungi
6. parasites

Viruses

- These are the smallest obligate intracellular pathogen.
- They are incapable of replication outside of living cell.

- Viruses consist of nucleic acid either RNA or DNA (genome). Surrounded by protein coat is called capsid.
- Some viruses have envelope (this envelope derived from the host cell membrane).
- Enveloped viruses include members of the herpesvirus group and paramyxoviruses such as influenza virus.

VIRUS STRUCTURE

Genetic Material

Viruses can have one of two kinds of genetic material, DNA or RNA. The latter are named retroviruses.

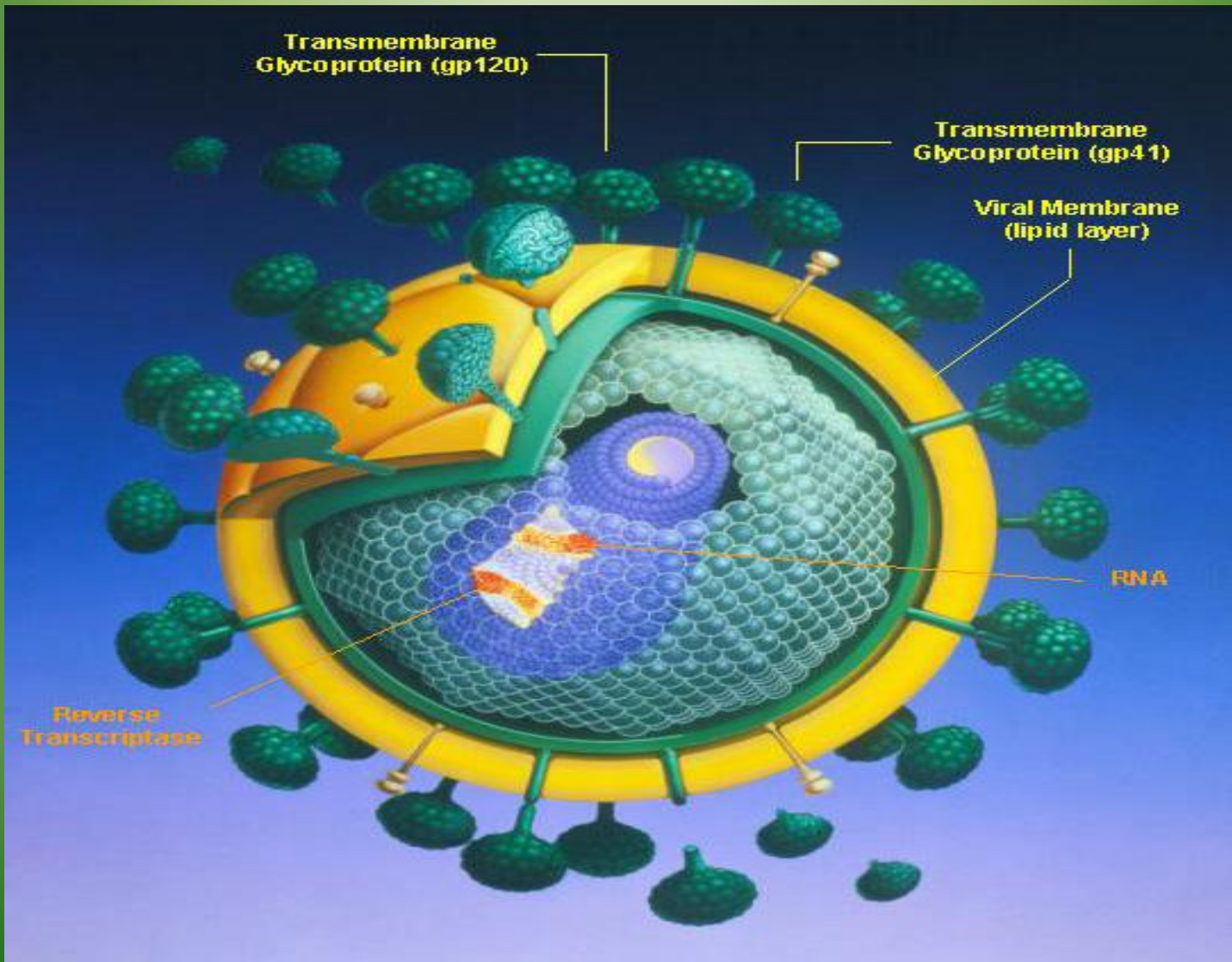
Membrane Envelope and Capsid

a layer of fatty acids coats many viruses. It is usually derived from the membrane of the host cell.



Ligands

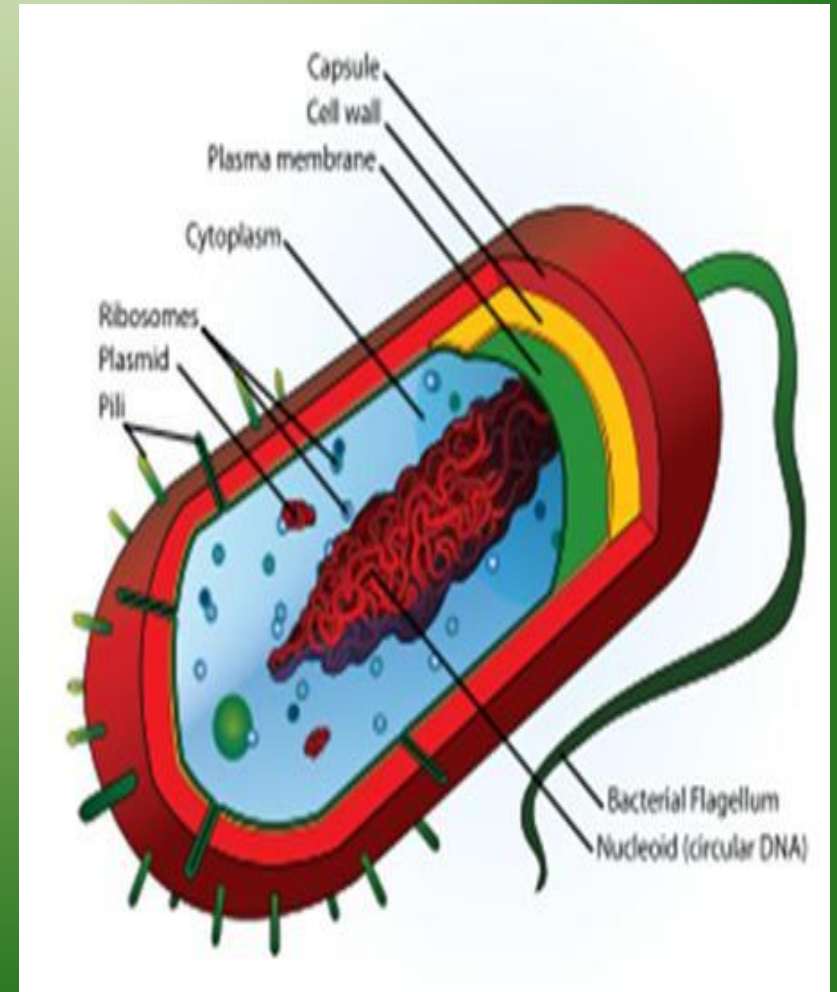
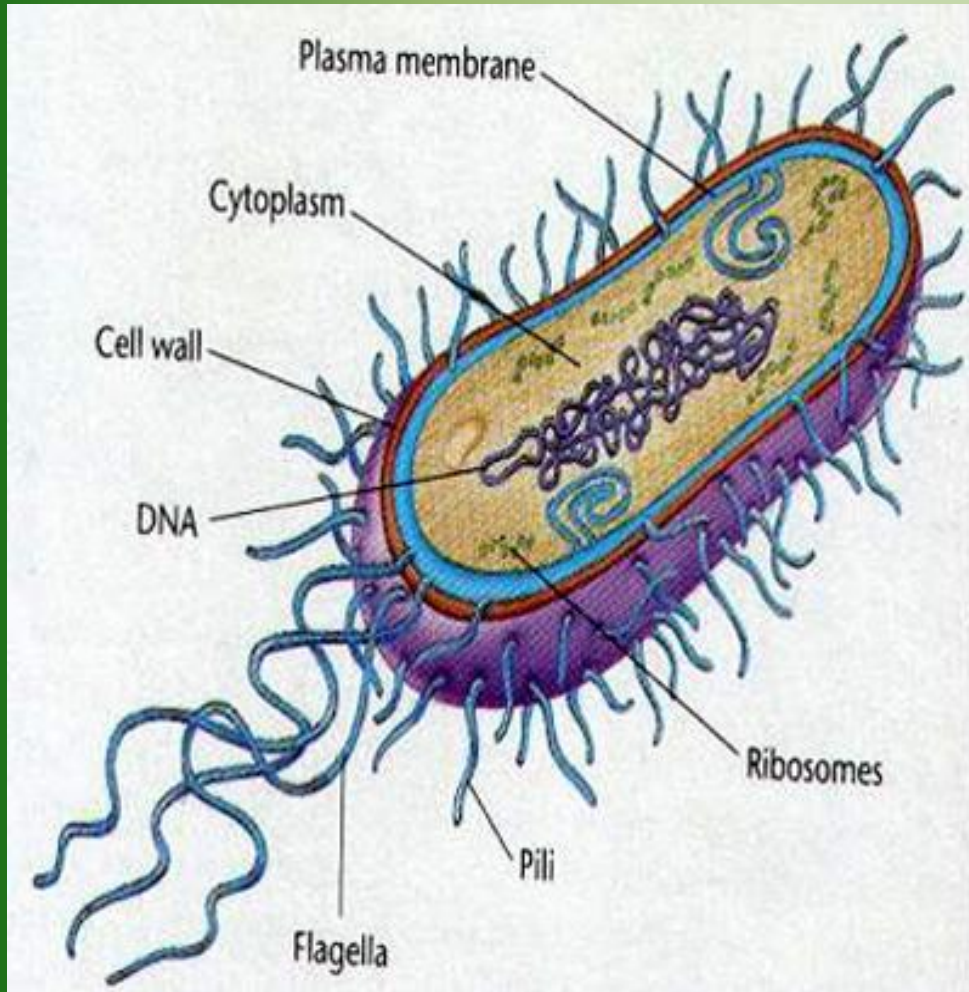
proteins that stick out of the surface of the virus. They act as a key to recognize the cell to be infected and invade it.

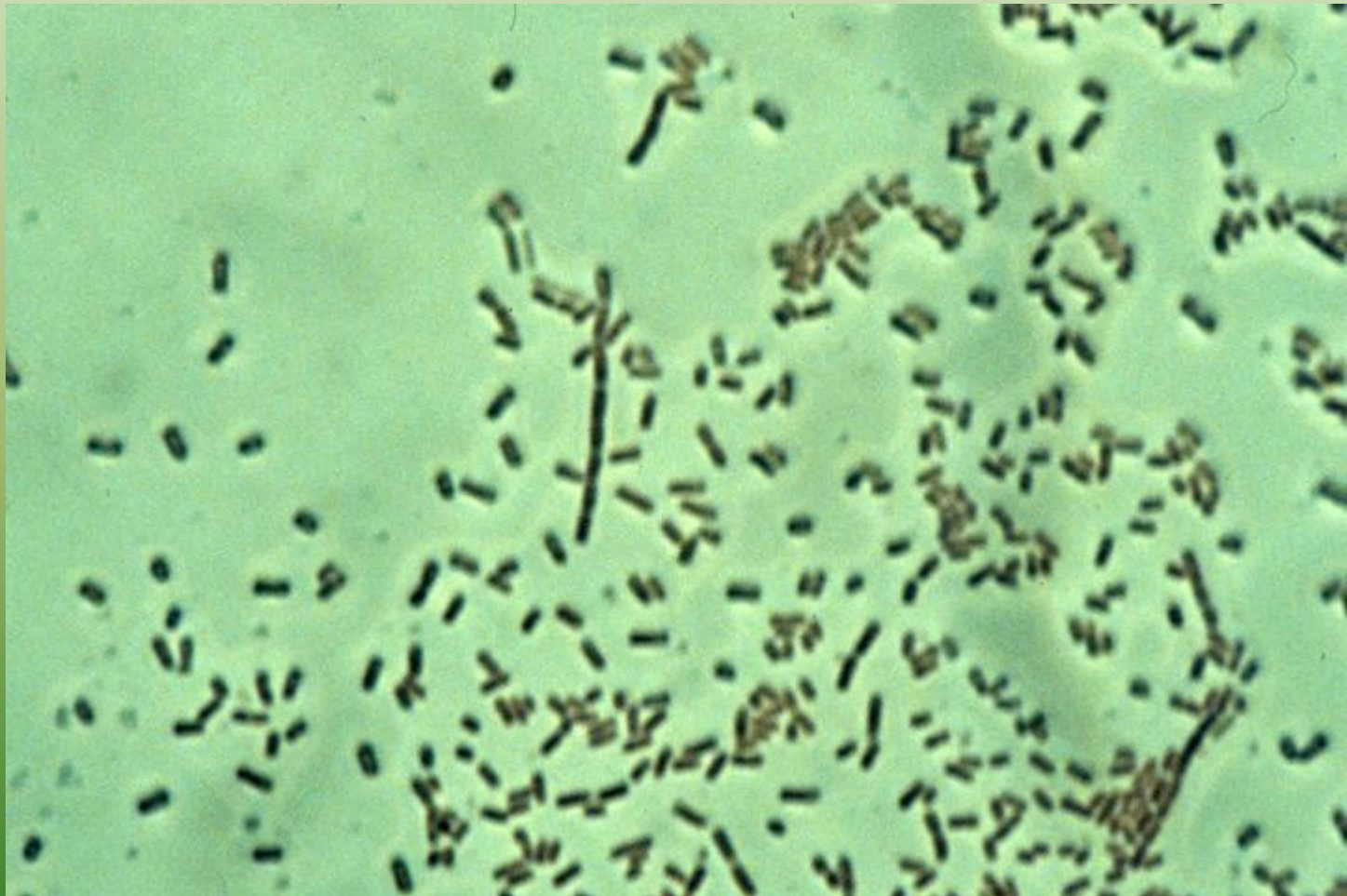


- Viruses must penetrate a susceptible living cell and use the biosynthetic machinery of the cell to produce viral progeny.
- Some viruses insert their genetic material into the host cell where the genome remains in latent, (not replicating state) for long periods without causing disease. Under the appropriate stimulation the virus undergoes active replication and produces symptoms of disease.

Bacteria

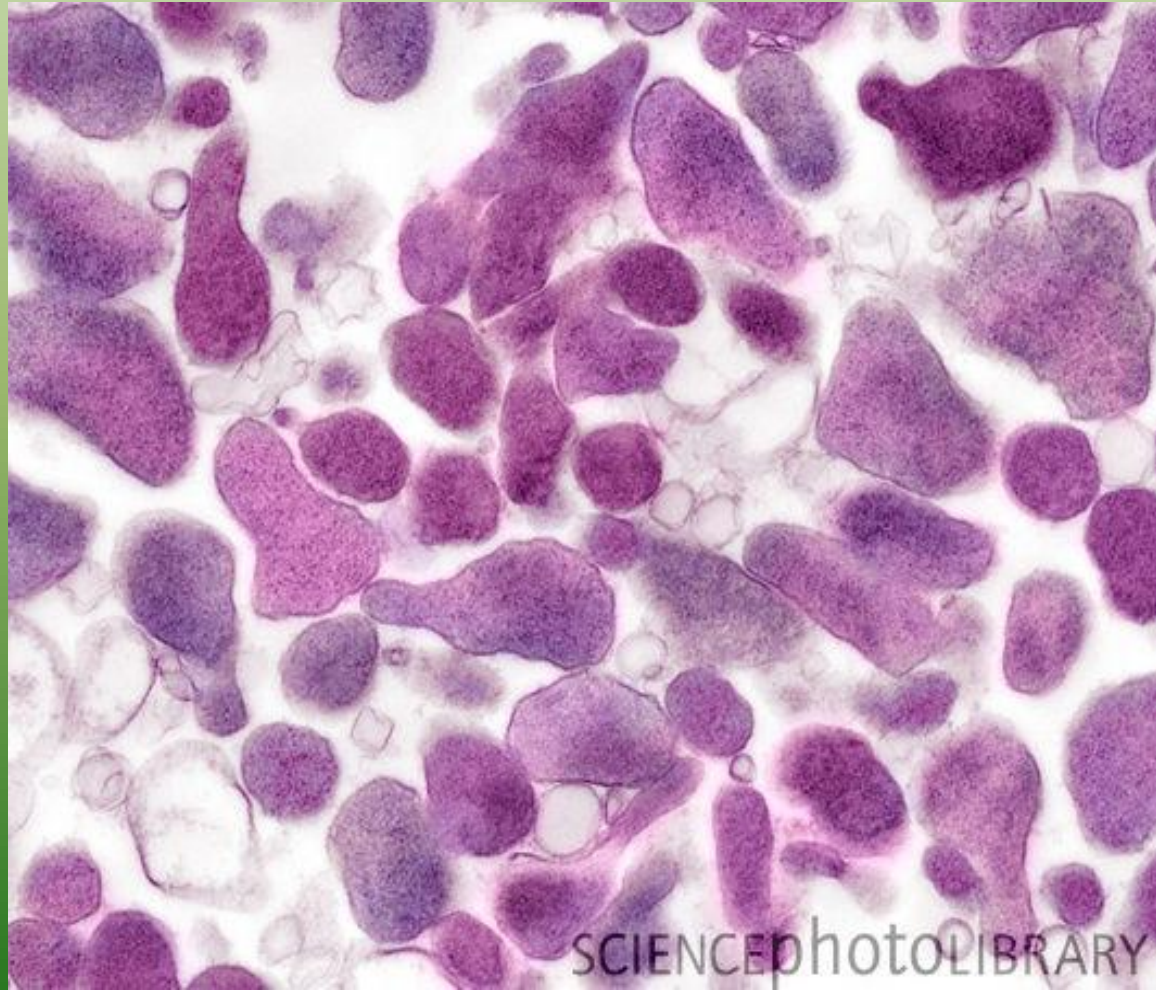
- Bacteria are autonomously unicellular organisms known as prokaryotes.
- Prokaryotes: organisms which lack an organized nucleus.
- Bacteria contain no organized intracellular organelles and only a single chromosome (genome) of DNA.
- Bacteria contain both DNA and RNA.
- The cytoplasm of bacteria contains the reproductive and metabolic machinery of the cell.
- Bacteria contain cell wall.
- Several bacteria have capsules.
- Certain bacteria are motile by flagella.
- Some have fimbriae
- Bacteria are classified according to Gram stain.





Mycoplasmas

- Mycoplasmas are unicellular prokaryotes.
- The cell is composed of cytoplasm surrounded by a membrane but have no cell wall.
- In human, mycoplasmas are commensals but some species are capable to producing pneumonia, genital infections.



SCIENCEPHOTOLIBRARY

Rickettsia and Chlamydia

- Both of them share some characteristics with viruses and other characteristics with bacteria.
- Both are obligate intracellular pathogens like the viruses.
- Both contain DNA and RNA.

Mechanisms of infection

- Epidemiology of infectious diseases:
- **Epidemiology:** is the study of factors, events, and circumstances that influence the transmission of infectious diseases among human.
- When study infectious diseases must be classified according to incidence, portal of entry, source, disease course, symptomatology, site of infection, agent, and host characteristic, so that potential outbreaks may be predicted and prevented or treated.

Portal of entry

- It refers to the process by which a pathogen enters the body, reach the susceptible tissue and produce disease. Mode of transmission are: penetration, direct contact, ingestion inhalation.
- Source:
- the source of infectious diseases refers to the, location, host, object or substances from which the infectious agent was acquired, essentially the who, what, when , and where the disease transmission.

Symptomatology

- Disease Course:
- The course of any infectious disease can be divided into several distinguishable stages after the point of time in which the potential pathogen enter the host. These stages are:
 1. Incubation period,
 2. The prodromal stage,
 3. The acute stage,
 4. Convalescent stage
 5. The resolution stage

1. Incubation period

- Is the stage during which the pathogen begins active replication without producing recognizable symptoms.
- The incubation period may be short, as in case of salmonellosis (6-24 hours), or prolonged such as hepatitis B (50-180 days).
- Incubation period can be influenced by additional factors including; general health of the host, portal of entry, and infectious dose of pathogen.

2. Prodromal stage

- The initial appearance of the symptoms in the host.
- The duration of prodromal stage can vary considerably from host to host.

3. Acute stage

- It is the period during which the host has the maximum effect of the infectious process due to rapid proliferation and dissemination of the pathogen.
- The symptoms of the host are pronounced and more specific than the prodromal stage.

Convalescent stage

- It is characterized by progressive elimination of the pathogen, repair of damaged tissue, and resolution of associated symptoms.
- The time required for complete convalescence may be days, weeks, months depends on the type of pathogen and immune response of the host.

5. Resolution

- Total elimination of the pathogen from the body with disappearance of clinical symptoms

Site of infection

Virulence factors

- These are substances generated by infectious agents that enhance the ability to cause disease.

e.g.

1. Toxins
2. Adhesion factors
3. Evasive factors
4. Invasive factors