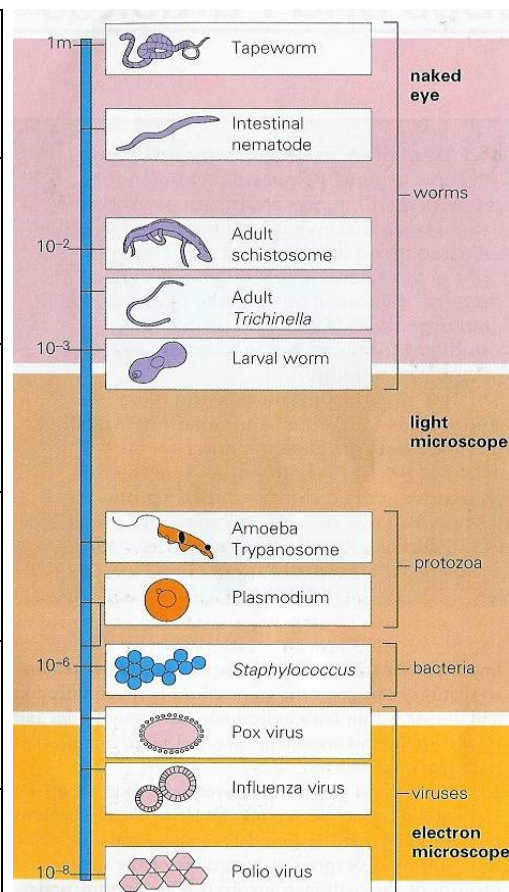


## Unit I – Problem 6,7 – Microbiology: Host-Parasite Relationships



### Parasitic organisms:

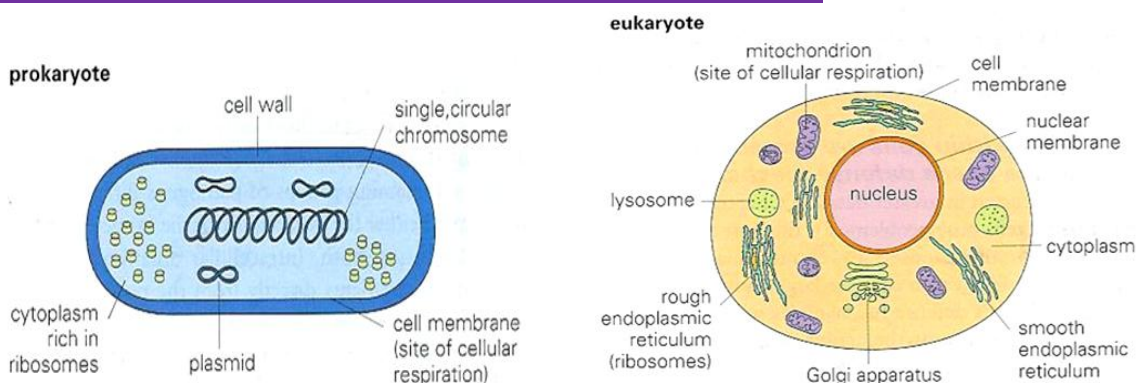
<b>Bacteria</b>	Small prokaryotic single-celled organisms with a single DNA circular chromosome and characteristic cell walls (example: E.coli)
<b>Viruses</b>	Smaller than bacteria with DNA or RNA genome; obligate parasites which cannot replicate outside host cells (example: cytomegalovirus CMV).
<b>Fungi</b>	Eukaryotes with cell walls containing chitin, cellulose (or both of them); from germinative spores (example: Candida albicans).
<b>Protozoa</b>	Single-celled eukaryotic organisms with several organelles; simple or complex life cycles (example: Plasmodium falciparum)
<b>Helminthes</b>	Small to large metazoan or multicellular organisms, or worms with simple to complex life cycles (example: A.lumbricoides).
<b>Arthropods</b>	Organisms with jointed appendages; mostly ectoparasites (example: S.scabiei).



### Relationships of microbes to the host:

- **Mutualism:** there is reciprocal benefit between both the microbe and the host.
- **Commensalism:** host will provide shelter and food for the microbe while it will cause no harm.
- **Parasitism:** microbe causing harm to its host with varying degrees.

### What is the difference between prokaryotes and eukaryotes?



### Sterile (microbe-free) anatomical sites and fluids:

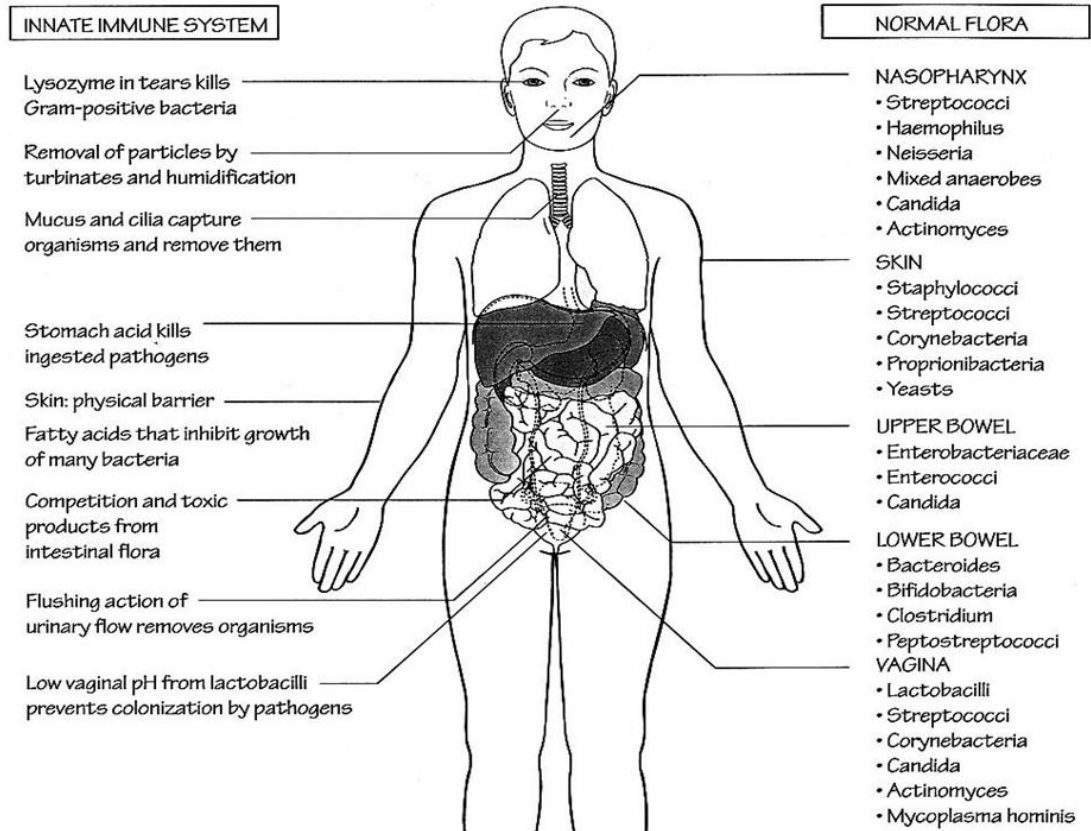
<b>Tissues and organs</b>	Heart and circulatory system, liver, kidneys, brain, lungs, muscles, bones, ovaries/testes and glands (pancreas, salivary, thyroid).
<b>Fluids of the body</b>	Blood, urine, cerebrospinal fluid, semen and amniotic fluid surrounding the fetus.

### Sites which contain normal flora:

- Skin, Upper Respiratory Tract (URT), gastrointestinal tract, external genitalia, vagina, external ear canal and external eye (lid + conjunctiva).



- Normal flora are considered as a common source of infection when they are present in the wrong site (not in their original place). In addition, they protect the sites which they live in from harmful external pathogens.



#### - Host-Parasite Relationship in Infection and Disease:

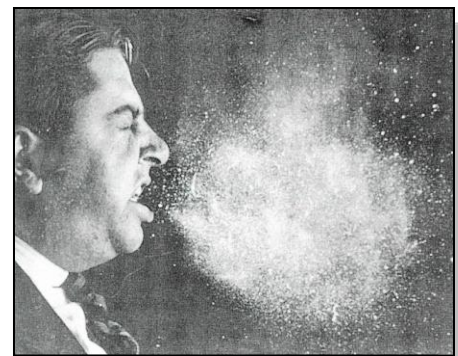
- **Encounter:** agent meets the host which it is going to invade.
- **Entry:** agent enters the host.
- **Spread:** agent which entered the host can remain localized or spread to other parts of the body.
- **Growth:** agent multiplies or completes its life cycle in the body.
- **Outcome:** either agent or the host win the battle at the end, or both of them will learn to co-exist with each other.

#### - What might be the sources of infection?

- Soil and decayed matter.
- Water contaminated with human/animal waste.
- Food (unwashed vegetables, raw meat and milk).
- Air and aerosols and dust.
- Reservoir hosts.

#### - What are the modes of transmission?

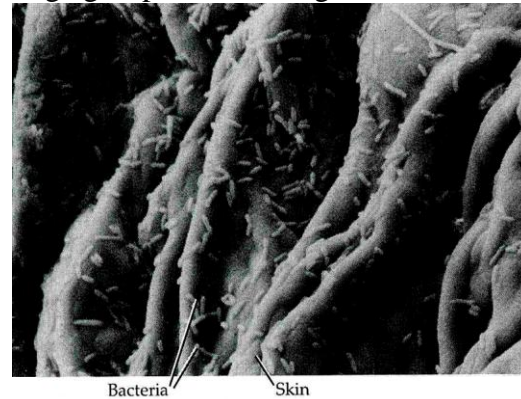
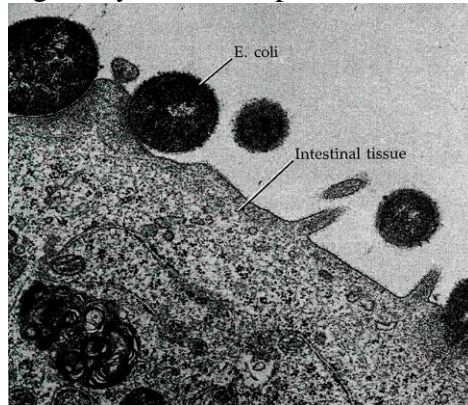
- **Inhalation:** air or aerosol-borne infective organisms.
- **Ingestion:** contaminated/infected food and water; unwashed hands.
- **Contact:** direct with the skin or penetration through mucous membranes (oral, nasal, urethral or vaginal).
- **Contamination of cuts and wounds.**
- **Arthropods and animal bites.**
- **Organ/tissue transplant and blood transfusion.**
- **Congenital/transplacenta (through the placenta).**
- **Perinatal (during delivery of the baby through birth canal).**





- **Host-parasite interface:**

- It can cause a localized infection in which the site can be determined.
- **Infection can spread to other areas through the following:**
  - ✓ Active migration (movement of the parasite itself in the body of the host).
  - ✓ Passive carriage (through blood, lymph or body fluids).
  - ✓ Intracellular carriage (e.g. semen macrophages carry HIV).
- Host must provide a proper physiological environment for the host so it can survive. This is represented by optimal pH, temperature, O<sub>2</sub> and CO<sub>2</sub>.
- Some cell membranes might contain receptors or adhesion molecules which make it easy from the parasite to adhere and enter cells of the host.
- Notice that TOLL-like receptors (Pattern Recognition Receptors) recognize pathogens by molecular pattern shared by large groups of microorganisms.



- **Human infections transmitted via urine:**

<b>Schistosomiasis</b>	Parasite eggs are excreted in urinary bladder
<b>Typhoid</b>	Bacterial persistence in urinary bladder scarred by Schistosomiasis
<b>Polyomavirus infection</b>	Commonly excreted in urine in normal pregnancy.
<b>Cytomegalovirus infection</b>	Commonly excreted in infected children.

- **Human infections transmitted via saliva:**

<b>Herpes simplex virus</b>	Infection generally during childhood
<b>Cytomegalovirus and EBV</b>	Adolescent/adult infection is common
<b>Rabies virus</b>	Shed in saliva of infected dogs, wolves, jackals and vampire bats

- **Transplacental transmission of infection:**

<b>Rubella virus, cytomegalovirus</b>	Placental lesion, abortion, stillbirth or malformations.
<b>HIV</b>	Childhood AIDS
<b>Hepatitis B virus</b>	Antigen carriage in infant, but most of these infections are perinatal or postnatal.
<b>Treponema pallidum</b>	Stillbirth, congenital syphilis with malformations
<b>Listeria monocytogens</b>	Meningoencephalitis
<b>Toxoplasma gondii</b>	Stillbirth and CNS disease

- **What are the factors which increase the risk for infections?**

- Changes in environment/ecosystem.
- Changes in food production and food handling.
- Routine use of antibiotics in medicine (which creates more resistance).
- Altered sexual/social habits.
- Increased population and housing densities.