

## Host - Parasite Relationship

➤ Human host is in contact with many microorganisms (normal flora) only a small number of these (primary and opportunistic pathogens) can cause disease.

➤ Host-parasite relationships:

Is characterized by fighting of the organism to invade the body and the body defending itself by protective measures.

### Host Resistance to Parasite Invasion is Divided into:

a) **Non specific resistance** – part of natural constitution of the host.

e.g.

- a) Skin mechanical barrier
- b) Ciliated epithelium of respiratory tract
- c) Competition by normal flora
- d) Low pH in the stomach
- e) Cough, peristalsis
- f) Lysozymes
- g) Neutrophils

b) **Specific / Acquired resistance** – to certain organism: e.g. Antibodies

**Pathogenicity** Ability of a microorganism to cause disease.

**Pathogen** A microorganism having capacity to cause disease in a particular host.

**Disease** Is the end product of an infectious process.

## Pathogens

- Can be divided according to degree of Pathogenicity into:

a) Primary pathogens:

causing disease in non immune host to that diseases.

- e.g. - *Bordetella species*  
- *Mycobacterium tuberculosis*

b) Opportunistic pathogens:

having low pathogenicity and infect people with low immunity.

- e.g. *Pseudomonas*

c) When the organism is able to produce disease even in an apparently healthy host it is referred to as PRIMARY PATHOGEN but when it causes disease only when the host's defenses are impaired, it is called SECONDARY PATHOGEN (Opportunistic pathogen).

### **Resistance:**

- Ability of the host to prevent establishment of infection by using its defence mechanisms.

### **Susceptibility:**

- Lack of this resistance

#### ➤ **Note:**

- a) Infection is simply invasion of cells and multiplication by microorganisms without tissue destruction.
- b) Virulence is an ability to invade and destroy tissue to produce disease.

Virulence is measured by the Lethal dose 50 (LD50) which is the number of organisms or mg. of toxins that will kill 50% of susceptible lab. animal – usually mice – when injected into such animal. When the LD 50 is small, the microorganism is considered highly virulent and when it is high the organism is said to be of low virulence.

### **Transmissibility**

Ability to spread from one host to another. This enables microorganism to maintain continuity of its species in the event of death of original host.

## Determinants of Pathogenicity

Before causing disease a microorganism should have the ability to:

- a) **Adherence:** ability to attach firmly to host epithelial surface.
- b) Survive host natural defense mechanisms.
- c) To multiply to large numbers.
- d) **Tissue Destruction:**

Ability to overcome host defense and invade tissue and cause destruction to produce clinical disease.

### a) Adherence:

- By means of adhesins (attachment apparatus) on bacterial surfaces.

- e.g.
- a) Pili
  - b) Other protein surface structures

#### b) Structures on host cells include:

- a) Fibronectin
- b) Proteins and glycopeptide parts

#### **c) Tissue destruction is produced by:**

- a) Toxin production either
  - Exotoxin
  - Endotoxin
- b) Invasion by
  - Capsulated or
  - Non-capsulated

➤ Capsulated organism bacterial capsules are all made of polysaccharide except that of *B. anthracis* (made of polypeptide).

➤ Capsule prevent phagocytosis:

- But such organisms are readily killed once they are phagocytosed. So called extracellular organisms e.g. *Pneumococcus*

➤ Non capsulated organism resist intracellular killing so called intracellular organisms.

e.g. *M. Tuberculosis, Salmonella typhi, Brucella etc.*

➤ Exotoxin can be:

a) A - B exotoxins

e.g. Cholera toxins

A = Active Unit

B = Binding Unit for attachment

b) Membrane active exotoxin

e.g. Haemolysin of group A Streptococci

## Exotoxin

## Endotoxin

1- Protein

Lipopolysaccharide

2- Soluble & Diffusible

Part of cell wall

3- Heat Labile

Heat stable

4- Pharmacologically specific action

Non-Specific

5- High Immunogenicity

Low Immunogenicity

6- Inactivated by Chemicals to  
toxoids

Do not form toxoids

7- No Fever

Induce Fever

### Koch's Postulates

- For a microorganism to be accepted as the cause of an infection disease it must satisfy all or most of these criteria:
- 1) The organism must be found in all cases of the **disease** and its distribution in the body must correspond to that of the **lesions** observed in the host.
  - 2) The organism should be **cultured** in pure culture from all cases of the disease.  
**N.B.** Some organisms are yet to be cultured in the lab.  
*e.g.. Treponema pallidum, M. leprae.*
  - 3) The organisms should **reproduce** the disease in other susceptible animal hosts.
  - 4) **Antibodies** to the disease usually develop in the course of the disease.