



Lecture Title:

HOST PARASITE RELATIONSHIP

(Foundation Block, Microbiology)

Lecturer name: *Prof. Hanan Habib,*
Dr. Ali Somily

Department of Pathology, Microbiology Unit

Lecture Objectives..



By the end of this lecture, the student should be able to:

1~Define core terms important in understanding host~parasite relationship: parasite, pathogen, pathogenicity, disease, infection.

2~Know host response to parasite invasion that include; nonspecific and specific defense mechanisms.

Lecture Objectives..



- 3~Name the important examples of primary pathogens and opportunistic pathogens.
- 4~ Recognize the differences between virulence and pathogenicity and know how virulence is measured.
- 5~ Recognize the transmissibility of pathogens.

Lecture Objectives..



- 6~ Describe the attributes of pathogenicity and recalls examples, including:
 - a~ Adherence
 - b~ Survival of host natural defence mechanisms
 - C~Invasion (capsulated and non capsulated organisms)
 - d~ Multiplication
 - e~ Tissue destruction by toxins (the differences between endotoxins and exotoxins)
- 7~ States Koch's postulates.



Host ~ Parasite Relationship

- Human host is in contact with many microorganisms called **normal flora or commensals** but can cause disease and called **opportunistic pathogens**.
- **Primary pathogens**, strict pathogens or virulent bacteria
- **Non-Pathogenic bacteria**, they will never cause disease

Pathogens



- Can be divided according to degree of Pathogenicity into:

a) Opportunistic (or secondary) pathogens:

having low pathogenicity and infect people with impaired host's defense mechanism.

e.g. *Pseudomonas*

b) Primary pathogens:

causing disease in non immune healthy host to that diseases.


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

Host~parasite relationships:



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

Pathogenicity  The ability of a microorganism to cause a disease.

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

Infectious Disease  Is the end product of an infectious process (tissue damage → health change).

➤ A Pathogenicity



Host Resistance to Parasite Invasion is Divided into:

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

e.g.

1. Competition by normal flora
2. Skin mechanical barrier
3. Lysozymes
4. Ciliated epithelium of respiratory tract
5. Cough
6. Low pH in the stomach
7. peristalsis
8. Neutrophils

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



Disease in the host

Resistance:

- The ability of the host to prevent establishment of infection by using its defense mechanisms.

Susceptibility:

- Lack of this resistance and establishment of disease.

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. (the degree of pathogenicity)

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

- The 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



Exposure to Pathogen



Adherence (Adhesion,
Colonization, Growth)

Escape the Host Natural Defense Mechanism



Invasion Toxicity



Tissue Damage

Infectious Disease



a) Adherence:

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

e.g. a) Pili

b) Other surface protein 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



Organisms

- Capsulated organisms 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 phagocytized. So called extracellular organisms
e.g. *Pneumococcus*



- Non capsulated organisms resist intracellular killing so called intracellular organisms.

e.g. *M. tuberculosis, Salmonella typhi, Brucella species, etc.*

- **Exotoxin** can be:

a) **A - B -exotoxins**

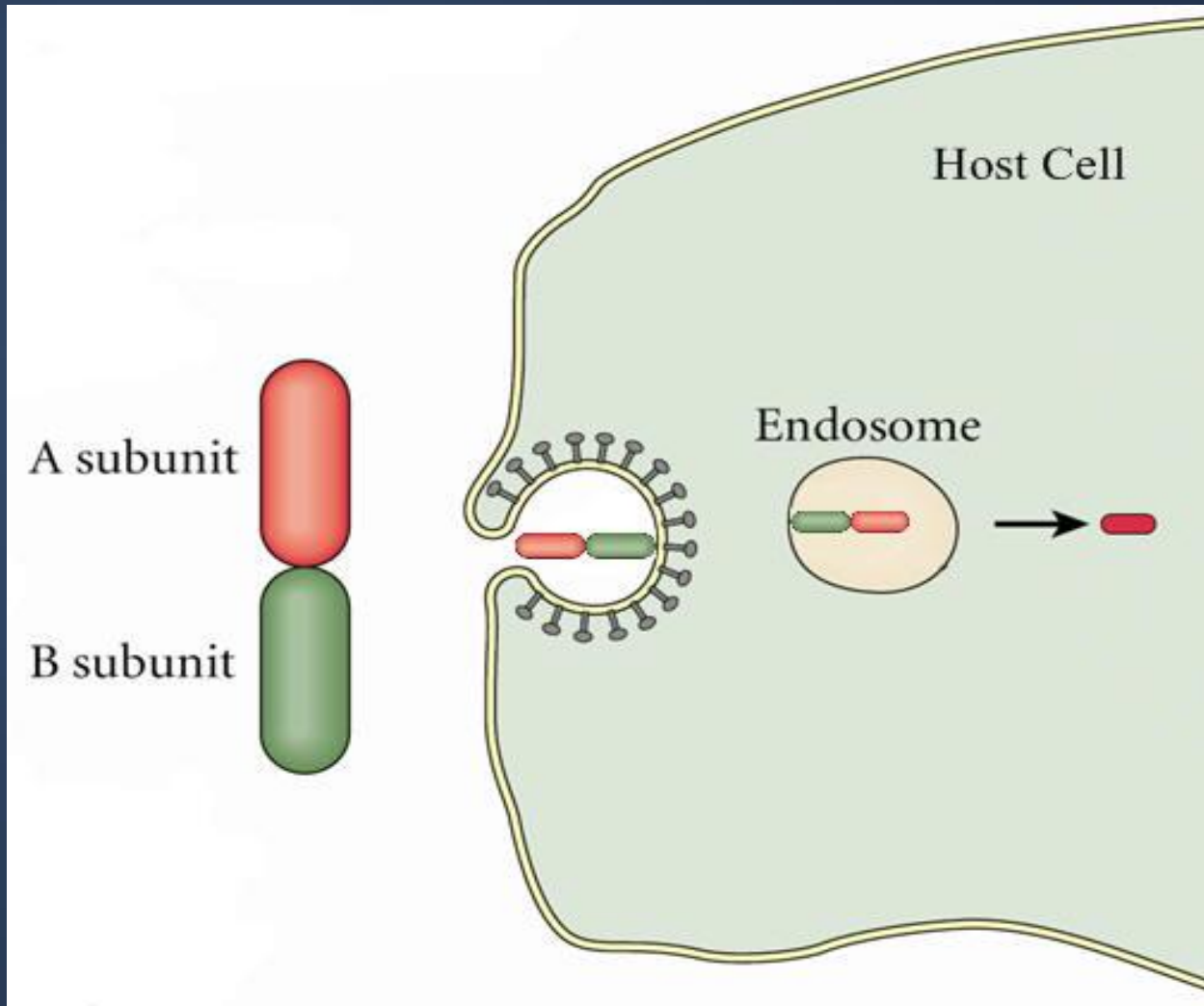
e.g. Cholera toxins

A = Active Unit

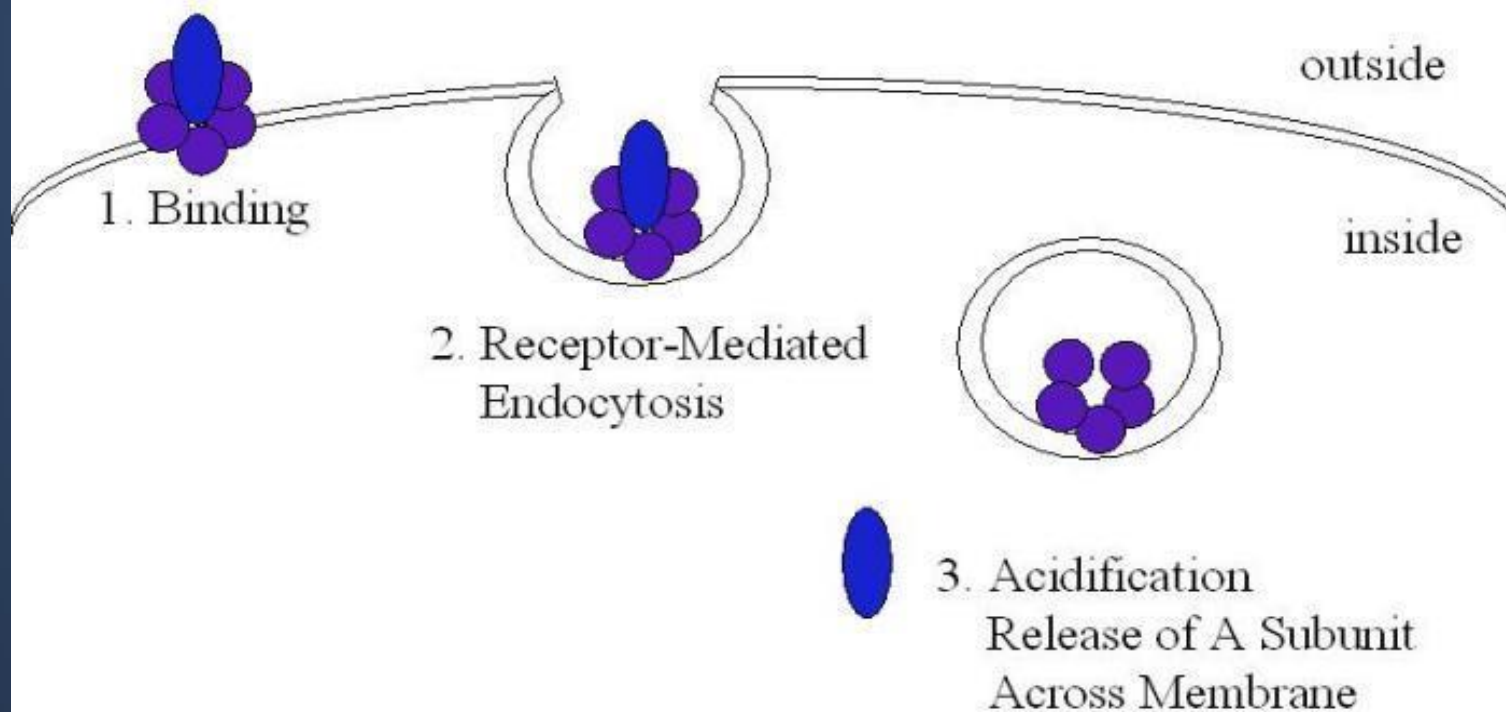
B = Binding Unit for attachment

b) **Membrane active exotoxin**

e.g. Haemolysin of group A Streptococci



A-B Toxin Entry



Exotoxin versus Endotoxin

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

If a microorganism is the causative (etiologic) agent of an infectious disease, it **must** be:

1. **Present** in every case of the disease, but absent from the healthy host
2. **Isolated** and grown in pure culture
3. Able to **Cause** the disease when a pure culture is inoculated into a healthy host
4. **Re-isolated** from the host that was inoculated with the pure culture

Reference book and the relevant page numbers..



Sherries page 149~172 *SHERRIS* MEDICAL
MICROBIOLOGY, AN INTRODUCTION TO
INFECTIOUS DISEASES.

KENNETH RYAN / GEORGE RAY. LATEST
EDITION.

PUBLISHER MC GRW HILL

CHAPTER 10, PAGE 149~ 172



Thank You 😊

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Prof. Hanan Habib & Dr. Ali Somily