

Lecture Title:

HOST PARASITE RELATIONSHIP

(Foundation Block, Microbiology)

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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 (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.

- **It can be discussed under:**

- A) Pathogenicity**

- B) Normal flora**

Pathogenicity



The 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.

➤ A Pathogenecity

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

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*

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.

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.

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)**.

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

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 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 phagocytosed. 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**

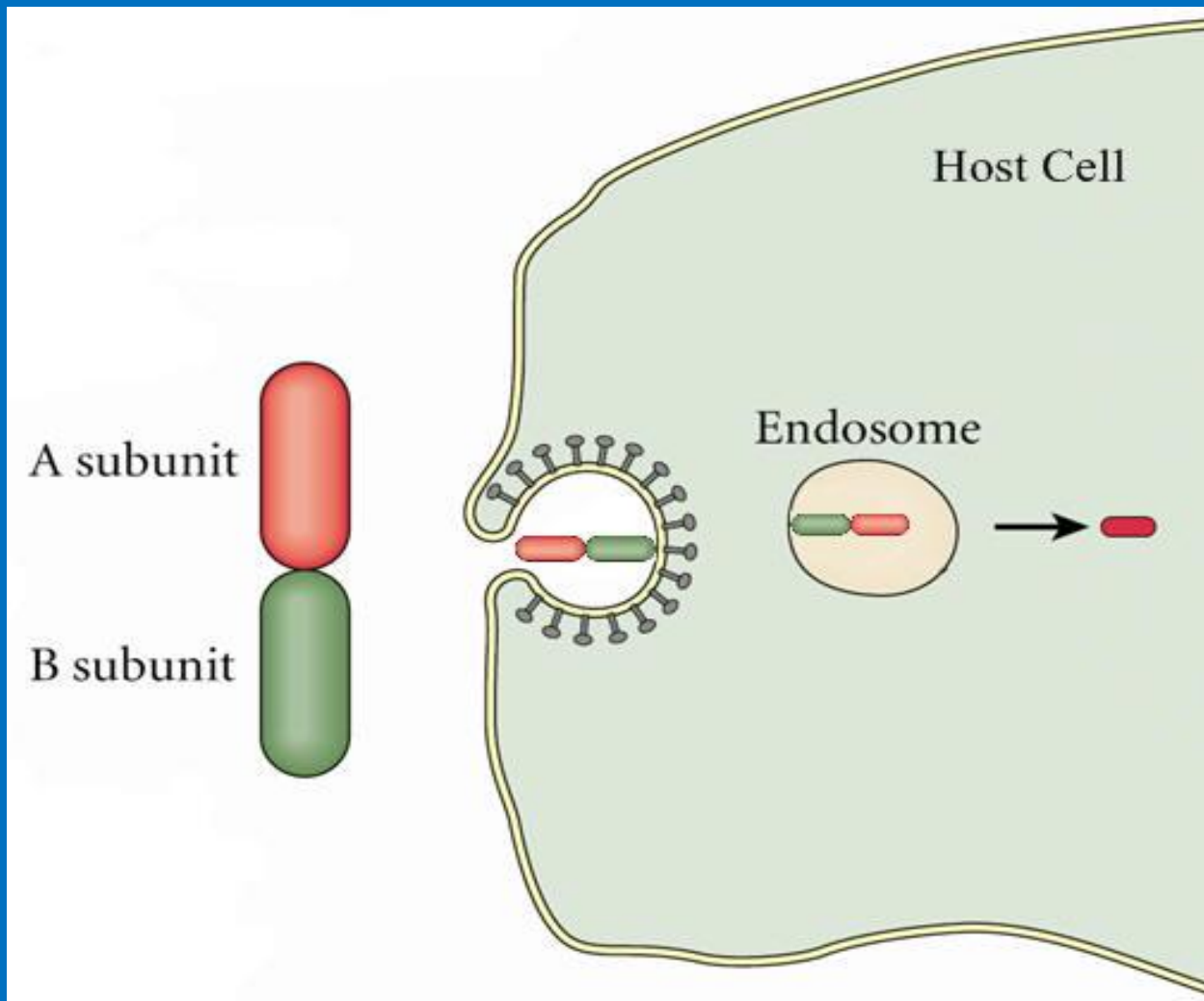
e.g. Cholera toxins

A = Active Unit

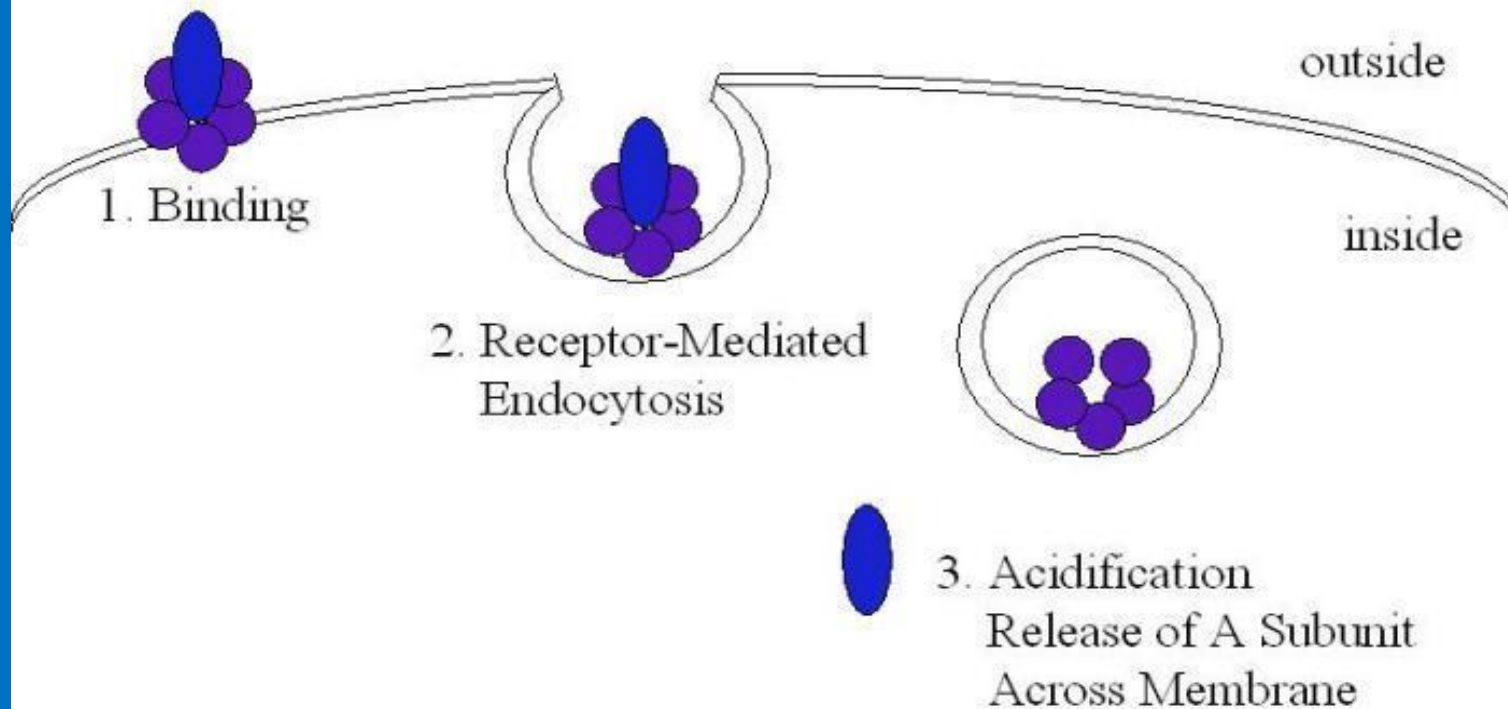
B = Binding Unit for attachment

b) **Membrane active exotoxin**

e.g. Haemolysin of group A Streptococci



A-B Toxin Entry



Exotoxin versus Endotoxin

Exotoxin	Endotoxin
1~ Protein 2~ Soluble & Diffusible 3~ Heat Labile 4~ Pharmacologically specific action 5~ High Immunogenicity 6~ Inactivated by Chemicals to toxoids 7~ No Fever	Lipopolysaccharide Part of cell wall Heat stable Non-Specific Low Immunogenicity Do not form toxoids Induce Fever

Koch's Postulates

- For a microorganism to be accepted as the cause of an infectious 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.

Koch's Postulates (continued)

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) The organism should be cultured and antibodies to the disease usually develop in the course of the disease.

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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