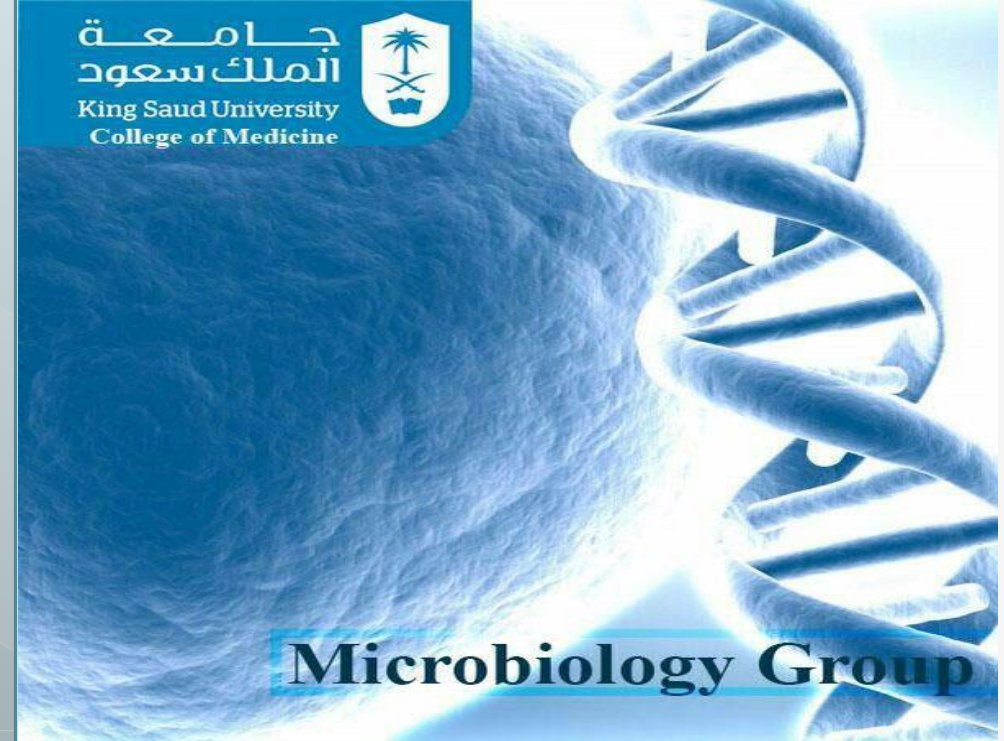


*Host – Parasite  
Relationship*

جامعة  
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College of Medicine



**Microbiology Group**

**LECTURE**  
**3**

# Objectives

- Define core terms important in host-parasite relationship.
- Know host response to parasite invasion (specific and non-specific responses).
- Know important examples of primary and secondary pathogens.
- Recognize the differences between virulence and pathogenicity and know how virulence is measured.
- Recognize the transmissibility of pathogens.
- Describe the attributes of pathogenicity and recall examples.
- State Koch's postulates

# Terms To-Be Familiar With “Definitions”

- **Pathogenicity:**

The ability of a microorganism to cause disease. (الإمراضية)

- **Pathogen:**

A microorganism having capacity to cause disease in a particular host. (الممرض)

- **Disease:**

Is the end product of an infectious process. (المرض)

- **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.

# Terms To-Be Familiar With “Definitions”

- **Infection:**

is simply **invasion** of cells and multiplication by microorganisms without tissue destruction.

- **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:**

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.

# Host-Parasite Relationship

- Human host is normally in contact with many microorganisms (**normal flora**), only a small number of these microorganism (**primary and opportunistic pathogens**) can cause disease.
- **Host-parasite relationship** Is characterized by fighting of the organism to invade the body and the body defending itself by protective measures.
- **Can be discussed under:**

Pathogenicity

Normal Flora

# Pathogenicity

## ◦ Host Resistance to Parasite Invasion is divided into:

### Non-specific Resistance

- Part of natural constitution of the host
- **EXAMPLES:**
- Skin mechanical barrier
- ciliated epithelium of respiratory tract
- Competition by normal flora
- Low pH in the stomach
- Cough
- Peristalsis<sup>(1)</sup>
- Lysozymes<sup>(2)</sup>
- Neutrophils

### Specific “Acquired” Resistance

- To certain organism:
- **EXAMPLE:**
- Antibodies

# Explanation:

Peristalsis: ●

The progressive wave of contraction and relaxation of a tubular muscular system, especially the alimentary canal by which the contents are forced through the system.

Lysozymes: ●

An enzyme that is destructive of bacteria and functions as an antiseptic.

# Pathogens

- Can be divided according to degree of Pathogenicity into:

## Primary Pathogens

- cause disease in non immune host to that disease
- When the organism is able to produce disease even in an apparently healthy host it is referred to as **Primary Pathogen** .
- **EXAMPLES:**
  - *Bordetella species*
  - *Mycobacterium tuberculosis*

## Opportunistic Pathogens

- having low pathogenicity and infect people with low immunity
- When the organism causes disease only when the host's defenses are impaired, it is called “secondary pathogen” **Opportunistic Pathogen**
- **EXAMPLE:**
  - *Pseudomonas*



# Determinants of Pathogenicity

- **Before causing disease a microorganism should have the ability to:**

## Adherence

- Ability to **attach** firmly to host epithelial surface

Survive host  
natural  
defense  
mechanisms

To multiply to  
large  
numbers

## Tissue Destruction

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

# Adherence

- By means of adhesions (**attachment apparatus**) on bacterial surfaces
- **EXAMPLES:**
  - Pili
  - Other protein surface structures
- Structures on host cells include:
  - a) Fibronectin
  - b) Proteins and Glycopeptide parts

# Tissue Destruction

- Produced By:

Toxin Production  
either

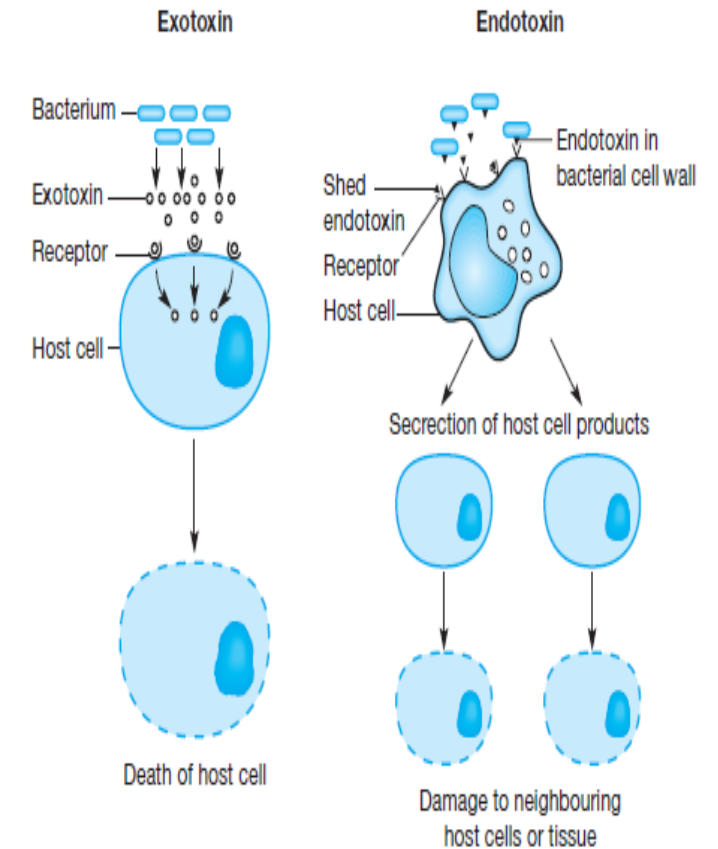
- Exotoxin
- Endotoxin

Invasion  
by

- Capsulated organisms
- Non-capsulated organisms

# Toxins

Exotoxin	Endotoxin
Protein	Lipopolysaccharide
Soluble & Diffusible	Part of Cell Wall
Heat Labile	Heat Stable
Specific Pharmacological Action	Non-Specific
High Immunogenicity	Low Immunogenicity
Inactivated by Chemicals to Toxoids	Do not form Toxoid
Do not Induce Fever	Induce Fever



# Exotoxins:

o Can Be:

**1-A-B Exotoxins**

**EXAMPLE:**

**Cholera Toxins**

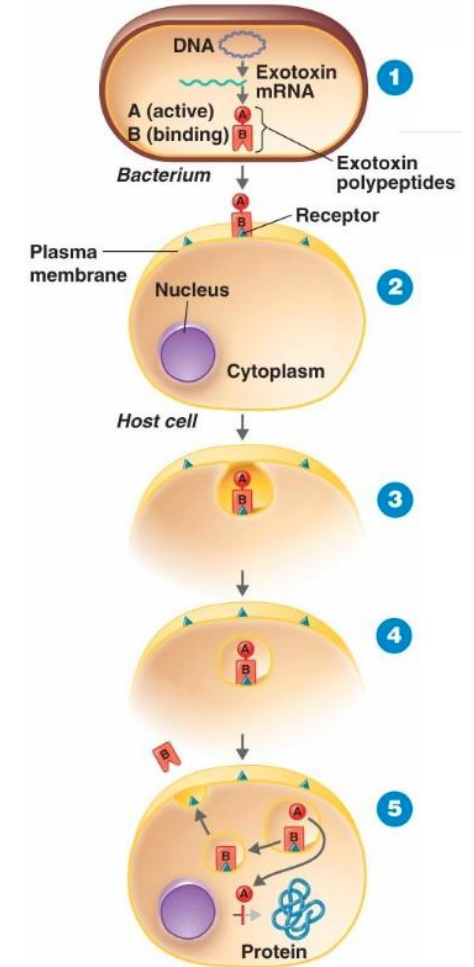
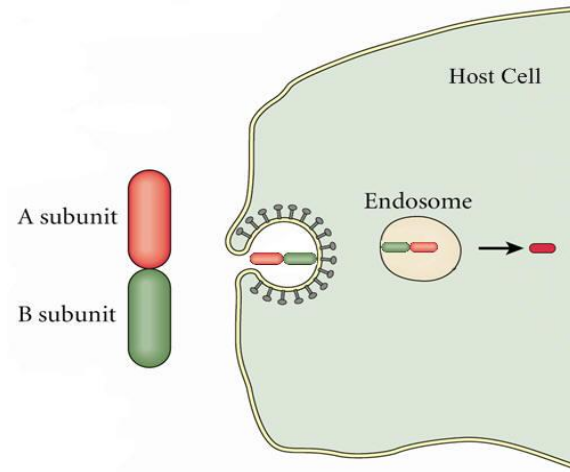
A = Active Unit

B = Binding Unit for Attachment

**2-Membrane Active Exotoxin**

**EXAMPLE:**

**Haemolysin of Group A Streptococci**



# Capsulated And Non-capsulated Organisms:

## Capsulated


- Bacterial capsules are **ALL** made of **polysaccharide** except that of **Bacillus anthracis** made of **polypeptide**.
- Capsule prevent phagocytosis
- Capsulated organisms are called **extracellular organisms** and they are phagocytosed.  
**EX: Pneumococcus**

## Non-Capsulated

- Non-Capsulated organisms resist intracellular killing so they are called **intracellular organisms**.
- **EX: Mycobacterium tuberculosis, Salmonella typhi, Brucella species.**

# 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:



- 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.




- The organism should be cultured in pure culture from all cases of the disease.



- The organisms should reproduce the disease in other susceptible animal hosts.



- Antibodies to the disease usually develop in the course of the disease.



**N.B.**  
Some organisms cannot be cultured in the lab.

**EXAMPLE:**  
*Treponema pallidum*,  
*Mycobacterium leprae*.

# Thank You

قال تعالى:

(فَمَنْ كَانَ يَرْجُوا لِقَاءَ رَبِّهِ فَلْيَعْمَلْ عَمَلًا  
صَالِحًا وَلَا يُشْرِكْ بِعِبَادَةِ رَبِّهِ أَحَدًا)



## DONE BY:



- Alhanouf AlMohanna



- AlJouhara AlDahsh



- Abudalaziz AlMani



- Amal Afrah



- Aya AlDayel



- Deema AlRajhi



- Dhaherah AlJohani



- Hanan Khoshaim



- Jawaher AlOmran



- Manal AlHamdan



- Nouf AlMasood



- Rawa AlOhali



- Reema Hazazi



- Reema AlHammad



- Wajda AlHathali

## MCQ's

..... Is an example of specific resistance: ●

Cough b) **Antibodies** c) Neutrophils d) Peristalsis (a

Opportunistic Pathogens: ●

Is the end product of an infectious process. (a

**Have low pathogenicity and infect people with low immunity.** (b

Is a microorganism that have capacity to cause disease in a particular host. (c

One of these is not a characteristic of Exotoxin: ●

High immunogenicity b) heat labile c) **Gram negative bacteria** d) No fever (a

## MCQ's

.....are organisms that are readily killed once they are phagocytosed. ●

**Extracellular organisms** b) Non capsulated organism c) Intracellular organisms (a

Resistance is the ability of the host to prevent establishment of infection by using its ●  
defense mechanisms.

a)**T** b)F

When the lethal dose 50 is high the microorganism is considered highly virulent ●

a)T b)**F**

All bacterial capsule are made of polysaccharide. ●

a)T b)**F**

## Related Videos:

<http://youtu.be/5yGbxyOpZRk> ○

<http://youtu.be/4j6jikayKZA> ○

<http://youtu.be/gbpPxJ3zBTE> ○

