

Microbiology – Lecture

Host parasite relationship



TEAM 437

Red: important

Green : doctor notes

Black : original slides

Grey: extra information

In this link, you will find any corrections or notes unmentioned in the team's work. Please check the link below **frequently**.

https://docs.google.com/presentation/d/1yIQ3G8UDFG6xYMRhXkTk-dS54NeTfhJaPe_y0M-kjk/edit?usp=sharing



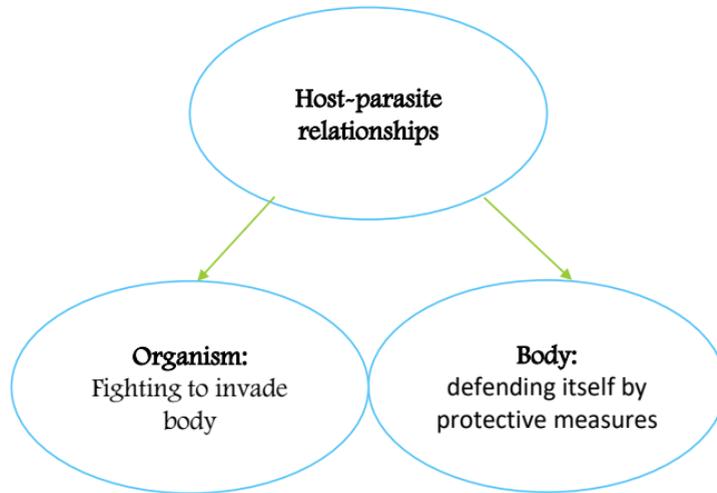
Objectives

- 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.
- 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.
- 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 normally in contact with **many microorganisms** (*normal flora*) or (*commensals*), only a small number of these microorganism (primary and opportunistic pathogens) can cause disease.



Definitions



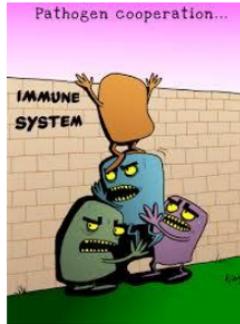
MICROBIOLOGY
437

Pathogenicity:

The ability of a microorganism to cause disease.

Pathogen:

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



Disease:

is the end product of an infectious process.



Transmissibility:

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

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.

Pathogens



MICROBIOLOGY

437

➤ Can be divided according to the **degree of Pathogenicity** into:

Primary
pathogens:

Cause disease in non-immune host to that organism(diseases). Can cause disease even with strong immune system. Ex:

- Bordetella species
- Mycobacterium tuberculosis

Opportunistic
pathogens:

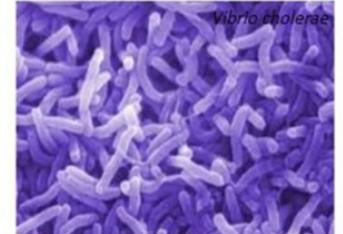
having low pathogenicity and infect people with low immunity. Only cause disease when the immune system is weak. Ex:

- Pseudomonas

True vs. Opportunistic Pathogen

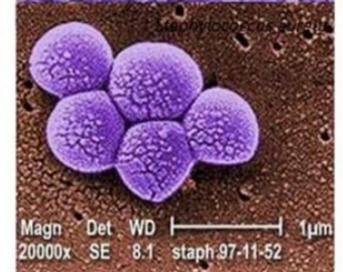
True pathogen

- Causes disease in healthy individuals
- Associated with a specific and recognizable disease



Opportunistic pathogen

- Causes disease in immune compromised host
- Gain access (injury) to sterile regions





Infection and virulence

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.

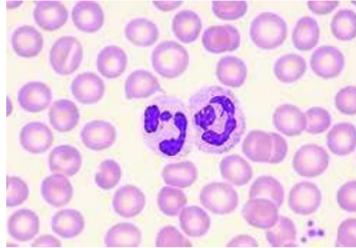


Pathogenicity :

Host Resistance To Parasite Invasion

Non specific defense : is 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 (movement of intestines)
- ✓ Lysozymes (abundant in the eye)
- ✓ Neutrophils (WBC)



specific defense : is acquired resistance to certain organism

- ✓ formation of Antibodies



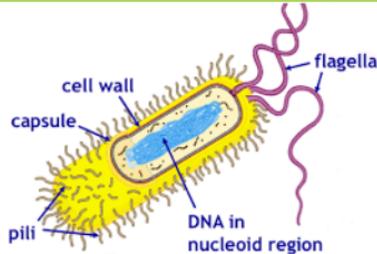


Determinants of Pathogenicity

- Before causing disease, the microorganism should have the ability to:

a) Adherence : the ability to attach firmly to host epithelial surface.	b) Survive host natural defense mechanisms.
c) Multiply to large numbers.	d) Tissue Destruction :the ability to overcome host defense , invade the tissues and cause destruction to produce clinical disease.

Adherence:



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

examples:

- a) Pili
- b) Other protein surface structures

Structures on host cells involved in adhesion include:

a) Fibronectin

b) Proteins and Glycopeptide parts

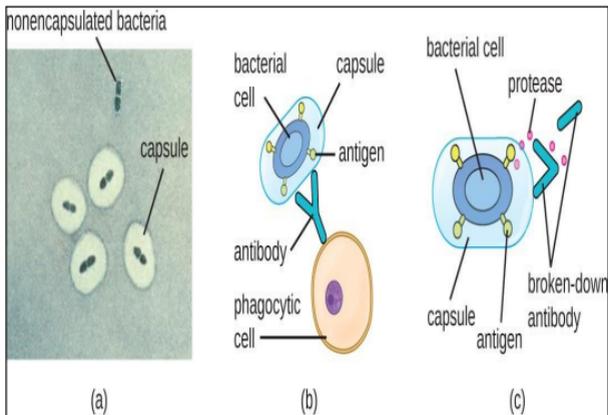
Tissue destruction



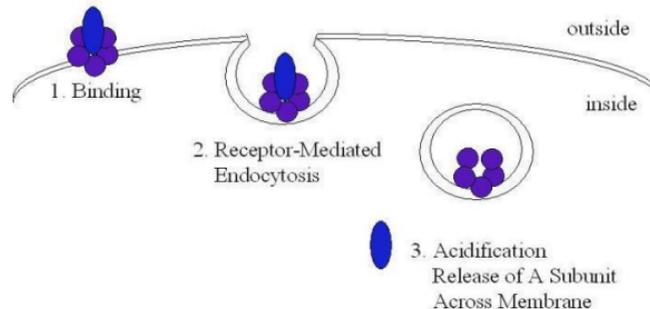
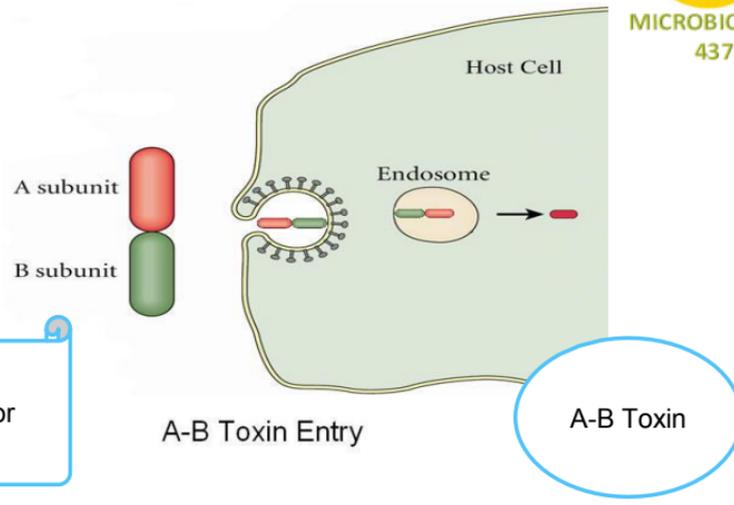
➤ Tissue destruction is produced by:

Toxin production		Invasion by: الغزو	
<p>Endotoxin سم داخلي: only found in gram negative bacteria.</p>	<p>Exotoxin سم خارجي: produced outside the gram positive and gram negative bacteria.</p> <p>Exotoxin can be:</p> <p>A) A - B –exotoxins</p> <p>e.g. Cholera toxins</p> <p>B) Membrane active exotoxin</p> <p>e.g. Hemolysin of group A Streptococci</p>	<p>Capsulated organisms, bacterial capsules are all made of <u>polysaccharide</u> except that of Bacillus anthracis (made of polypeptide).</p> <p>Capsule prevent phagocytosis: such organisms are readily killed once they are phagocytosed. So they're called extracellular organisms</p> <p>e.g. Pneumococcus</p>	<p>Non capsulated, organisms resist intracellular killing so they're called intracellular organisms.</p> <p>e.g.</p> <ul style="list-style-type: none">- Mycobacterium tuberculosis- Salmonella typhi- Brucella species

Tissue destruction



Capsulated and non-capsulated bacteria

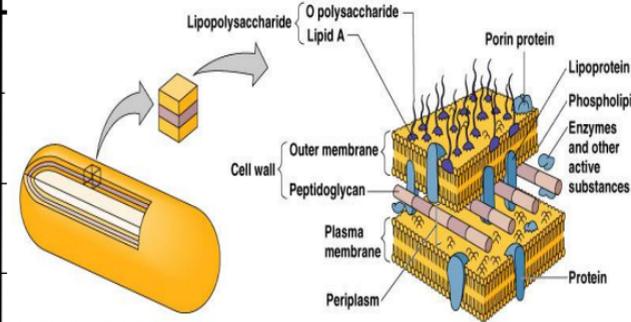


Exotoxin versus Endotoxin



MICROBIOLOGY
437

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



(c) Gram-negative cell wall

Copyright © 2004 Pearson Education, Inc., publishing as Benjamin Cummings.

Koch's Postulates



MICROBIOLOGY

437

a) 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.

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

For a microorganism to be accepted as the cause (Causative/etiologic agent) of an infectious disease it must satisfy all or most of these criteria:

b) 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.

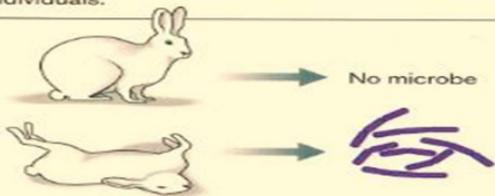
e.g. *Treponema pallidum*, *M. leprae*.

d) Antibodies to the disease usually develop in the course of the disease.



Koch's Postulates

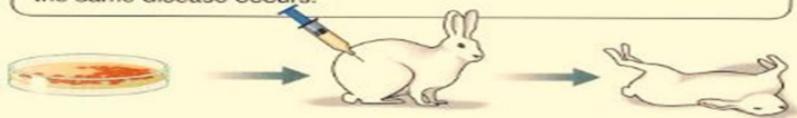
1. The microbe is found in all cases of the disease but is absent from healthy individuals.



2. The microbe is isolated from the diseased host and grown in pure culture.



3. When the microbe is introduced into a healthy, susceptible host, the same disease occurs.



4. The same strain of microbe is obtained from the newly diseased host.



Koch's Postulates

- In order to identify what organism causes a specific disease, certain rules are followed.
- Koch Postulates:
 - 1) pathogen must be found in subject with disease but never in a healthy subject
 - 2) pathogen can be isolated from sick person and grown in lab
 - 3) pathogens injected into healthy person will cause the individual to become infected with the same disease
 - 4) injected pathogens can be isolated from newly infected individual and are identical to original pathogens



Questions

1-Refers to a microorganism having the capacity to cause disease in a particular host?

- a) *Antigen* b) *Infection* c) Pathogen d)Flora

2- The ability of the host to prevent establishment of infection by using its defence mechanisms?

- a) Resistance b) Susceptibility c)Pathogenicity d) Disease

3- An example of a primary pathogen?

- a)Tuberculosis b) *Pseudomonas* c) Mycobacterium tuberculosis d)E.coli

4-An ability to invade and destroy tissue to produce disease is referred to as?

- a) Infection b)Disease c) Virulence d) Pathogenicity



Questions and video

5-Example of endotoxin?

- a) Protein b)Virus c) Bacteria d) Lipopolysaccharide

6- A determinant of pathogenicity?

- a) Tissue Repair b) Inflammation c) Tissue Destruction d)Bacteria

7- The ability to spread from one host to another is transmissibility

- a) True b) False

Useful video: <https://youtu.be/nhj4I6YdVBo>

1-C 2-A 3-C 4-C 5-D 6-C 7-A



MED437
KING SAUD UNIVERSITY

لايقوى الإنسان في الحياة على هذه الأرض من دون أن يعاونه الناس ويقفوا معه.



MICROBIOLOGY
437

Team members:

الهام العلامي	فهد الفايز	داود إسماعيل
رناد المقرن	سعد الهداب	عمر الفوزان
هديل عورتاني	خالد الدوسري	عبدالله الزهراني
اسراء النزاوي	خالد المطيري	معن شكر
لمياء القويز	أنس السيف	عبدالمجيد الوردي
شوق القحطاني	عبدالجبار اليماني	محمد إبراهيم
نورة القاضي	عبدالله السرجاني	عمر السحبياني
افنان المصطفى	عبدالعزیز الدخيل	سيف المشاري
رهدف الشمري	عادل العريني	سعد العقيلي
الهوف الجلود	محمد الدويغري	فهد الشغيرثي
		حسين علامي

Team leaders:

غادة الحيدري ، علي الشحادة

For any corrections, suggestions or any useful information please contact us at:

Micro.437@hotmail.com