



**Lec.5**

# **Infection**

*by*

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# Infection

The multiplication of a microorganism(Bacteria) in or on the tissues of a host constitutes infection. It does not invariably result in disease.





# **Classification of infections :Infections may be classified in various ways:**

- 1. Primary infection:** Initial infection with a microorganism in a host is termed primary infection.
- 2. Reinfections:** Subsequent infections by the same microorganism in the host are termed reinfections.
- 3. Secondary infection:** When a new microorganism sets up an infection in a host whose resistance is lowered by a preexisting infectious disease, this is termed secondary infection.
- 4. Local infection:** The term local infection (more appropriately local sepsis) indicates a condition where, due to infection or sepsis at localized sites such as appendix or tonsils, generalized effects are produced.
- 5. Cross-infection:** When in a patient already suffering from a disease, a new infection is set up from Another host or another external source, it is termed cross-infection.
- 6. Nosocomial infections:** Cross-infections occurring in hospitals are called nosocomial infections (from Greek nosocomion hospital).

**7. Iatrogenic infection:** The term iatrogenic infection refers to physician induced infections resulting from investigative, therapeutic or other procedures.

**8. Inapparent infection:** Inapparent infection is one where clinical effects are not apparent.

**9. Subclinical infection:** The term subclinical infection is often used as a synonym to inapparent infection.

**10. Atypical infection:** Atypical infection is one in which the typical or characteristic Clinical manifestations of the particular infectious disease are not present.

**11. Latent infection:** Some microorganism, following infection, may remain in the tissues in a latent or hidden form proliferating and producing clinical disease when the host resistance is lowered. This is termed latent infection

# Sources of infection

**A. Human**

**B. Animals**

**C. Insects**

**D. Soil and water**

**E. Food.**

**A-Humans serving as the microbial reservoir:**

- 1. Acquisition of “strep” throat through touching**
- 2. Gonorrhea, and syphilis by sexual contact**
- 3. Tuberculosis by coughing; and the common cold through sneezing.**

**B. Animals**

**Reservoir hosts:** Many pathogens are capable of causing infections in both human beings and animals. Therefore, animals may act as a source of infection of such organisms. These, animals serve to maintain the parasite in nature and act as *reservoir* and they are, therefore, called **reservoir hosts.**

## **C. Insects**

**Arthropod-borne Diseases** Blood-sucking insects, such as mosquitos, ticks, mites, flies, and lice may transmit pathogens to human beings and diseases so caused are called **arthropod borne diseases**.

## **D. Soil and Water**

### **i. Soil**

**Some pathogens can survive in the soil for long periods.**

**Examples :** Spores of tetanus and gas gangrene: Spores of tetanus and gas gangrene remain viable in the soil for several decades and serve as source of infection.

### **ii. Water**

**Water may act as the source of infection either due to contamination with pathogenic microorganisms (*Shigella, Salmonella, Vibrio cholerae*, ).**

## **E. Food**

**Contaminated food may act as source of infection of organisms causing food poisoning, gastroenteritis, diarrhea and dysentery**

**Virulence:** The term virulence denotes the ability of a strain of a species to produce disease. For

## **Determinants of virulence**

### **1. Transmissibility**

**The first step of the infectious process is the entry of the microorganism into the host by one of several ports: the respiratory tract, gastrointestinal tract, urogenital tract, or through skin that has been cut, punctured, or burned. example, encapsulated pneumococci are more virulent than non-encapsulated pneumococci.**

### **2. Adhesion**

**Adhesins: The initial event in the pathogenesis is the attachment of the bacteria to body surfaces.**

**This attachment is not a chance event but a specific reaction between surface receptors on host cells and adhesive structures (ligands) on the surface of bacteria. These adhesive structures are called adhesins.**



### 3. Invasiveness

**Invasiveness signifies the ability of a pathogen to spread in the host tissues after establishing infection. Highly invasive pathogens characteristically produce spreading or generalized lesions (e.g. streptococcal septicemia following wound infection)**

**while less invasive pathogens cause more localized lesions (e.g. staphylococcal abscess).**

### 4. Toxigenicity

**Some bacteria cause disease by producing toxins, of which there are two general types: The exotoxins and the endotoxins (Table 5.1)**

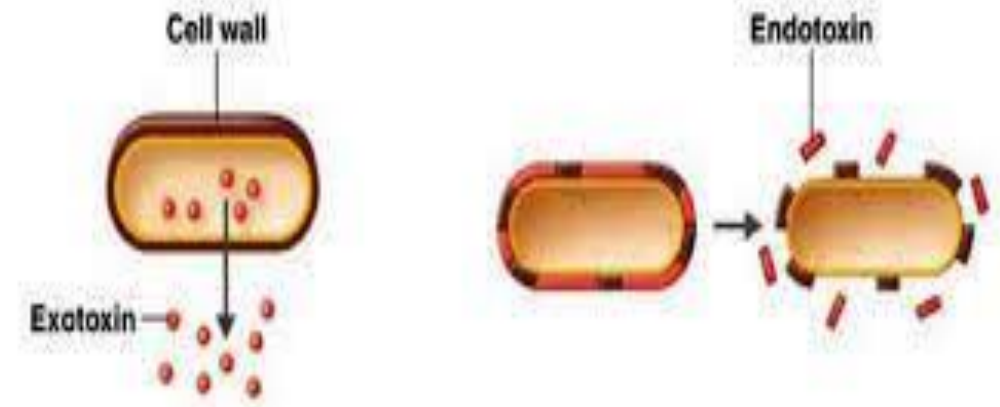


## Exotoxins

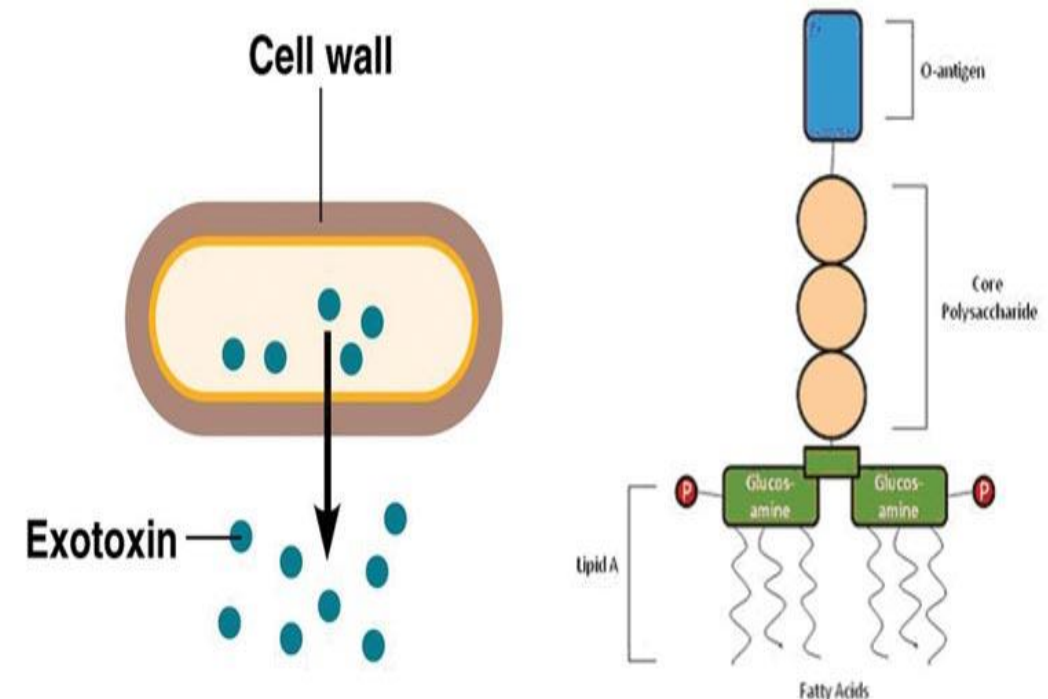
1. Proteins
2. Heat-labile. (inactivated at 60°–80°C)
3. Actively secreted by the cells; diffuse into the surrounding medium
4. Readily separable from cultures by physical means, such as filtration
5. Action often enzymatic
6. Specific pharmacological effect for each exotoxin
7. Specific tissue affinities
8. Highly toxic and fatal in microgram quantities
9. Highly antigenic
10. Action specifically neutralized by antibody
11. Usually do not produce fever
12. Produced by both gram-positive bacteria and gram-negative bacteria
13. Frequently controlled by extrachromosomal genes (e.g. plasmids)
14. Disease examples- Botulism diphtheria tetanus

## Endotoxins

1. Lipopolysaccharide on outer membrane. Lipid A portion is toxic
2. Heat-stable
3. Form integral part of the cell wall; do not diffuse into surrounding medium
4. Obtained only by cell lysis
5. No enzymatic action
6. Nonspecific action of all endotoxins
7. No Specific tissue affinities
8. Moderate toxicity. Active only in very large doses
9. Weakly antigenic
10. Neutralization by antibody ineffective
11. Usually produce fever by release of interleukin-1
12. Produced by gram-negative bacteria only
13. Synthesized directly by chromosomal genes
14. Gram-negative infections, meningococemia



## EXOTOXINS VS ENDOTOXINS



**Enzymes:** enzymes that play important roles in the infection process.

**1. Coagulase:** Coagulase is produced by *Staphylococcus aureus*. This thrombin-like enzyme prevents phagocytosis by forming a fibrin barrier around the bacteria and walling off the lesion.

**2. Lecithinase-C and collagenase:** *Clostridium perfringens* produces lecithinase-C and collagenase promoting spread of infection in tissue.

**3. Hyaluronidases:** Hyaluronidases split hyaluronic acid and thus facilitate the spread of infection along tissue spaces, e.g. *Streptococcus*.

**4. Streptokinase (fibrinolysin):** Many haemolytic *streptococci* produce streptokinase (fibrinolysin) which promotes the spread of infections.

**5. Cytolysins:** These include hemolysins capable of destroying erythrocytes and leukocidins damage polymorphonuclear leukocytes.

**6. IgA 1 proteases:** These enzymes specifically cleave immunoglobulin IgA which protects at mucosal surfaces.