

## Lecture 5: PATHOGENESIS OF BACTERIAL INFECTION

### Relationship between organisms:

**Normal flora:** normal inhabitants of the host ex. *S.epidermidis* on skin, *E.coli* in intestine

**Commensalism :** One organism benefits; the other unaffected; can be opportunistic infection

**Mutualism:** both benefit

Some bacterial species are always considered to be pathogens, and their presence is abnormal.

Examples include *Mycobacterium tuberculosis* (tuberculosis) and *Yersinia pestis* (plague).

Other species are commonly part of the normal flora is also a common cause of urinary tract infection, diarrhea, and other diseases.

### Basic terms frequently used in describing aspects of pathogenesis:

**Virulence factors:** factors that cause disease or aid in spread of disease quickly in host or to other hosts. It determine the virulence of bacteria, or their ability to cause infection and disease.

**Adherence:** In order for a microbe to cause disease it first must adhere to a host surface. Some microbes produce materials or structures that allow them to adhere (stick) to membranes or surfaces, and thus escape defenses

**Pili (fimbriae) :** *Neisseria gonorrhoea*, if a strain has no pili it is not pathogenic. The chemicals that allow such attachment are called “adhesins” – They are often glycoproteins or protein that bind to receptors on host cell surfaces.

**Toxins :** Poisonous microbial by products that are produced by the microbe and diffuse into tissues causing damage/ enhance invasion/ avoid defenses are toxins produced by micro-organisms, including bacteria and fungi. Microbial toxins promote infection and disease by directly damaging host tissues and by disabling the immune system.

Toxins produce by bacteria are generally classified into two group

**Endotoxin:** Many gram-positive and gram-negative bacteria produce exotoxins of considerable medical importance. Some of these toxins have had major role in world history (e.g. toxin of *Clostridium tetani*).

**Exotoxins :** Produced inside some bacteria as part of their growth and metabolism and released into the surrounding medium ex.*Staphylococcus aureus*

- Are proteins, and many are enzymes
- Most bacteria that produce exotoxins are gram-positive
- The genes for most exotoxins are carried on bacterial plasmids or phages.

**Endotoxin :** Released by many Gram (-) bacteria when cells lyse, Examples:

Lipid A, in many pathogenic enteric bacteria like Shigella, can cause high fevers and even shock.

### **Enzyme**

Many species of bacteria produce enzymes that are not intrinsically toxic but play important role in the infectious process.

**Collagenase:** degrades collagen, the major protein of fibrous connective tissue, and promotes spread of infection in tissue.

**Hyaluronidase** – breaks down hyaluronic acid, the polysachharide that may hold some cells together, *S. pyogenes* produces such an enzyme

Causes necrosis and blackening of tissue (inches of progression in hours)

**Coagulase:** Affects the fibrin in the blood causing it to clot, *Staphylococcus aureus* produces coagulase,

**Hemolysin :** This exotoxin is an enzyme and lyses RBC. *S. pyogenes* Alpha and Beta Hemolysis of the Strep.