Assist. Prof. Aamer.Y. Alchalaby
Microbiology
2024-2025

Pathogenesis and Virulence Factors of Bacteria.

Basic terms frequently used in describing aspects of pathogenesis;-

Infection: Multiplication of an infectious agent within the body.

Pathogenicity: The ability of an infectious agent to cause disease.

Virulence: degree of pathogenicity of a microbe, or in other words the relative ability of a microbe to cause disease.

Toxigenicity: The ability of a microorganism to produce a toxin that contributes to the development of disease.

Invasion: The process whereby bacteria, parasites, fungi and viruses enter the host cells or tissues and spread in the body.

Pathogen: A microorganism capable of causing disease

Non-pathogen: A microorganism that does not cause disease. It may be part of the normal flora.

Opportunistic pathogen: An agent capable of causing disease only when the host´s resistance is impaired

Bacteremia: The presence of bacteria in blood

Viremia: When viruses are found in the blood

Toxemia: The term describes the condition when toxins are found in the blood.

Septicemia: When bacteria are both present and multiplying in the blood.

Methods by which pathogens cause disease (Virulence factor):

1- **Adhesion**: Many bacteria must first bind to host cell surfaces (colonization of a niche in the host), the host cell receptors for bacteria are essential proteins for other functions.

2- **Entry:** entry into and exit out of cells (if the pathogen is an intracellular one).

2- **Colonization:** Some virulent bacteria produce special proteins that allow them to colonize parts of the host body.

3- **Invasion:** Some virulent bacteria produce proteins that either disrupt host cell membranes or stimulate endocytosis into host cells.

4- **Immune response inhibitors:** Many bacteria produce virulence factors that inhibit the host's immune system defenses. For example, a common bacterial strategy is to produce proteins that bind host antibodies.

5- **Capsule:** The term capsule in microbiology refers to a layer that lies outside the cell wall of bacteria

6- **Plasmids:** provide a mechanism for horizontal gene transfer within a population of microbes

7- **Enzymes:** Some pathogens produce extracellular enzymes, or exoenzymes, that enable them to invade host cells and deeper tissues. Exoenzymes have a wide variety of targets.

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

b. Coagulase:

c. Hyaluronidases

d. Streptokinase:

e. Hemolysins and leukocidins:

8- **Toxins:** Biological poisons, that assist in the pathogen's ability to invade and cause damage to tissues. The ability of a pathogen to produce toxins to cause damage to host cells is called toxigenicity. Toxins can be divided as endotoxins or exotoxins.

- **Endotoxin:** Include the lipopolysaccharide (LPS)m which found on the outer membrane of gram-negative bacteria.
- **Exotoxins:** are protein molecules that are produced by a wide variety of living pathogenic bacteria. Although some gram-negative pathogens produce exotoxins, the majority are produced by gram- positive pathogens.

Assist. Prof. Aamer.Y. Alchalaby
Microbiology
2024-2025

Microbial Mechanisms of Pathogenicity: How Microorganisms Cause Disease: