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Lecture. 3
Two stage

College of Technology & Health Sciences
Department of Medical Laboratory Technique

PATHOGENECITY AND VIRULENCE

Pathogenicity and Virulence

Pathogenicity: is the ability to cause disease by overcoming host defenses, To cause disease, most pathogens must gain access to the host, adhere to host tissues, penetrate or evade host defenses, and damage the host tissues.

The term virulence denotes the ability of a strain of a species to produce disease. Virulence provides a **quantitative measure of pathogenicity**, or the likelihood of **causing disease**. For example, Escherichia coli that express Shiga-like toxins are more virulent than those that do not express these toxins.

Virulence Factors

Virulence factors refer to the properties (i.e. gene products) that enable a microorganism to establish itself on or within a host of a particular species and enhance its potential to cause disease. **Virulence is determined** by three characteristics of the pathogens: **invasiveness, infectivity, and pathogenic potential**.

A major aspect of pathogenic potential **is toxigenicity**. Virulence factors help bacteria to **(1) invade the host, (2) cause disease, and (3) evade host defenses.**

Types of Virulence Factors:

1. **Adherence Factors:** Many pathogenic bacteria colonize mucosal sites by using pili (fimbriae) to adhere to cells.
2. **Invasion Factors:** Surface components that allow the bacterium to invade host cells can be encoded on plasmids, but more often are on the chromosome.

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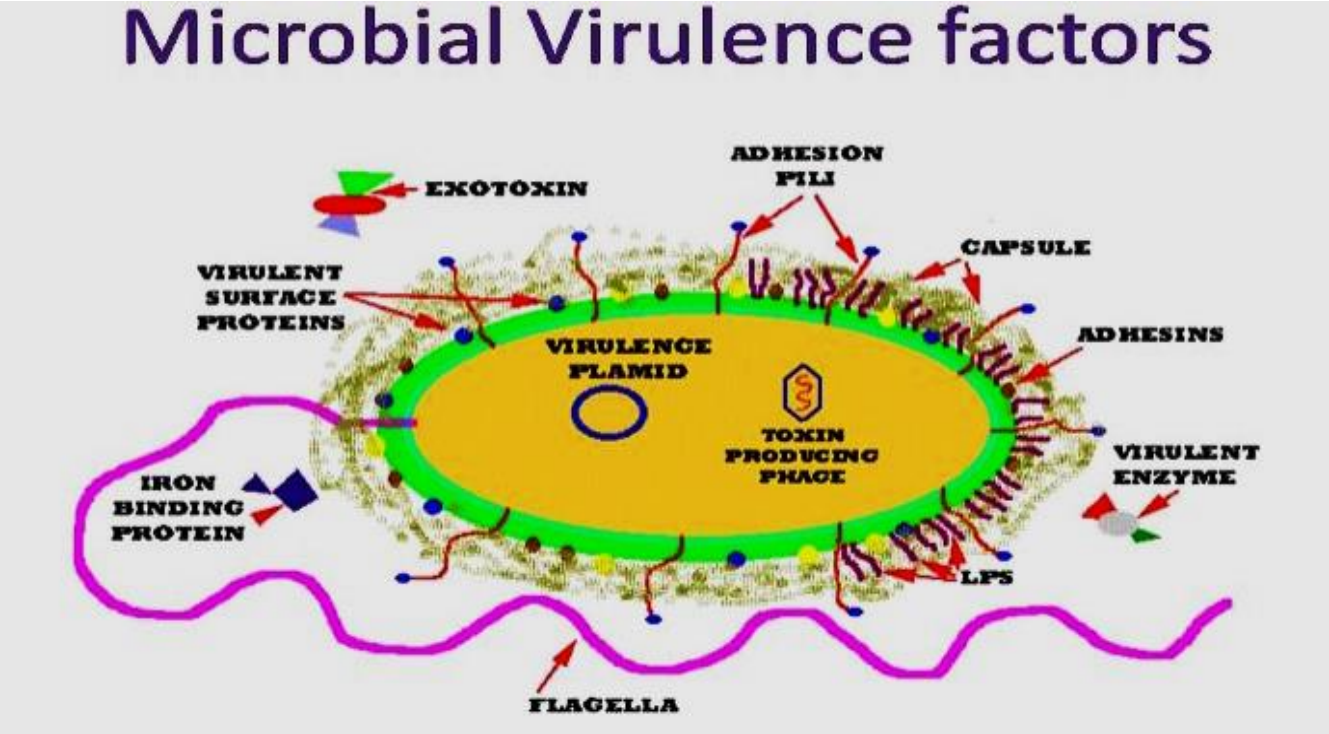
3. **Capsules:** Many bacteria are surrounded by capsules that protect them from opsonization and phagocytosis.
4. **Endotoxins:** The lipopolysaccharide endotoxins on Gram-negative bacteria cause fever, changes in blood pressure, inflammation, lethal shock, and many other toxic events.
5. **Exotoxins:** Exotoxins include several types of protein toxins and enzymes produced and/or secreted from pathogenic bacteria. Major categories include cytotoxins, neurotoxins, and enterotoxins.
6. **Siderophores:** Siderophores are iron-binding factors that allow some bacteria to compete with the host for iron, which is bound to hemoglobin, transferrin, and lactoferrin.



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Pathogenicity

Mechanism by which disease develops despite host resistance mechanisms. The mechanisms used by bacteria to evade host protective responses **include:**

(1) The inhibition of phagocytosis and intracellular killing in the phagocyte, (2) inactivation of complement function, (3) cleavage of IgA, (4) intracellular growth (avoidance of antibody), and (5) change in bacterial antigenic appearance.

Stages of Pathogenesis for Bacterial Infections

The outcome of infection depends on a variety of factors of the microbe and host as follows:

1. The ability of the organism to break host barriers and to evade destruction by innate local and tissue host defenses.

2. The ability of the organism to replicate, to spread, to establish infection, and to cause disease.

3. The ability of the organism to transmit to a new susceptible host.

4. The innate and adaptive immunologic ability of the host to control and eliminate.

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The invading microorganism.

The infection process involves the following stages:

(a) transmission of infection,

(b) entry of the organisms and evasion of the local defenses,

(c) adherence to cell surfaces,

(d) growth and multiplication of the bacteria at the site of adherence,

(e) manifestations of disease,

(f) termination of disease.