

# Determinants of Infectious Disease

To produce an infectious disease, a pathogen must be able to:

1. initially be transported to the host
2. adhere to, colonize or invade the host
3. grow, multiply, or complete its life cycle in the host
4. initially evade host defense mechanisms
5. damage the host by mechanical and/or chemical means

In the end it is – Numbers (of bacteria) that make you sick!

# Virulence and Pathogenicity

**Pathogen:** a parasitic organism that causes damage to, or disease in its host.

**Pathogenicity:** the ability to cause disease.

**Virulence:** the relative degree or intensity of pathogenicity.

Virulence is determined by the five following characteristics of the pathogen.

**Invasiveness:** the ability of the organism to spread to adjacent tissues or other tissues.

**Toxigenicity:** the ability of the organism to produce toxic products that cause disease and/or damage in the host.

**Infectivity:** the ability of the organism to establish a focal point of infection through growth.

**Pathogenic potential:** the degree that the pathogen causes morbid symptoms.

**Hypersensitivity:** host's innate sensitivity to pathogen.

## **Virulence Factors –**

Aid in establishment and maintenance of disease (i.e., colonization and/or growth).

**Coagulase** – enzyme produced by *Staphylococcus aureus* that promotes fibrin clotting causing a protective network that acts to localize the infection.

**Streptokinase** – enzyme made by *Streptococcus pyogenes* that is fibrinolytic causing dissemination of infection.

**Collagenase** – enzyme produced by *Clostridium* that breaks down collagen.

**Hemolysins** – enzymes produced by *Streptococcus* that most commonly has the ability to lyse RBC's.

**Leukocidins** – enzymes produced by many bacteria that decrease resistance of the host by lysing WBC's.

**Hyaluronidase** – enzyme produced by many bacteria that breaks down hyaluronic acid, a polysaccharide that functions as tissue cement.

## **EXOTOXINS**

- ☞ usually synthesized by specific pathogens with plasmids bearing the exotoxin genes
- ☞ heat-labile proteins
- ☞ toxic in very small doses (microgram per kg)
- ☞ highly immunogenic
- ☞ associated with specific diseases, often given the name of the disease they produce; have specific mechanisms of action

## **ENDOTOXINS**

- ☞ lipid A region of the LPS in Gram-negative bacteria
- ☞ heat-stable LPS-lipoprotein complex
- ☞ toxic only at high doses (milligram per kg)
- ☞ weakly immunogenic
- ☞ generally similar, despite source, usually causing fever