

CHAPTER 5
REQUIREMENTS FOR INFECTION

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FIVE REQUIREMENTS FOR INFECTION

- ◆ There are five requirements for a successful infection: get in, stay in, defeat the host defenses, damage the host, and be transmissible
- ◆ Understanding the requirements necessary for infection is critical to understanding treatment

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PORTALS OF ENTRY

- ◆ Places at which pathogens enter the body are called portals of entry
- ◆ The major portals of entry are the mucous membranes, the skin, and parenteral routes
- ◆ Mucous membrane portals of entry are associated with the respiratory, digestive, and genitourinary tracts of the body

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ESTABLISHMENT

- ◆ Establishment (the requirement of staying in) can be accomplished using adhesin molecules, which are surface proteins. In addition, some pathogens take advantage of structures such as fimbriae to adhere to tissues
- ◆ Virulence for a given pathogen can be gauged by the ID₅₀ and LD₅₀ of that organism

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VIRULENCE

- ◆ Virulence for a given pathogen can be gauged by the ID₅₀ and LD₅₀ of that organism

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DEFEATING THE HOST'S DEFENSES

- ◆ Pathogens defeat a host's defenses in two ways:
 - ◆ passively (by using structures such as the capsule)
 - ◆ actively (by attacking the host defense directly through the production of enzymes)
- ◆ Most of the damage to a host can be divided into two causes:
 - ◆ pathogens are present and active
 - ◆ host defense mechanisms

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DEFEATING THE HOST'S DEFENSES

- ◆ Damage to the host can be either direct or indirect:
 - ◆ direct damage is usually localized
 - ◆ indirect damage is usually systemic through the production of soluble toxins

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EXOTOXINS

- ◆ Exotoxins are extremely lethal substances produced by living cells (usually Gram-positive bacteria) and in most cases are proteins
- ◆ Exotoxins can be:
 - ◆ cytotoxins (which kill cells)
 - ◆ neurotoxins (which interfere with neurological signaling)
 - ◆ enterotoxins (which affect the lining of the digestive system)
- ◆ Exotoxins can cause antibody production

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ENDOTOXINS

- ◆ Endotoxins are part of the bacterial cell wall and are released on the death of the organism or during cell division
- ◆ Endotoxins are products of Gram-negative bacteria, do not effectively cause the generation of antibodies, and are less toxic than exotoxins

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ENDOTOXINS

- ◆ Lipid A, which is part of the Gram-negative phospholipid outer membrane of the bacterial cell wall, has endotoxin properties
- ◆ Endotoxins cause chills, fever, aches, muscle weakness and even disseminated intravascular coagulation

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CYTOPATHOGENIC EFFECT

- ◆ Viral host cell damage is referred to as a cytopathogenic effect. It occurs from viral overload, killing of host cells, damage caused by host defense

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