

CHAPTER 6
TRANSMISSION OF INFECTION, THE
COMPROMISED HOST, EPIDEMIOLOGY,
AND DIAGNOSING INFECTIONS

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RESERVOIRS OF INFECTION

- ◆ Transmission is the final requirement for a successful infection
- ◆ Reservoirs are places where pathogens grow and accumulate
- ◆ There are three potential reservoirs of infection:
 - ◆ humans
 - ◆ other animals
 - ◆ nonliving reservoirs

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RESERVOIRS OF INFECTION

- ◆ Human reservoirs can be infected people who are asymptomatic carriers
- ◆ Animal-to-human infections are referred to as zoonotic disease
- ◆ Nonliving reservoirs include water, soil, and food

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MECHANISMS OF TRANSMISSION

- ◆ Mechanisms of transmission are ways in which organisms move from place to place. There are three mechanisms:
 - ◆ contact
 - ◆ vehicle
 - ◆ vector
- ◆ Contact transmission can be direct, indirect, or by droplet transmission

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TRANSMISSION OF INFECTION

- ◆ There can be predisposing factors for disease such as the host's age, gender, lifestyle, occupation, or emotional status
- ◆ Some infections are caused by opportunistic pathogens, which are normally harmless but can be pathogenic if the right conditions exist
- ◆ Organisms leave a host by portals of exit, which are essentially the same as the portals of entry

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HOST DEFENSE

- ◆ One of the most important factors of the infectious process is the host defense
- ◆ Compromise of the host defense can be due to a variety of problems such as:
 - ◆ HIV resulting in AIDS
 - ◆ congenital immunodeficiency
 - ◆ transplantation
 - ◆ chemotherapy
 - ◆ other conditions that debilitate the patient

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NOSOCOMIAL INFECTIONS

- ◆ Infections that occur in hospitals are referred to as nosocomial infections
- ◆ Universal precautions are specific guidelines for patient care, which provide proper procedures for dealing with blood, semen, vaginal secretions, and other samples of tissue and body fluids

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EPIDEMIOLOGY

- ◆ Epidemiology is the study of factors and mechanisms involved in the frequency or spread of diseases or health-related problems
- ◆ Incidence describes the number of new cases contracted within a set population in a specific period of time
- ◆ Prevalence is the total number of people infected within a population at any given time

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MORBIDITY AND MORTALITY RATES

- ◆ The morbidity rate of a disease is the percentage of individuals affected by the disease during a set period
- ◆ The mortality rate is the percentage of deaths due to a specific disease during a specific period

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DISEASE CLASSIFICATION

- ◆ Diseases can be:
 - ◆ sporadic (occurring only occasionally)
 - ◆ endemic (constantly in the population)
 - ◆ epidemic (a higher than normal incidence of a disease)
 - ◆ pandemic (a worldwide epidemic)
- ◆ Herd immunity can limit the spread of infection

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EPIDEMIOLOGICAL STUDY

- ◆ There are two types of epidemiological study:
 - ◆ descriptive
 - ◆ analytical
- ◆ Analytical epidemiological studies always contain a control group and can be retrospective or prospective

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DIAGNOSING INFECTIONS

- ◆ The control, prevention, and therapy of infectious diseases depend on quick and correct diagnosis of the species or even the strain of the pathogen
- ◆ After a sample has been taken, an enrichment step often follows for growth-based methods, then isolation and identification

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**SEROLOGY-BASED
DIAGNOSTICS**

- ◆ Key criteria of any diagnostic method are specificity and sensitivity
- ◆ Blood samples can be used directly for serological analysis
- ◆ Serology-based diagnostics are based on antigen-antibody reaction

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BIOTECHNOLOGY

- ◆ Antibodies used in diagnostics can be produced using biotechnology
- ◆ Basic biotech techniques are genetic engineering and recombinant DNA technology
- ◆ Diagnostics based on nucleic acids are based on the hybridization of complementary nucleic acids

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BIOTECHNOLOGY

- ◆ Identifying the strain (subspecies) is necessary for epidemiological studies and disease monitoring
- ◆ All diagnostic methods can be adapted and used for straintyping
- ◆ Drivers in diagnostics are the most sensitive technology, getting results faster with little manual effort

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NEW APPROACHES AND OPPORTUNITIES

- ◆ Nanomaterials enable us to detect previously unattainably minute changes in concentration
- ◆ The obvious trend is moving modern molecular diagnostics from hospital laboratories to the patient

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