Overview

Students will examine the general principles of the epidemiology of infectious diseases. They will discuss the ways in which infectious diseases are classified, the basic epidemiologic characteristics of infectious diseases, how the system of surveillance of infectious diseases works in the United States, the temporal variability of infectious diseases, how infectious disease mortality and morbidity rates changed during the 1800s and 1900s, and recent trends in infectious disease morbidity and mortality both in the United States and globally.

Learning Objectives

- Identify the methods by which infectious diseases are classified by epidemiologists and provide examples of each.
- Explain what the incubation period is and how it works, the biologic characteristics of infectious organisms, the types of infections that may be transmitted through transfusions, how the host-parasite relationship works, and the types of measurements used to quantify the occurrence of disease.
- Discuss how the system of surveillance of infectious diseases works in the United States.
- Describe the ways in which infectious diseases may undergo temporal variation, what herd immunity is, and how the incidence and mortality rates for tuberculosis have changed during the past century.
- Discuss recent trends in infectious disease morbidity in the United States.
- Discuss recent trends in infectious disease morbidity around the world.
Outline

I. The Classification of Infectious Diseases

   A. Infectious Diseases Transmitted by More Than One Means
      1. Tularemia
      2. Plague
      3. Anthrax
      4. Rabies
      5. Brucellosis
      6. Transmission of Microbial Agents by Transfusions

   B. Perinatal Infections
      1. Rubella
      2. Cytomegalovirus
      3. Herpes Simplex Virus
      4. Toxoplasmosis
      5. Syphilis
      6. Hepatitis B Virus
      7. Human Immunodeficiency Virus
      8. Other Infectious Agents

II. Epidemiologic Characteristics of Infectious Diseases

   A. Incubation Period
   
   B. Biologic Characteristics of the Organism
      1. Infectivity
      2. Pathogenicity
3. Virulence

4. Immunogenicity

5. Inapparent Infections

6. The Carrier State

C. Transfusion-Transmitted Infection

D. The Host-Parasite Relationship

1. Patterns of Natural History

2. The Immune Response to Infection

   a. B Lymphocytes and Humoral Immunity
   
   b. Local Immunity: The Mucosal Secretory IgA System
   
   c. T Lymphocytes and Cell-Mediated Immunity
   
   d. Granulocytes and Complement
   
   e. Innate Immunity

E. Quantification of Infectious Diseases

III. Surveillance of Infectious Diseases

IV. Temporal Trends of Infectious Diseases

   A. Seasonal Variation
   
   B. Annual Variation
   
   C. Herd Immunity
   
   D. Variations of Infectious Diseases Over Decades

   1. Tuberculosis
   
   E. Changes in Infectious Disease Morbidity and Mortality During the 1800s and 1900s
V. Recent Trends in Infectious Disease Morbidity and Mortality in the United States

VI. Recent Worldwide Trends in Infectious Disease Morbidity and Mortality

Discussion Questions

1. How does the system of surveillance of infectious diseases in the United States work?

In the United States, when selected infectious diseases are identified by healthcare workers, they report them to the local health department. These reports are then analyzed and forwarded to the state health department. From there, the data is reported to the CDC in Atlanta.

2. Why are mosquitoes infected with St. Louis encephalitis (SLE) considered dead-end hosts, and what does that mean?

A dead-end host is an organism that carries a virus, but is not effective as a reservoir host to infect additional organisms and maintain an epidemic. Mosquitoes infected with SLE have low levels of virus in the blood, and the virus is very transient, making them ineffective hosts to infect additional mosquitoes.

3. What are some cost-effective health interventions for the prevention of infectious disease morbidity and mortality in developing countries?

These cost-effective health interventions include effective treatment of tuberculosis, effective STD treatment, oral rehydration therapy for diarrhea, immunization for childhood diseases, ivermectin for the treatment and prevention of onchocerchiasis and schistosomiasis, zidovudine for the prevention of the perinatal transmission of HIV, chemotherapy and chemoprophylaxis of malaria, and antibiotic prophylaxis for the prevention of postsurgical infections.