**Nies: Community/Public Health Nursing: Promoting the Health of Populations, 4th Edition**

# Chapter 23: Communicable Disease

**Chapter Outline / Notes**

**I. Communicable Disease and *Healthy People 2010***

**A.** Three of the focus areas for *Healthy People 2010—*Immunization and Infectious Diseases, Sexually Transmitted Infections, and HIV; specific to communicable diseases. *Healthy People 2010* includes goals for immunization and infectious diseases. Relevant areas covered include:

1. Vaccine preventable diseases.

2. STIs.

3. HIV/AIDS.

4. Hepatitis.

5. Tuberculosis.

**B.** Application of community-based health interventions based on recommendations from *Healthy People 2010* can assist in interrupting or preventing disease transmission.

**C.** Analysis of the underlying environmental, socioeconomic, political, educational, employment, and health factors is important in development of interventions for disease prevention.

**II. Principles of Infection and Infectious Disease Occurrence**

**A. Multicausation**

The principle of multicausation emphasizes that an infectious agent alone is not sufficient to cause disease—the agent must be transmitted in the environment to a susceptible host.

**B. Spectrum of Infection**

The spectrum of infections involves the following concepts:

1. An infectious agent may contaminate the skin or mucous membranes of a host, but not invade the host.

2. An infectious agent may invade and multiply but produce a subclinical infection that is asymptomatic.

3. An infectious agent may invade and multiply resulting in overt symptomatic infection.

**C. Stages of Infection**

1. An infectious agent that has invaded and infected a host will replicate until it can be shed from the host. This period of replication before shedding is called the latent period.

2. The communicable period follows latency and begins with shedding of the agent.

3. The incubation period refers to the time from invasion to the time when disease symptoms first appear.

**D. Spectrum of Disease Occurrence**

Control of infectious diseases in a population requires identifying and monitoring the occurrence of disease.

1. Incidence: New cases of infectious disease.

2. Endemic: The consistent and expected level of a disease in a geographic area.

3. Outbreak: The unexpected occurrence of an infectious disease in a limited geographical area during a limited period of time.

4. Pandemic: The steady occurrence of disease over a very large geographical area (e.g., continent of Africa) or worldwide.

5. Epidemic: The unexpected increase of an infectious disease in a geographical area over an extended period of time.

**III. Chain of Transmission**

Transmission can be conceptualized as a chain with 6 connected links: infectious agent, reservoir, portal of exit, mode of transmission, portal of entry, and host susceptibility.

**A. Infectious Agents**

Infectious agents include prions, viruses, bacteria, fungi, protozoa. Each acts differently depending on intrinsic properties and how they interact with their human host. Intrinsic properties include size, shape, chemical composition, growth requirements, and viability.

**B. Reservoirs**

The environment in which a pathogen lives and multiplies is the reservoir. These reservoirs include humans.

**C. Portals of Exit and Entry**

Pathogens enter and leave a host through portals.

1. Common portals of entry include the respiratory passages, mucous membranes, percutaneous injection, oral cavity, and through the placenta.

2. Common portals of exit include respiratory secretions, vaginal secretions, semen, saliva, lesion exudates, blood, and feces.

**D. Modes of Transmission**

Modes of transmission may be direct or indirect.

1. Direct transmission implies the immediate transfer of an infectious agent from an infected host or reservoir to an appropriate portal of entry in the human host through physical contact such as touching, biting, kissing, or sexual contact, or through droplet spray.

2. Indirect transmission is the spread of infection through a vehicle of transmission outside the host. These may be contaminated fomites or vectors.

**E. Host Susceptibility**

Not all humans are equally susceptible for contracting an infection. Things that affect susceptibility include:

1. Biological and personal characteristics (e.g., age).

2. General health status.

3. Personal behaviors.

4. Immune system and immunization status.

**IV. Breaking the Chain of Transmission**

The chain of transmission can be disrupted by affecting any of the links.

**A. Controlling the Agent**

1. Inactivating an agent is the principle behind disinfection, sterilization, and radiation of fomites.

2. Antiinfective drugs, such as antibiotics, antivirals, antiretrovirals and antimalarials all play an important part in controlling infectious diseases.

**B. Eradicating the Nonhuman Reservoir**

Treating these or eliminating common non-human reservoirs for pathogens in the environment (e.g., water, food, milk, animals, insects, and sewage) are effective methods of preventing replication of pathogens and, thus, preventing transmission.

**C. Controlling the Human Reservoir**

1. Treating infected persons can prevent transmission of pathogens that can be transmitted directly to others.

2. Quarantine and isolation is another method of controlling the reservoir.

**D. Controlling the Portals of Exit and Entry**

1. The transmission chain may be broken at the portal of exit by properly disposing of secretions, excretions, and exudates from infected persons.

2. The portal of entry of pathogens also can be controlled by using barrier precautions (masks, gloves, condoms), avoiding unnecessary invasive procedures, such as indwelling catheters, and protecting oneself from vectors.

3. Universal Precautions are another way to control transmission via portals of exit or entry.

**E. Improving Host Resistance and Immunity**

1. Resistance is ability to ward off infections. Many factors, such as age, general health status, nutrition, and health behaviors contribute to a host’s resistance.

2. Immunity, however, is an incredible defense against infection. There are several different kinds of immunity, each providing resistance in different ways to different pathogens.

a. Natural immunity is an innate resistance to a specific antigen or toxin.

b. Acquired immunity is derived from actual exposure to the specific infectious agent, toxin, or appropriate vaccine. There are 2 types of acquired immunity: active and passive.

i. Active immunity is when the body produces its own antibodies against an antigen, either as a result of infection with the pathogen or introduction of the pathogen in a vaccine.

ii. Passive immunity is the temporary resistance that has been donated to the host through transfusions of plasma proteins, immunoglobulins, and antitoxins, or from mother to neonate transplacentally. Passive immunity lasts only as long as these substances remain in the bloodstream.

**V. Public Health Control of Infectious Diseases**

Infectious diseases are categorized as public or community health problems. Because of their potential to spread and cause community-wide or worldwide emergencies, infectious diseases require organized, public efforts for their prevention and control.

**A. Terminology: Control, Elimination and Eradication**

1. Control of a communicable disease refers to the reduction of incidence or prevalence of a given disease to a locally acceptable level as a result of deliberate efforts.

2. Elimination of a communicable disease involves controlling it within a specified geographical area such as a single country, an island, or a continent and reducing the prevalence and incidence to near zero. Elimination is the result of deliberate efforts, but continued intervention measures are required.

3. Eradication involves reducing the worldwide incidence of a disease to zero as a function of deliberate efforts, without a need for further control measures.

**B. Defining and Reporting Communicable Diseases**

1. Diseases are defined and classified according to confirmed cases, probable cases, laboratory-confirmed cases, clinically compatible cases, epidemiologically linked cases, genetic typing, and clinical case definition.

2. The Centers for Disease Control and Prevention (CDC) has designated notifiable infectious diseases, that is, diseases that health care providers must report to the local or regional health department.

3. Because state health departments have the responsibility for monitoring and controlling communicable diseases within their respective states, they determine which diseases will be reported within their jurisdiction.

**VI. Prevention: Vaccines**

**A. Vaccines: Word of Caution**

1. Information and recommendations on immunizations and vaccine usage change regularly; therefore, health care providers should seek the most current information on the CDC website.

2. Precautions must be taken when giving any immunization. The most recent recommendations regarding which immunizations to give; to whom they should be given; how they should be given; and how they are to be transported, stored, and administered can be obtained from the CDC.

3. The CDC produces Vaccine Information Statements (VISs) that explain to vaccine recipients, their parents, or their legal representatives both the benefits and risks of a vaccine. Federal law requires that VISs be handed out before each vaccination dose.

**B. Types of Immunizations**

1. Immunizing agents can include vaccines as well as immune globulins or antitoxins. Vaccination is a narrower term referring to the administration of a vaccine or toxoid to confer active immunity by stimulating the body to produce its own antibodies.

2. Vaccines can be live but weakened (attenuated) or they may be killed (inactivated) leaving only the antigenic property necessary to stimulate the human immune system to produce antibodies.

3. Immune globulins and antitoxins are solutions that contain antibodies from human or animal blood and are introduced into a patient to provide passive protection without initiating the immune system to produce an immunogenic response.

**C. Vaccine Storage, Transport, and Handling**

Exposing the vaccine to higher or lower temperatures than recommended may result in loss of potency and vaccine failure. Measures to insure safe storage include monitoring with specialized thermometers, or indicators that change color if the temperature exceeds or falls below the recommended level.

**D. Vaccine Administration**

The efficacy of the vaccine can be adversely affected if the vaccine is not administered appropriately. Routes vary with different vaccines.

**E. Vaccine Spacing**

1. All children should be age-appropriately immunized and kept up to date according to current recommendations of the ACIP.

2. An interruption in the schedule does not require that the entire series begin again. However, if vaccines are administered at less than the recommended intervals, they should not be counted as part of the primary series of immunization.

3. Completion of the primary vaccine series and receiving periodic booster doses as recommended are necessary to ensure protective levels of immunity.

4. All vaccines can be administered simultaneously without contraindication, except for yellow fever and cholera vaccines, which must be separated by at least three weeks.

5. Live injectable vaccines (e.g., MMR and varicella) must be separated by at least four weeks when not given simultaneously.

**G. Vaccine Hypersensitivity and Contraindications**

1. Adverse reactions are not common. These reactions can be from vaccine components such as eggs, egg proteins, antibiotics, preservatives, and adjuvants. Patient allergies should be considered before administration of specific vaccines.

2. Mild illness with or without low-grade fever is not a contraindication for vaccination.

3. Pregnancy is not a contraindication for immunization using inactivated vaccines, antitoxins, or immune globulins; however, pregnant women should avoid live vaccines including MMR, varicella, and yellow fever unless the risk of infection is very likely.

4. Immunocompromised patients should not receive live vaccines; however, MMR can be administered to asymptomatic HIV-infected people and varicella can be given to people with humoral immunodeficiency and some HIV-asymptomatic people as determined by their physician. Killed or inactivated vaccines can be given, but they may not produce an optimal antibody response.

**H. Vaccine Documentation**

The health care provider is responsible for maintaining accurate records, including patient name, dates immunized, vaccine type, vaccine manufacturer, vaccine lot number, date of the Vaccine Information Statement (VIS), and the name, title, and address of the person administering the vaccine.

**I. Vaccine Safety and Reporting Adverse Events and Vaccine-Related Injuries**

To monitor actual and potential vaccine-related problems, health care providers must report specific post-vaccination “adverse events” to the Vaccine Adverse Event Reporting System (VAERS).

**VII. Vaccine Needs for Special Groups**

Recommendation on immunizations and schedules for vaccination are routinely updated and published by CDC on its website.

**A. Healthy Infants, Children, and Adolescents**

Current recommendations at the time of this writing is that students complete a schedule of 11 childhood vaccines by age 18 months. The schedule is complex and includes the following:

1. 4 doses of diphtheria, tetanus, and acellular pertussis vaccine (DTaP).

2. 3 doses of inactivated poliovirus vaccine (IPV).

3. 1 dose of measles-mumps-rubella vaccine (MMR).

4. 3 to 4 doses of Hib conjugate vaccine.

5. 3 doses of hepatitis B vaccine (Hep B).

6. 1 dose of varicella vaccine.

7. 4 doses of a conjugated pneumococcal vaccine.

8. Hepatitis A vaccine is also recommended for children aged 2 to 18 years living in regions where hepatitis A rates are twice the national average.

Recommendations also include a routine health care visit at 11 to 12 years of age to ensure that previously unvaccinated adolescents would receive:

1. Hep B, varicella vaccine (if no history of disease).

2. A second dose of MMR vaccine.

3. A booster dose of tetanus and diphtheria vaccine (Td), if it has been more than 5 years since their prior dose.

As the result of a slight increased risk for meningococcal disease among freshman dormitory residents, the CDC recommends that vaccination against meningococcal disease be provided to freshman and other undergraduate students who request this vaccine, although routine vaccination is not recommended.

**B. Adults and the Elderly**

Vaccine-preventable diseases continue to cause thousands of hospitalizations and deaths in the American adult and elderly populations. Te CDC recommends a routinely scheduled, preventive health care visit for the 50-year-old adult to assess immunization status, administer Td and flu vaccines and to assess risk factors and need for pneumococcal vaccine.

1. The pneumococcal and influenza vaccines can be administered simultaneously at the same visit for those individuals needing both vaccines.

2. The emergence of serious new drug-resistant pneumococci makes immunization particularly important for this population.

**C. Immune Suppressed**

1. Live virus or bacterial vaccines are not recommended for persons who are immune suppressed for any reason (e.g., leukemia, lymphoma, HIV/AIDS, congenital immunodeficiency, radiation, therapy with an alkylating agent, large doses of corticosteroids).

2. The killed or inactivated vaccines can be given according to the same recommended administration schedule as for the healthy person.

**D. Pregnancy**

1. MMR and varicella vaccines are both contraindicated when pregnancy is known.

2. Other live virus vaccines (e.g., OPV and yellow fever) are not recommended during pregnancy, but they can be administered and are recommended for susceptible pregnant women who live in areas or may travel to areas where there is a high risk of exposure to these diseases.

3. Inactivated vaccines, toxoids, and immune globulin preparations are not contraindicated during pregnancy.

4. Hepatitis B, pneumococcal, meningococcal, and rabies vaccines are recommended for at-risk pregnant women.

**E. Vaccines for International Travel**

1. The only vaccine required for travel to certain countries is yellow fever vaccine. These countries require a stamped and signed International Certificate of Vaccination, which can be obtained from any provider authorized to administer yellow fever vaccine.

2. Other vaccines (e.g., typhoid) may be recommended depending on the area, the season, and the likelihood of exposure. Travelers can obtain the most current recommendations from the Office of Overseas Travel at the CDC.

**VIII.  *Healthy People* *2010* Focus on Immunization and Infectious Diseases**

*Healthy People 2010* objectives detailed three focus areas for infectious diseases. These highlight vaccine preventable and other priority infectious diseases, excluding STIs and HIV.

**IX. *Healthy People* *2010* Focus on Sexually Transmitted Infections (STIs)**

**A.** The rates of STIs in the United States are among the highest in the industrialized world and account for 87% of the top 10 infections reported to the CDC.

**B.** Populations disproportionately affected include adolescents, young adults, women, minorities, and the poor.

1. Teenage girls in particular may be more susceptible to STIs because they have fewer protective antibodies to STIs and a cervix that is biologically immature.

2. Women are at higher risk for contracting STDs than men because they have anatomical differences that enhance transmission of disease and make diagnosis difficult.

**C.** Complications from undiagnosed STIs occur more frequently and are more severe in women.

1. Pelvic inflammatory disease (PID) resulting from undetected STIs can lead to infertility, ectopic pregnancy, o chronic pelvic pain.

2. An infected woman who transmits an STI to her fetus during pregnancy or childbirth may experience spontaneous abortion, premature delivery, stillbirth, low birth weight, neonatal death, and, in the infant, chronic respiratory problems, blindness, and mental disabilities.

3. Certain strains of sexually transmitted human papilloma virus (HPV) are associated with cervical cancer.

**X.  *Healthy People* *2010* Focus on HIV/AIDS**

**A.** HIV, a retrovirus, is the organism that causes the syndrome known as AIDS. Following initial infection, the disease is typically asymptomatic for months to years.

**B.** HIV usually manifests gradually with conditions that result from inadequate immune system function as the virus slowly attacks the body’s immune system. Over time, the body loses its ability to fight illnesses and opportunistic infections occur and become recurrent.

**C.** HIV infection is usually determined by the HIV antibody test, and the most commonly used form is the enzyme-linked immunosorbent assay (ELISA). There may be false-positive findings, so the Western blot is frequently used to verify the results.

**D.** Treatment for HIV and AIDS is complex and changes frequently. The FDA has approved many drugs for HIV infection and AIDS-related conditions. At present there are four classes of antiretroviral drugs, each corresponding to different mechanisms whereby HIV takes invades the cells of the immune system.

**E.** CDC continues to update recommendations for post exposure prophylaxis (PEP) for occupational exposures. Although the principles of immediate treatment following exposure have not changed, the drugs and drug combinations have changed.

**XI. Prevention of Communicable Diseases**

**A. Primary Prevention**

Primary prevention of communicable diseases involves measures to prevent transmission of an infectious agent and to prevent pathology in the person exposed to an infection. Immunization is a primary prevention strategy.

**B. Secondary Prevention**

Secondary prevention includes activities for early detection and treatment of persons who are infected. Reporting infectious diseases, investigating contacts, notifying partners, finding new cases, and isolating cases are examples of secondary prevention.

**C. Tertiary Prevention**

Tertiary prevention includes activities involved in caring for persons with an infectious disease to ensure that they are cured or that their quality of life is maintained. Maybe the most important part of the treatment process is to ensure that the person takes their antimicrobials completely and effectively.