Chapter 20 Epidemiology

Summary Outline

20.1 Principles of epidemiology

A. **Epidemiology** is the study the **frequency** and **distribution** of disease in order to identify its **cause, source** and **route of transmission**.
   1. **Epidemiology** is concerned with the **rate of disease in a given population.**
   2. **Endemic diseases** are constantly present in a population.
   3. An **epidemic** is the occurrence of a disease in larger numbers than would be expected in a given population.
   4. An **outbreak** is a cluster of cases occurring during a specific brief time period and affecting a specific population.
   5. A **pandemic** is an epidemic of world-wide proportions.

B. **Reservoirs of infection**: Continuous source
   1. **Human reservoirs: Infected people** and people who are **carriers** of the infectious agent
   2. **Nonhuman animal reservoirs: Zoonotic diseases** are those such as plague and rabies that can be transmitted to humans but exist primarily in other animals.
   3. Diseases with **environmental reservoirs** are probably impossible to eliminate.

C. **Portals of exit** include
   1. In **feces**
   2. In **respiratory droplets**
   3. On **skin** cells
   4. In **genital secretions**
   5. In **urine**

D. Transmission
   1. **Hand washing** is an important control measure in preventing diseases that are spread through **direct** or **indirect contact**, as well as those that spread via **contaminated food**.
   2. **Direct contact** occurs when one person physically touches another. Diseases with a **low infectious dose** and those caused by **pathogens that cannot survive for extended periods** in the environment are generally transmitted through **direct contact**.
   3. **Indirect contact** involves transfer of pathogens via **fomites**.
   4. **Droplet transmission** of respiratory pathogens is considered direct contact because of the close proximity involved.
   5. **Food-borne pathogens** can originate from the animal reservoir or from contamination during food preparation.
   6. **Waterborne pathogens** often originate from sewage contamination.
   7. **Droplet nuclei**, dead skin cells, household dust and soil may carry airborne respiratory pathogens. This type of transmission is most difficult to control.

E. **Vectors**
   1. **Mechanical vectors** result in moving the microbe from one place to another.
   2. **Biological vectors** are a required part of a parasite's life cycle.
   3. Prevention of vector-borne disease relies on control of the vector.

F. The **portal of entry** of a pathogen can effect the outcome of disease.

G. **Factors** that influence the epidemiology of disease
   1. The **dose**: The probability of infection and disease is lower if an individual is exposed to fewer numbers of pathogens.
   2. Diseases with a long **incubation period** can spread extensively before the first cases appear.

3. Population characteristics
    a. **High percentages of immunity** in a population make it difficult for a disease to spread.
    b. **Malnutrition, overcrowding** and **fatigue increase the susceptibility** of people to infectious diseases.
    c. **Age**: The **very young** and the **elderly** are generally **more susceptible** to infectious agents.
    d. **Natural immunity** can vary with **genetic background**, but it is difficult to determine the relative importance of genetic, cultural and environmental factors.

20.2 **Epidemiological studies**

A. **Descriptive studies** attempt to identify **potential risk factors** that correlate with the development of disease by creating a profile of the persons who became ill. Three types of variables describe the population: **Person, place and time**.

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C. **Analytical studies** try to determine which risk factors are actually relevant to disease development.
    1. A **retrospective study** compares the activities of cases with controls to determine the cause of the epidemic.
    2. A **prospective study** looks ahead, comparing **cohort** groups, to determine if the identified risk factors predict a tendency to develop disease.

D. **Experimental studies** are generally used to evaluate
    1. The **effectiveness of a treatment**
    2. **Intervention** in preventing disease.

20.3 Infectious disease surveillance

A. The **Centers for Disease Control and Prevention** collects data on diseases of public health importance and summarizes their status in the **Morbidity and Mortality Weekly Report**.

B. **State public health departments** are involved in infection surveillance and control.

C. The **World Health Organization (WHO)** is an international agency devoted to achieving the highest possible level of health for all people.

20.4 Trends in disease

A. Reduction and eradication of disease
    1. Smallpox has been eradicated.
    2. The World Health Organization hopes to soon eliminate other diseases including dracunculiasis, polio and measles.

B. Emerging diseases include those that are new or newly recognized and familiar ones that are reemerging after years of decline.

20.5 **Nosocomial infections**: Hospital acquired infections

A. **Reservoirs** of infectious agents in hospitals include other **patients**, the **hospital environment, medical personnel** or the **patient's own flora**.

B. **Transmission of infectious agents in hospitals** can occur by **diagnostic and therapeutic procedures** and **health care personnel.**

C. **Hand-washing** is an important means of prevention.