

Principles in Prevention and Control of Communicable Diseases

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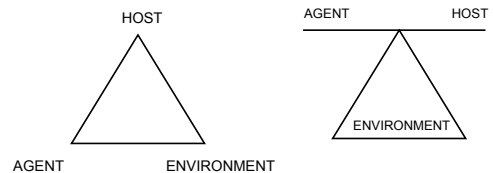
Objectives

- Relationship between agent, host and environment and human in diseases transmission
- Discuss the principles of disease prevention
- Describe methods of control and prevention used for communicable diseases
- Definition: diseases prevention, control, elimination and eradication, isolation vs quarantine
- Examples

The Epidemiologic Triad: Agent, Host and Environment

- Traditional model of infectious disease causation.
- Three components: an external agent, a susceptible host, and an environment that brings the host and agent together.

Epidemiologic triangle and triad (balance beam)



• AGENT FACTORS

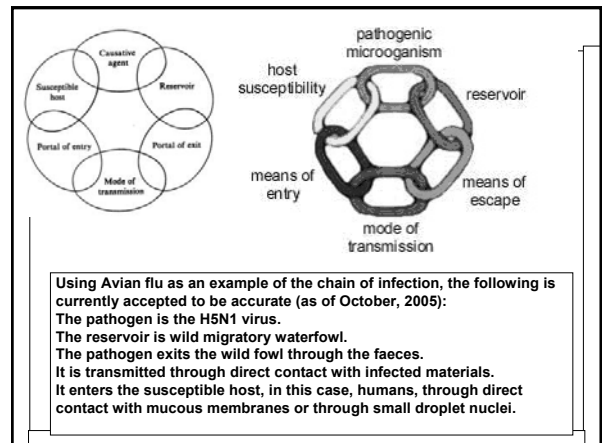
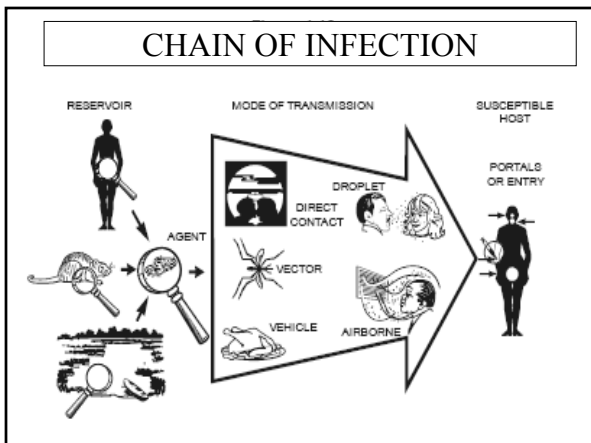
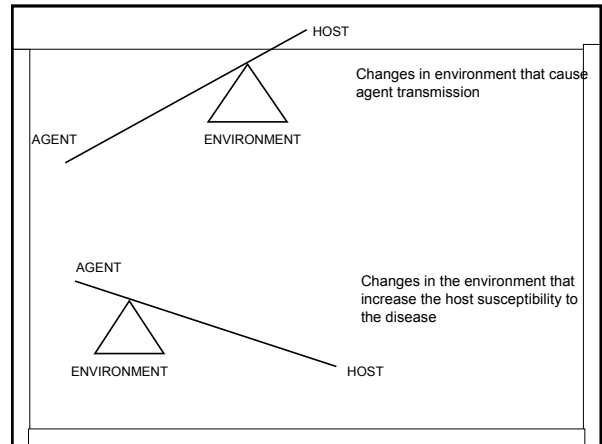
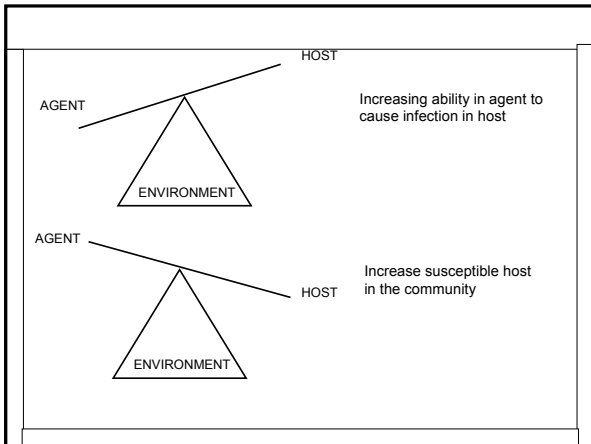
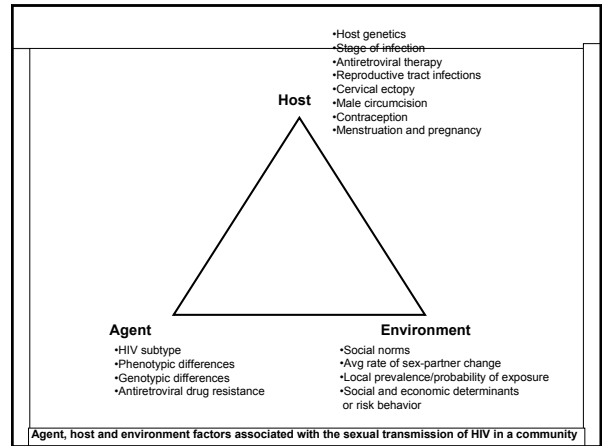
- Biological – bacteria, virus, parasites, fungi
- Physical – physical forces, heat, radiation, noise
- Chemical – contaminants, poisons, drugs, allergens
- **Generally agents must be present for disease to occur .**

• HOST FACTORS

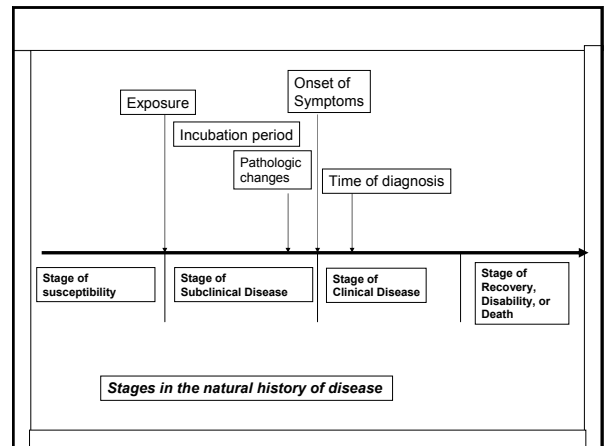
- Intrinsic factors that influence an individual's exposure, susceptibility, or response to a causative agent.
- Example; age, race, sex, socioeconomic status, behaviors, nutritional status etc.

• **ENVIRONMENTAL FACTORS**

- Extrinsic factors which affect the agent and the opportunity for exposure.
- Example; physical factors such as geology, climate, climate and physical surroundings; biologic factors such as insects that transmit the agent; and socioeconomic factors such as crowding, sanitation, and the availability of health services.



Natural history of disease



- **Subclinical stage** – corresponds to time during which the etiologic agent is present within the body but has not yet caused discernible signs or symptoms
- Both infectious and noninfectious diseases are characterized by subclinical stages of disease.
- In infectious diseases – incubation period
- In noninfectious diseases – latent period or induction period

- **Incubation periods vary considerably according to agent-disease pairs**
- Some diseases have short incubation periods e.g. cholera 24-48 hour, intermediate e.g. chickenpox 2-3 weeks extended e.g. AIDS 10 years leukemia due Hiroshima atomic bomb 2-12 years occupational associated bladder tumors in GB 5-40 years
- **Variability in incubation and latency can be due to differences in host susceptibility, pathogenicity of the agent, and dose exposure**

- **Stage of clinical disease** – begins with patient's first symptoms and ends with either recovery, disability and death
- Depending on host factors, access to health care, and the diagnostic acumen of the clinician in charge, the lag between the onset of symptoms and diagnosis may vary considerably.
- **The onset of symptoms - not the time of diagnosis – marks the beginning of the clinical stage of disease**

Three terms are used to describe an infectious disease according to the various outcomes that may occur after exposure to its causative agent.

Infectivity refers to the proportion of exposed persons who become infected.

Pathogenicity refers to the proportion of infected persons who develop clinical disease.

Virulence refers to the proportion of persons with clinical disease who become severely ill or die.

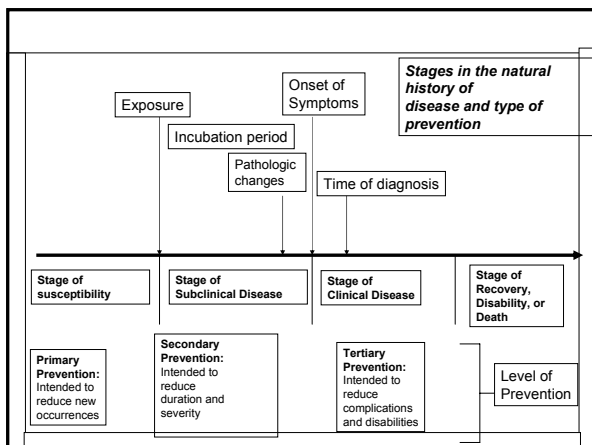
What is disease prevention?

- Disease prevention covers measures not only to prevent the occurrence of disease, such as risk factor reduction, but also to arrest its progress and reduce its consequences once established

- **Disease prevention efforts** can be classified according to the stage of disease they are applied
- **Primary prevention** – directed toward the stage of susceptibility, before the pathogen establishes itself in the body
- **Goals**
 - to prevent disease from occurring
 - reducing its incidence and prevalence in the community
 - Example; needle exchange programs to prevent the spread of HIV, vaccination programs, smoking cessation

- **Secondary prevention** – directed toward the subclinical stage, people who carry the agent in their bodies but are not yet symptomatic
- **Goal**
 - To reduce the expression or severity of the disease once it emerges.
 - Example; treating asymptomatic HIV infected pts with combination of antiviral agents, screening for cervical cancer and breast cancer to detect the diseases in their early stages.

- **Tertiary prevention** – directed toward the clinical stage
- **Goal**
 - To prevent or minimize the progression of the disease or its sequelae
 - Example; screening people with diabetes for diabetic retinopathy in order to promptly treat the progression of blindness



Terms related to control

- **Isolation**
 - In epidemiology isolation refers to a procedure used in communicable disease control. It consists of a separation of cases (persons or animals) for a disease's period of communicability.
 - The cases are isolated in a specific location and under conditions that minimize the risk of direct or indirect transmission of the infectious agents to those who may be susceptible

- **Quarantine**

- Quarantine is defined as a restriction of the activities of healthy persons or animals who have been exposed to a communicable disease. The aim is to prevent transmission of the disease from potentially infected persons to healthy persons during the incubation period.
- Quarantine can take two forms: absolute or complete quarantine, which consists of a limitation of freedom for a period equal to the longest usual incubation period of the disease; and modified quarantine, which involves selective or partial limitation of movement, based on known differences in susceptibility.

- **Control:**

- The reduction of disease incidence, prevalence, morbidity or mortality to a locally acceptable level as a result of deliberate efforts; continued intervention measures are required to maintain the reduction.
- Example: diarrhoeal diseases.

- **Extinction:**

- The specific infectious agent no longer exists in nature or in the laboratory.

- **Elimination of disease:**

- Reduction to zero of the incidence of a specified disease in a defined geographical area as a result of deliberate efforts; continued intervention measures are required. Example: neonatal tetanus.

- **Elimination of infections:**

- Reduction to zero of the incidence of infection caused by a specific agent in a defined geographical area as a result of deliberate efforts; continued measures to prevent re-establishment of transmission are required. Example: measles, poliomyelitis.

- **Eradication:**

- Permanent reduction to zero of the worldwide incidence of infection caused by a specific agent as a result of deliberate efforts; intervention measures are no longer needed. Example: smallpox.

Examples

- Cholera (*V. cholerae*)

- Primary prevention

- Health education
- Management of water supply, sanitation and food hygiene
- Vaccine?

- Secondary prevention

- Early detection and treatment (ORS and antibiotic)

- Tertiary prevention

- rehabilitation

- Dengue fever

- Primary prevention

- Health education
- Environment sanitation, human behaviour
- Mosquito net, bed nets
- Vaccine?

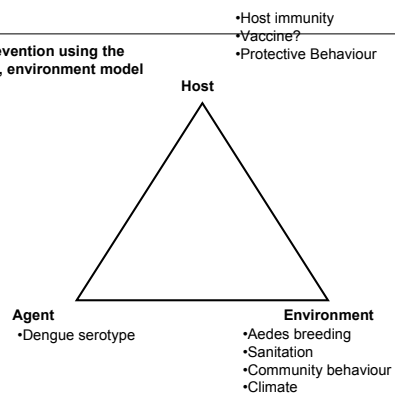
- Secondary prevention

- Early detection and treatment
- Isolation or quarantine?

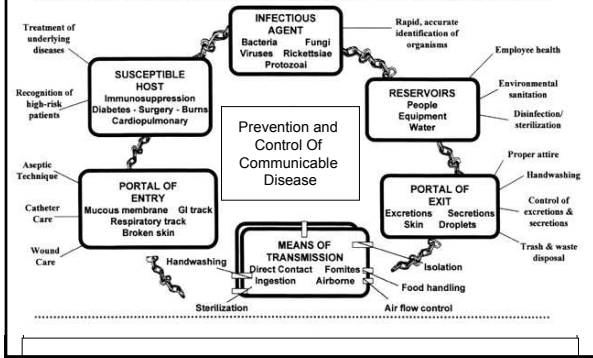
- Tertiary prevention

- Prevent/reduce complication
- rehabilitation

Dengue Prevention using the agent, host, environment model



BREAKING THE CHAIN OF INFECTION



Thank You