

## Epidemiology of communicable diseases

Communicable Disease: It is an illness caused by an infectious agent or its toxic product that is transmitted from an infected person, animal or inanimate source to a susceptible host.

### Components of the infectious process (chain of disease transmission)

- 1 .The Agent
2. Reservoirs
3. Portal of exits
4. Mode of transmission
5. Portals of entry
- 6 . Susceptible host

#### I. The Agents

The agents in the infectious process range from viral particles to complex multi-cellular organisms

#### II. Reservoirs

A reservoir is an organism or habitat, in which an infectious agent normally lives, transforms, develops and/or multiplies. Reservoirs for infectious agents may be humans, animals, plants or other inanimate objects .

✚ Some diseases with human reservoirs are :

All infected humans, whether showing signs and symptoms of the disease or not, are potential sources of infection to others. **A person who does not have apparent clinical disease, but is a potential source of infection to other people is called a Carrier.** An example of carrier is a person

infected with HIV. A person infected with HIV might not have the signs and symptoms but he/she is capable of transmitting the infection to others

- ✚ Some diseases are transmitted to human beings from animals. These diseases are called zoonoses.

### III .Portal of Exit

Portal of exit is the way the infectious agent leaves the reservoir .Possible portals of exit include all body secretions and discharges : Mucus, saliva, tears, breast milk, vaginal and cervical discharges ,excretions (feces and urine), blood, and tissues. For example, feces are the portal of exit for the eggs of hook worm.

### IV. Mode of Transmission

Modes of transmission include the various mechanisms by which agents are conveyed to other susceptible hosts. Transmission may be direct or indirect .

#### 1 .Direct Transmission

- Direct contact: Occurs when there is contact of skin, mucosa , or conjunctiva with infectious agents directly from person or vertebrate animal, via touching, kissing, biting, passage through the birth canal, or during sexual intercourse .Example HIV/AIDS/STIs, rabies.
- Direct Projection: is transmission by projection of saliva droplets during coughing, sneezing, singing, spitting or talking . Example: common cold
- Transplacental: is transmission from mother to fetus through the placenta .Example : syphilis, HIV/AIDS

## 2 .Indirect transmission

- Vehicle-borne: Transmission occurs through indirect contact with inanimate objects fomites: bed sheets, towels, toys, or surgical instruments; as well as through contaminated food, water, IV fluids etc.
- Vector-borne: The infectious agent is conveyed by an arthropod to a host. Vectors may be biological or mechanical.
  - ❖ Biological vector: A vector is called biological vector if the agent multiplies in the vector before transmission. Example: anopheles' mosquito is a biological vector for malaria
  - ❖ Mechanical vector: A vector is called mechanical vector if the agent is directly infective to other hosts, without having to go through a period of multiplication or development in the vector. The vector simply carries the agent by its body parts (leg, proboscis etc.) to susceptible hosts. Flies are mechanical vectors for the transmission of trachoma
- Airborne: which may occur by dust or droplet nuclei (dried residue of aerosols) Example: Tuberculosis.

**V. Portal of entry** - is the site where an infectious agent enters a susceptible host .Examples: -Nasal mucosa is portal of entry for common cold - Conjunctiva is the portal of entry for trachoma -Injury site is portal of entry for tetanus

**VI. Susceptible human host:** The susceptible human host is the final link in the infectious process. Host susceptibility or resistance can be seen at the individual and at the community level.

Host resistance at the community (population) level is called herd immunity. **Herd immunity can be defined as the resistance of a**

population to the introduction and spread of an infectious agent, based on the immunity of a high proportion of individual members of the population, thereby lessening the likelihood of a person with a disease coming into contact with susceptible.

**Susceptibility to infection is universal but susceptibility to disease depends on:**

- 1 -Immunity.
- 2 -Dietary and nutritional factors.
- 3- Genetic factors.

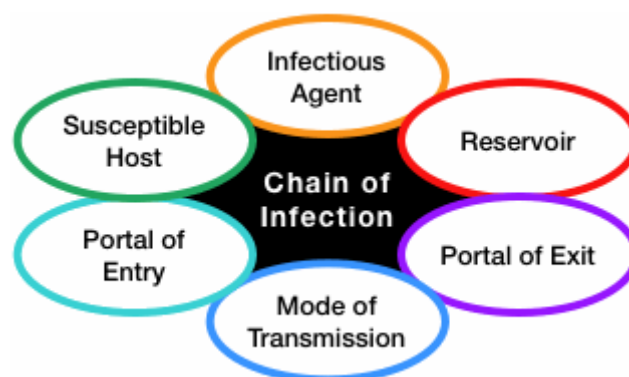
**Incubation Period:** It is the period between the entry of the organism and the appearance of the first symptom of the disease.

Knowledge of the incubation period is important for:

- Surveillance and quarantine in some diseases.
- Application of preventive measures to abort or modify the attack.
- Identification of the source of infection

**Prevention and control of communicable diseases**

(Should Break the Cycle)



### **Measures that directed to the agent**

Sterilization, disinfection, and proper treatment of infected individuals to kill the agent at its source.

### **Measures directed to the reservoir**

**Cases:** Case finding, reporting to the local health authority in order to apply the appropriate control

**measures for contact and the environment,** isolation (strict isolation or discharge/body fluid isolation) for the whole period of communicability and treatment, surveillance for the longest incubation period.

**Carriers:** Identification of carriers in the community, treatment and exclusion from work till the organism is eliminated especially if food handlers or working with children.

**Animal reservoir:** Adequate animal husbandry, immunization of animals (if vaccine is available), treatment of infected animals and killing if treatment is not feasible.

### **Measures directed towards breaking transmission**

- Isolation if indicated = to interrupt direct transmission.
- Decontamination of fomites = vehicle transmission.
- Promote hand washing = prevent feco-oral transmission.
- Modify ventilation and air pressure = prevent airborne transmission.
- Control vector population = control vector-borne transmission.
- Environment: sanitation of water, food, proper sewage handling.

### **Measures Directed towards Protecting Portal of Entry**

- Using bed-nets (against mosquitoes).
- Wearing masks and gowns to prevent entry of infected body secretions or droplets through skin or mucous membranes.
- Covering skin and using insect repellents.

### **Measures directed to the host**

- Health education.
- Adequate personal hygiene.
- Good nutrition.
- Immunization.
- Chemoprophylaxis