
Welcome

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Epidemiology

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Definitions

Health: A state of complete physical, mental and social well-being and not merely the absence of disease or infirmity (WHO,1948)

Disease: A physiological or psychological dysfunction

Illness: A subjective state of not being well

Sickness: A state of social dysfunction

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Definitions…

Public health

The science & art of

Preventing disease,

prolonging life,

promoting health & efficiency

through organized *community effort* (Winslow, 1920)

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Definitions…

Epidemiology

It is the *study* of *frequency*, *distribution*, and *determinants* of *diseases* and *other health-related* conditions in a human *population*

and

the *application* of this study to the prevention of disease and promotion of health

DEFINITIONS

- ”the study of the distribution and determinants of health related states and events in specific populations and the application of the study of control health problems"

  (John.M.Last 1988).

Components of the definition

1. ***Study***: Systematic collection, analysis and interpretation of data

Epidemiology involves collection, analysis and interpretation of health related data

Epidemiology is a science

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Components…

2. ***Frequency***: the number of times an event occurs

Epidemiology studies the number of times a disease occurs

It answers the question ***How many?***

Epidemiology is a quantitative science

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Components…

3. ***Distribution***: Distribution of an event by person, place and time

Epidemiology studies distribution of diseases

It answers the question ***who, where and when?***

Epidemiology describes health events

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Components…

4. ***Determinants***: Factors the presence/absence of which affect the occurrence and level of an event

Epidemiology studies what determines health events

It answers the question how and why?

Epidemiology analyzes health events

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Components…

5. ***Diseases & other health related events***

Epidemiology is not only the study of diseases

The focus of Epidemiology are not only patients

It studies all health related conditions

Epidemiology is a broader science

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Components…

6. ***Human population***

Epidemiology diagnoses and treats communities/populations

Clinical medicine diagnoses and treats patients

Epidemiology is a basic science of public health

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Components…

7. ***Application***

Epidemiological studies have direct and practical applications for prevention of diseases & promotion of health

Epidemiology is a science and practice

Epidemiology is an applied science

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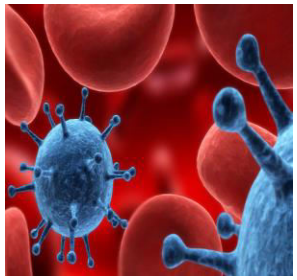
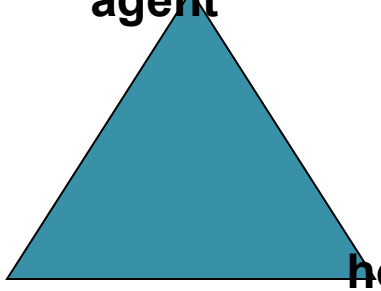
BASIC CONCEPTS IN EPIDEMIOLOGY

- agent
- host
- environment



agent



host

environment

BASIC CONCEPTS IN EPIDEMIOLOGY

- **Agent:** an animate or inanimate factor that must be present or lacking for a disease or condition to develop.
- **Host:** a living species (human or animal) capable of being infected or affected by an agent.
- **Environment:** all that is internal or external to a given host or agent and that is influenced and influences the host and/or agent.

AIMS OF EPIDEMIOLOGY

According to International Epidemiological Association(IEA), epidemiology has three main aims,

- To describe the distribution and magnitude of health and disease problems in human populaions.
- To identify the etiological factors or risk factors in the pathogenicity of disease.
- To provide the data essential to the planning , implementation and evaluation of services.

Scope of Epidemiology

Originally, Epidemiology was concerned with investigation & management of ***epidemics*** of communicable diseases

Lately, Epidemiology was extended to endemic communicable diseases and non-communicable infectious ***diseases***

Recently, Epidemiology can be applied to ***all*** diseases and other health related events

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contd

- It is a concerned with the systematized study of :
- 1 . Whole population in their living &working environment
- 2. Factors that determine a state of health & disease
- 3. Pattern of health as well as pattern of illness
- 4. Measures of prevention & control

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Purpose/use of Epidemiology

The ultimate purpose of Epidemiology is prevention of diseases and promotion of health

How?

1. Elucidation of natural history of diseases
2. Description of health status of population
3. Establishing determinants of diseases
4. Evaluation of intervention effectiveness

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terminologies used in epidemiology

Frequency:

- relationship between the number of cases of disease and the size of the population

Determinants:

- causes and other factors that influence the occurrence of disease and other health-related events

Public Health Surveillance

- ongoing, systematic collection, analysis, interpretation, and dissemination of health data to help guide public health decision making and action

- Case Definition

  a set of standard criteria used for classifying whether a person has a particular disease, syndrome, or other health condition

- Descriptive Epidemiology

  Type of epidemiology which only covers time place and time to describe an outbreak rather than case definition, person, place, time, and causes/risk factors/modes of transmission

- Analytic Epidemiology

  The type of epidemiology turned to to test hypotheses formed with information acquired through descriptive epidemiology

- Experimental studies

  Form of analytic epidemiology which tests hypotheses in a very controlled environment

- Observational studies

  Type of analytic study in which the epidemiologist simply observes the exposure and disease status of each participant. (Cohort, case-control, and cross-sectional)

- Cohort Study

  Epidemiologist tracks whether or not the participant is exposed and then tracks them to see if they develop the disease. It is the most reliable form of analytic study, but most expensive and time-consuming.

- prospective study

  A study which monitors exposure first, then looks forward to see if disease is developed.

- retrospective study

  starts with people already diseased, then traces back to see if they had been exposed

- Case-control study

  enroll people with disease and use people without the disease. they then compare previous exposures between the two groups

- cross-sectional study

  the least expensive and least effective analytic study

- Epidemiological triad

  agent host environment

- agent

  A microbe which causes disease

- Host

  the human who develops the disease

- environment

  extrinsic factors that affect the agent and the opportunity for exposure

- Incubation period

  the stage of subclinical disease extending from the time of exposure to onset of disease symptoms for infectious diseases

- Latency period

  the stage of subclinical disease extending from the time of exposure to onset of disease symptoms for chronic disease

- Spectrum of disease

  the disease process resulting in illness which is mild, severe, or fatal and eventually ends in recovery, disability, or death

- Infectivity

  the proportion of exposed persons who become infected

- pathogenicity

  the proportion of infected individuals who develop clinically apparent disease

- virulence

  the proportion of clinically apparent cases that are severe or fatal

- carriers
  persons who are infectious but have subclinical disease

- reservoir
  the habitat in which the agent normally lives, grows, and multiplies

- portal of exit
  the path by which a pathogen leaves its host

- mode of transmission
  the way through which an agent is transmitted to its host

- portal of entry

  the manner in which the pathogen enters a susceptible host

- direct transmission

  an infectious agent is transferred from a reservoir

- direct contact

  skin to skin contact

- droplet spread

  spray with relatively large, short-range aerosols produced by sneezing, coughing, or even talking

- indirect transmission

  the transfer of an infectious agent from a reservoir to a host by suspended air particles, inanimate objects, or vectors

- airborne

  transmission occurs when infectious agents are carried by dust or droplet nuclei suspended in air

- herd immunity

  suggests that if a high enough proportion of individuals in a population are resistant to an agent, then those few who are susceptible will be protected by the resistant majority since the pathogen will be unlikely to "find those few susceptible individuals

- endemic level

  the amount of a particular disease that is usually present in the community

- sporadic

  a disease that occurs infrequently and irregularly

- endemic

  the constant presence and or usual prevalence of a disease or infectious agent in a population within a geographic area

- common source outbreak

  an outbreak in which a group of persons are all exposed to an infectious agent or toxin from the same source

- point source outbreak

  if the group is exposed over a relatively brief period, so everyone who becomes ill does so in on incubation period, then the common source outbreak is further classified as a point source outbreak

- ratio

  the relative magnitude of two quantities or a comparison of any two values

- proportion

  the comparison of a part to the whole

- rate

  a measure of the frequency with which an event occurs in a defined population over a specified period of time

- incidence rate

  conveys a sense of speed with which disease occurs in a population, and seems to imply that this pattern has occurred and will continue to occur for the foreseeable future

- attack rate

  the proportion of the population that develops illness during an outbreak

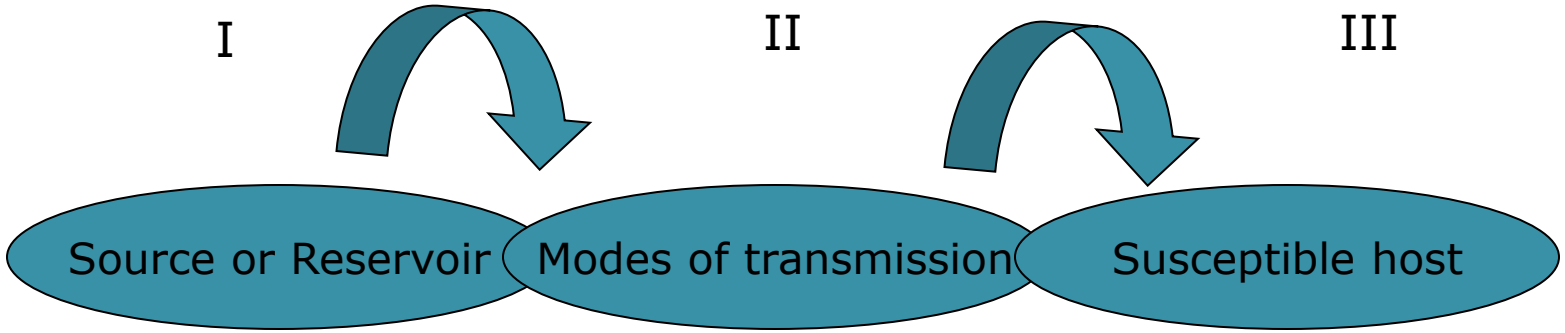
- case fatality rate

  the proportion of persons with the disease who die from it

- prevalence rate

  the proportion of the population that has a health condition at a point in time

Dynamics of disease Transmission (Chain of Infection)

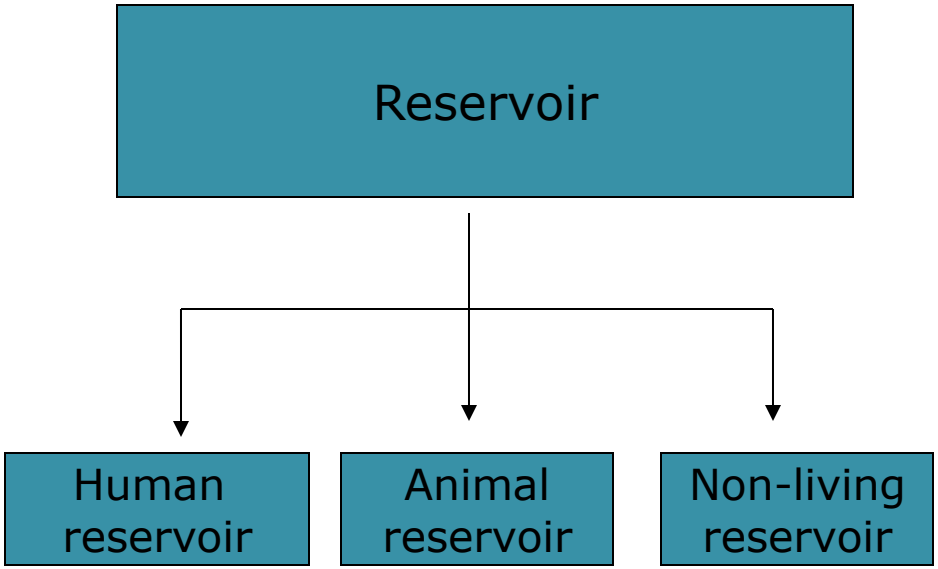


(I): Source or Reservoir

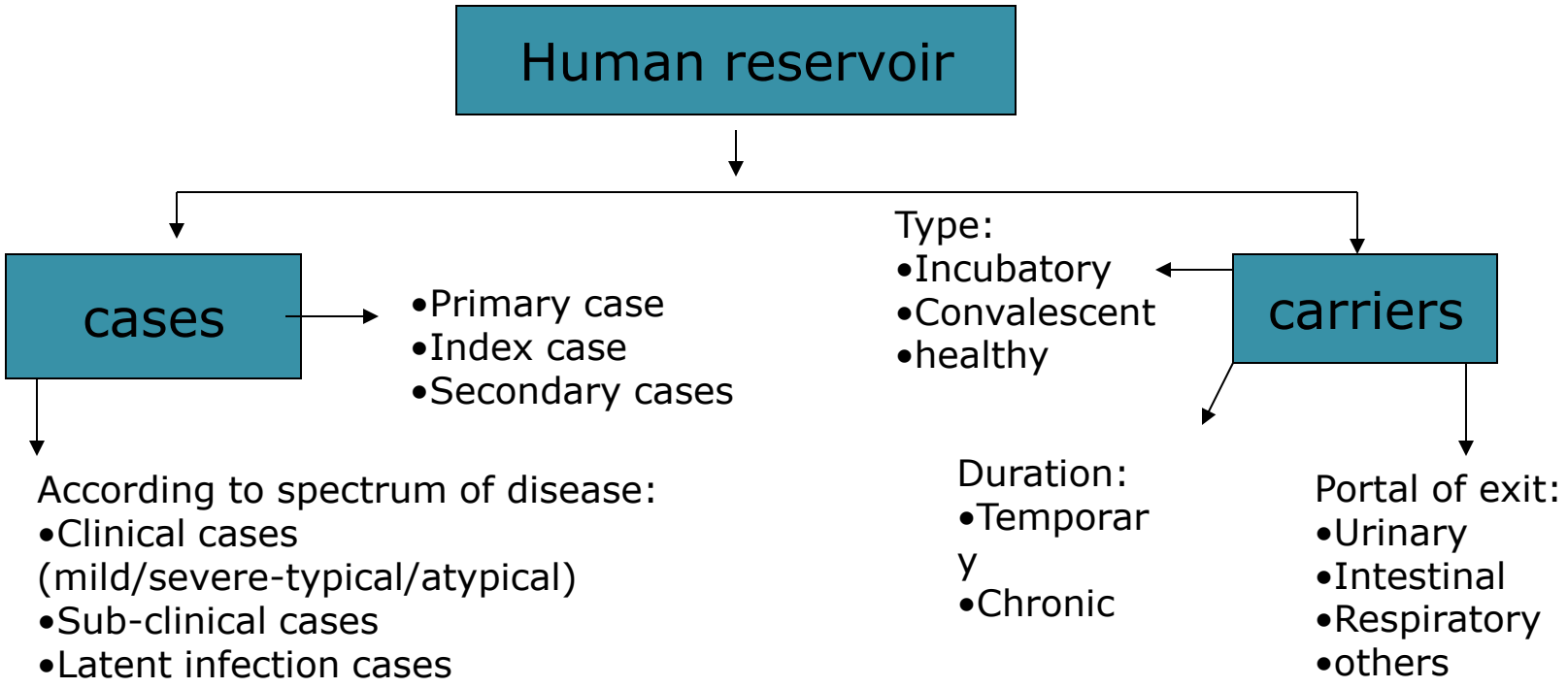
- The starting point for the occurrence of a communicable disease is the existence of a reservoir or source of infection.

- The source of infection is defined as "the person, animal, object or substance from which an infectious agent passes or is disseminated to the host (immediate source). The reservoir is "any person, animal, arthropod, plant, soil, or substance, or a combination of these, in which an infectious agent normally lives and multiplies, on which it depends primarily for survival, and where it reproduces itself in such a manner that it can be transmitted to a susceptible host. It is the natural habitat of the infectious agent."

Types of reservoirs



Human reservoir



Cases

- A case is defined as “a person in the population or study group identified as having the particular disease, health disorder, or condition under investigation”

Carriers

- It occurs either due to inadequate treatment or immune response, the disease agent is not completely eliminated, leading to a carrier state.

- It is "an infected person or animal that harbors a specific infectious agent in the absence of discernible (visible) clinical disease and serves as a potential source of infection to others.

- Three elements have to occur to form a carrier state:

1. The presence in the body of the disease agent.
2. The absence of recognizable symptoms and signs of disease.
3. The shedding of disease agent in the discharge or excretions.

Animal reservoirs

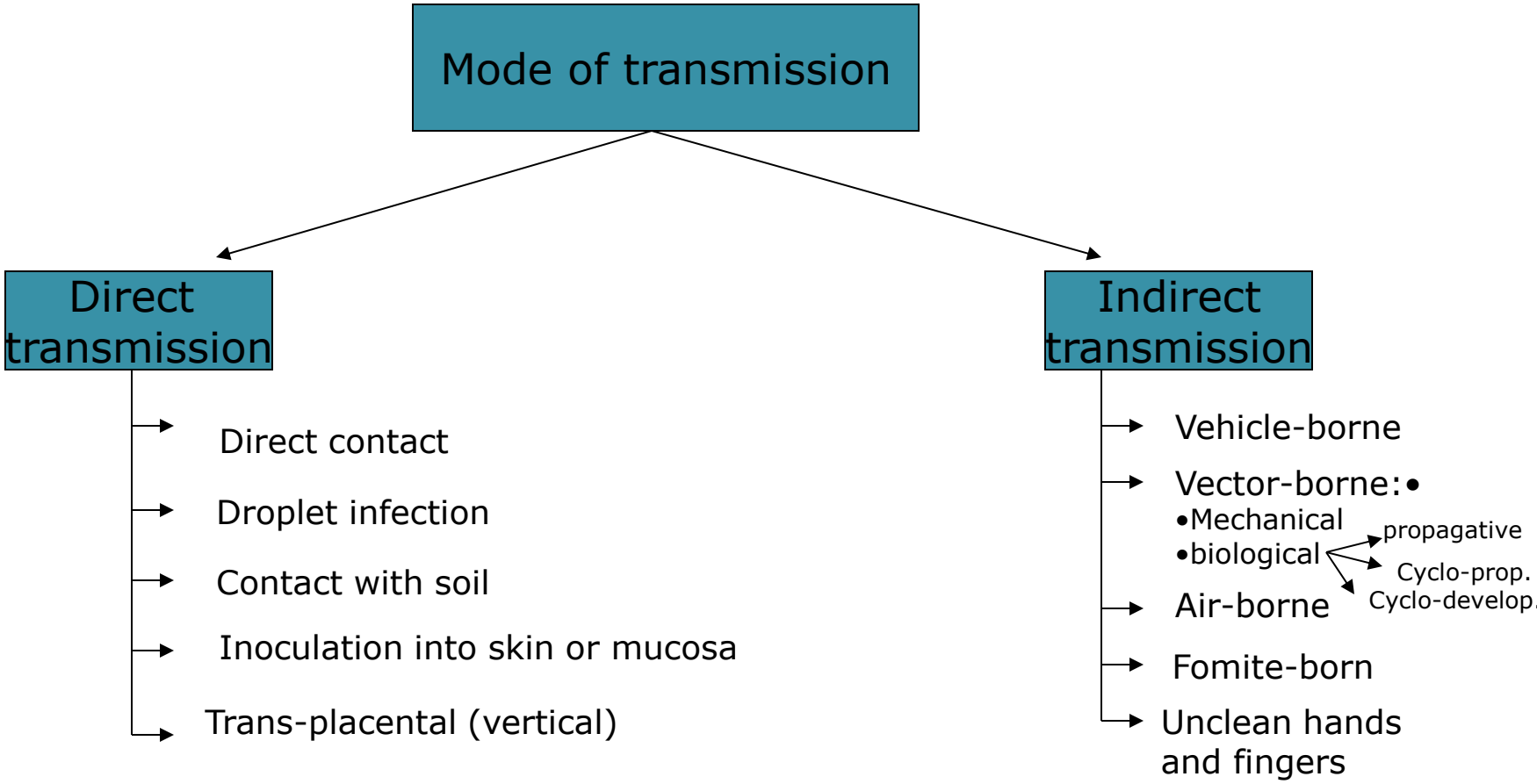
- Zoonosis is an infection that is transmissible under natural conditions from vertebrate animals to man, e.g. rabies, plague, bovine tuberculosis….
- There are over a 100 zoonotic diseases that can be conveyed from animal to man.

Reservoir in non-living things

- Soil and inanimate matter can also act as reservoir of infection.

- For example, soil may harbor agents that causes tetanus, anthrax and coccidiodomycosis.

(II): Modes of transmission



(III): Susceptible host

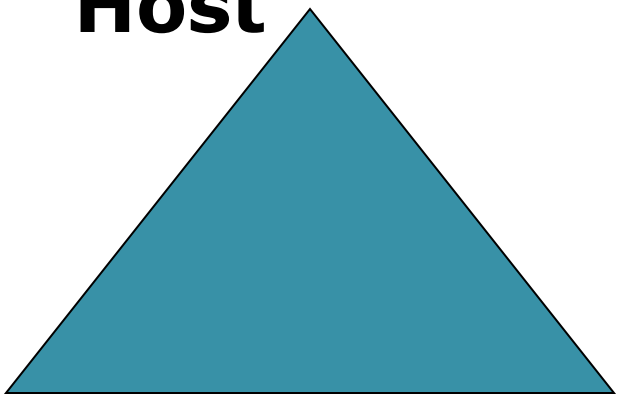
- An infectious agent seeks a susceptible host aiming "successful parasitism".

- Four stages are required for successful parasitism:
  1. Portal of entry
  2. Site of election inside the body
  3. Portal of exit
  4. Survival in external environment

Epidemiologic triad

Host

- **Demographic characteristics**
- **Biological characteristics**
- **Socioeconomic characteristics**



Agent

- **Biological agents**
- **Physical agents**
- **Chemical agents**
- **Nutrient agents**
- **Mechanical agents**
- **Social agents**

Environment

- **Physical environment**
- **Biological environment**
- **Social environment**

Mortality and