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Microbial epidemiology

* **Epidemiology** is the science that studies the patterns, causes, and effects of health and disease conditions in defined populations.

The distinction between:

* **Epidemic diseases:** that are visited upon a population.

* **Endemic disease:** that resides within a population (endemic).

Epidemiologists also study the interaction of diseases in a population. A condition known as **a Syndemic** is the aggregation of two or more diseases in a population.

Reservoir of infection: This was obtained from the French (reservoir) and English (reserve).

It means the primary habitat of the organism. **Any person, animal, plant, water, soil or substance (part of a device) in which an infectious agent usually lives and multiplies.**

The reservoir typically harbours the infectious agent without injury to itself and serves as a source from which other individuals can be infected. The infectious agent primarily depends on the reservoir for its survival. It is from the reservoir that the infectious substance is transmitted to a human or another susceptible host.

Epidemiological markers:

Biological markers characterize microorganisms or discriminate between genomes based on genetic variation among microbial isolates. Which are include:

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1- **Genotype**: Genetic constitution of an organism as assessed by a molecular method such as **plasmid typing. SNP typing**

2- **Phenotype**: Observable characteristics of an isolate such as **serotyping, bacteriocin typing, and antibiotic typing.** The epidemiological marker should remain stable for each isolate after **its primary isolation & during laboratory storage & subculture across generations.**

How Do Infectious Diseases Spread?

Microbes invade the host body and begin multiplying using the host body's resources. Thus, this causes problems in the normal functioning of the infected part, organ or tissue. Microbes can enter the body by the following mode of entry:

Respiratory Tract Illnesses: through inhalation of airborne droplets containing microbes by sneezes or coughs.

Food Borne Illnesses: Infections can spread through contaminated food and drinks.

Vector Borne Illness: Infections that spread by a vector who serves as an intermediate host to a healthy person is called as vector borne illness. Diseases such as malaria

Person-To-Person Contact: Many illnesses spread by direct contact with the infected person. Body fluids that contain microbes can enter the body through saliva, blood, semen, pus or an open wound.

Venereal/Sexual Transmission : like gonorrhea, syphilis, HIV/AIDS, etc. spread through unsafe intercourse with an infected person.

Vertical Transmission: When an infected woman gets pregnant or acquires an infection during pregnancy, it results in vertical transmission. This means, the infection can spread from the mother to her embryo, fetus or child during pregnancy or childbirth

Iatrogenic transmission: Infection that spreads due to medical error or lapse, that is injection or transplantation of an infected material into a healthy individual.

Animal to person: infections that can be transmitted between vertebrate animals and humans. The natural host is the animal is called as **zoonotic diseases**. Rabies is an example of such an infectious disease.

Bacterial Infections characterized by following signs:

*Redness, swelling, and heat on the infected part *Pain at the site of infection * Pus

Some of the common diagnostic methods to detect infection include:

*Blood tests * X-rays *Microbial culture *Stool samples

*Urinalysis *Microscopically tests *Biochemical tests

*Molecular diagnostic tests *Biopsy

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Bacterial antigenic structures: There are three different antigenic structures found in bacteria which are:

1- **O antigen:** which is represented to a somatic bacterial antigen (Ag) such as lipopolysaccharide (LPS).

2- **K antigen:** which is represent to capsular part of bacteria

3- **H antigen:** which is represent to bacterial flagella .

Several terms are predominantly related with infection

Infectious disease is an infection that can be transmitted between humans (or organisms/animals, etc.).

Acute infections will be those that arise quickly (e.g. tonsillitis) and progress rapidly

Chronic infections which have a longer course (e.g. tuberculosis), lasting for weeks up to years without resolution.

Latent infections are those in which the microbe is able to persist for years within a site in the host and cause of the time the organism is present.

Generalized infections are often more severe. The involvement of numerous organs throughout the body will lead to more complications. Another term for systemic infection is 'multi-organ infection'.

Localized infections: simply infecting a site such as on the skin**.**

Nosocomial infections : People often acquire an infection during their stay in hospital.