

Epidemiology

Dynamic of disease
Epidemiologic cycle

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Epidemiologic cycle

=Epidemiological infection cycle

= Infection Process

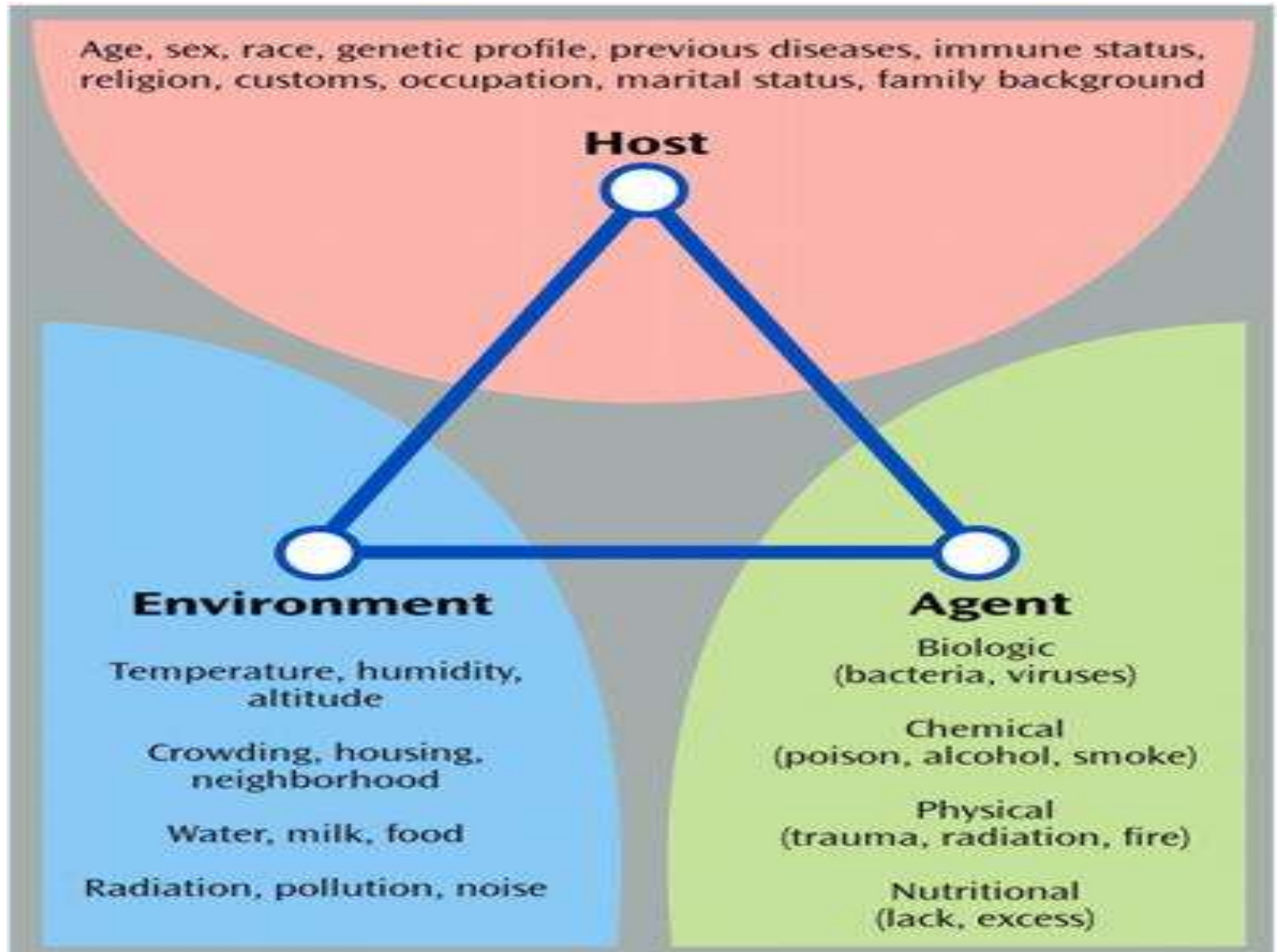
=Chain of Infection

=Infection Process

Out line:-

- Epidemiologic **Triad**
- **Concepts**
- **Factors** for development or spread of infectious disease
- **Chain** of Infection
- Infectious **Agent**= Causative Organism
- **Reservoirs** of infectious disease
- Portals of **exit**
- Mode of **Transmission**
- Portals of **entry**
- Susceptible **host**
- **Process** of Infection
- *Different Ways to **break Chain***
- **Factors** that influence epidemiology of disease
- Population **characteristics** that influence occurrence of disease

Epidemiologic Triad



CONCEPTS

Communicable disease

- Disease transmitted from one host to another
- **In order for disease to spread**, a chain of events must occur
 - **Pathogen** must have **suitable environment** in which to live
 - **Pathogen** must **leave reservoir** to be **transmitted** to **susceptible host**
- **Natural habitat** يسمى **الموطن \ المسكن** is termed **مستودع** reservoir
 - Reservoir of pathogen affects **extent and distribution of disease** مدى انتشار
 - Can be **animal** or **environment**
 - Must have **portal of exit** to leave reservoir and **enter host**

Non-communicable

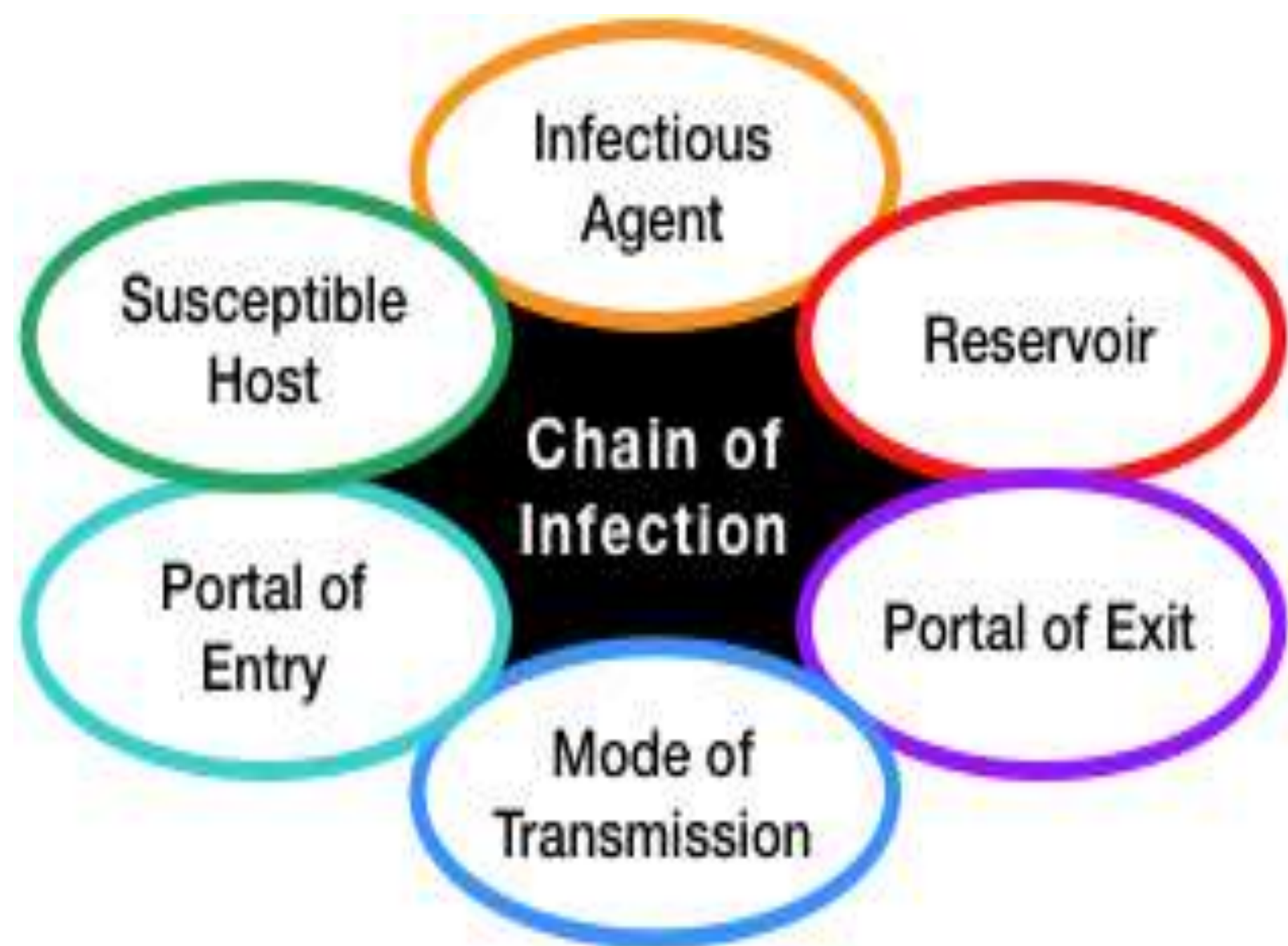
- Disease that **does not spread** from **one host to another**

Factors for development or spread of infectious disease

- An **etiological agent** responsible for the disease should be present.
- There should be a **reservoir** **مستودع** or **carrier** **حامل** for the etiological agent to survive.
- The infecting agent should be able to escape from the reservoir of infection through the **portal of exit**
- There should be a possible source of **entry to** transmit the agent to a new **susceptible host**
- The agent should be able to **invade** the **new host**
- The **host** **عائل** should be **susceptible** **حساس | سريع التأثير**

Chain of Infection

- **Definition:** Chain سلسله of infection is a model (a circle of links حلقه من الروابط) used to understand the infection process.
- Each circle represents a component in the cycle.
- Each link must be present and in the sequential order for an infection to occur.
- Breaking any link in the chain can disrupt the infection.



Infectious Agent= Causative Organism

The causative organism may be :

- 1. Bacteria**
- 2. Virus**
- 3. Parasite**
- 4. Fungus**

Reservoirs of infectious disease

1. Human reservoir

- Symptomatic infections
- Asymptomatic carriers

2. Non-human animal reservoirs

Disease transmitted by non-human animal reservoirs are termed zoonotic

1. Environmental reservoirs

- Water
- Air
- Soil

Portals of exit

- Microbes must leave one host in order to be transmitted to another
 - Organisms **inhabiting intestinal tract** are shed
خروج in **feces**
 - Organisms **inhabiting respiratory tract** are expelled in respiratory droplets of **saliva**
 - Organisms of the **skin** are shed with skin cells as they **slough off** الافرازات الجلديه من خلال المسامات

Mode of Transmission

1. Air

Respiratory droplets can be transmitted through the air.

2. Vectors

- Any living organism that can carry a disease
 - Most common are arthropods
 - Vector may carry organism internally or externally



Portals of entry = Inlet مدخل of transmission

- **Pathogen** must enter and colonize يستعمر new host
- **Route** by which pathogen **enters body** is termed portal of entry
- **Major portals** of entry include
 - Eyes
 - Ears
 - Respiratory tract
 - Broken skin
 - Digestive tract
 - Genitourinary tract الجهاز البولي التناسلي

المضيف السريع التأثير Susceptible host

Susceptible hosts have been exposed to neither the wild strain إجهاد شديد of the disease nor a vaccination against it, and thus have not developed immunity. Those individuals who have antibodies against an antigen associated with a particular infectious disease will not be susceptible

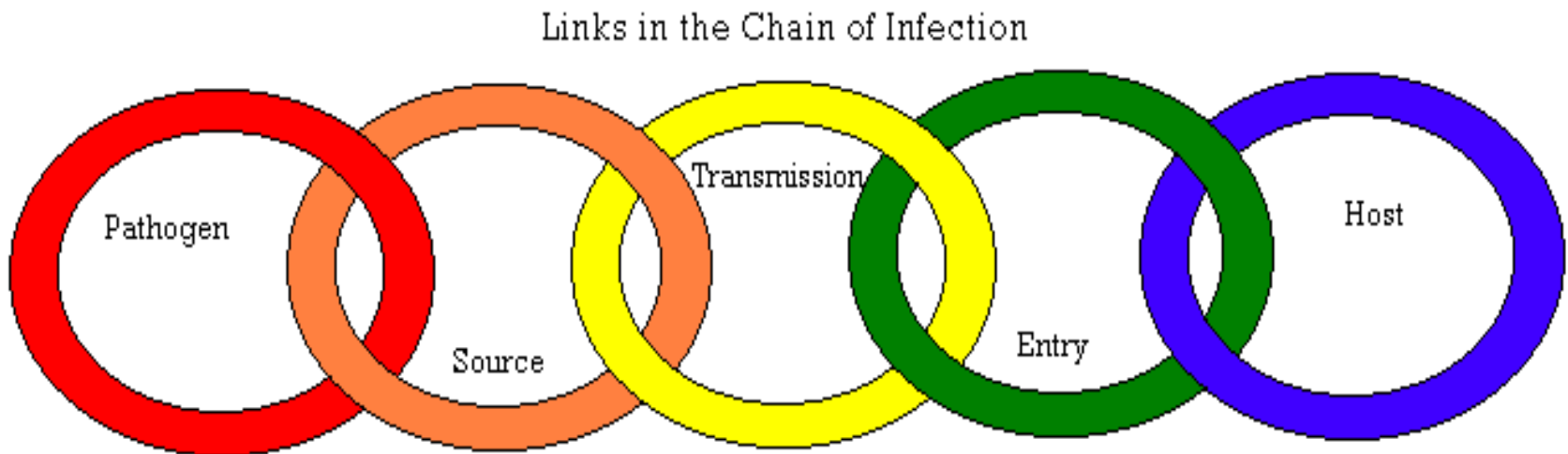
Process of Infection

It is the **process of Infection** begins when,

1. *An infectious agent leaves its*
2. *Reservoir or host through a*
3. *Portal of exit and then*
4. *Is conveyed ينقل by some mode of transmission to*
5. *Enter through an appropriate portal of entry to*
6. *Infect a susceptible host*

Different Ways to break Chain

- Diseases have certain weak points
- The basic approach in **controlling the disease** is to **Identify** these **weak points** and
- **Break the weakest links** in chain of transmission



Factors that influence epidemiology of disease

- **Dose**
 - Probability of contracting disease is often proportional with dose
 - Minimum number of bacteria required to establish disease
- **Incubation period**
 - Disease with long incubation period can spread extensively before first case appears
- **Population characteristics**
 - Certain populations are more susceptible than others to certain pathogens

Population characteristics that influence occurrence of disease

◎ Immunity to pathogen

- Previous exposure or immunization of population decreases susceptibility of population to organism
- Can lead to herd immunity
 - Unimmunized protected due to lack of reservoir of infection

◎ General health

- Stressors such as malnutrition or overcrowding increase susceptibility of population

◎ Age

- Very young and very old tend to be at greater risk
 - Young due to underdeveloped immune system
 - Old due to waning ضعف immune system

- **Gender**

- Gender influences disease distribution
 - Often due to anatomical differences

- **Religious and cultural practices**

- Cultures that routinely breast feed babies see less infectious disease in children

- **Genetic background**

- Natural immunity can vary with genetic background
- Difficult to assess relative importance of genetics

**THANK
YOU**