

# An introduction to infection

## What is an infection?

Invasion of a host's tissues by pathogenic microorganisms such as (viruses ,bacteria, fungi, parasites ,prion)

The organism uses that person's body to sustain itself, reproduce, and colonize. These infectious organisms are known as pathogens.

Some infections are mild and barely noticeable, but others are severe and life-threatening, and some are resistant to treatment.

An infection **does not** always result in disease.

Microbes can enter the body through the four sites:

- 1- Respiratory tract (mouth and nose) e.g. influenza virus which causes the flu
- 2-Gastrointestinal tract (mouth oral cavity) e.g. *Vibrio cholerae* which causes cholera
- 3-Urogenital tract e.g. *Escherichia coli* which causes cystitis
- 4-Breaks in the skin surface e.g. *Clostridium tetani* which causes tetanus

A disease may cause by:

- Microbial multiplication:
- Toxins(Exo & endotoxins)
- Host response(Autoimmune &Hypersensitivity diseases)

## **Modes of pathogen transmission**

### **1- Horizontal transmission :**

#### **a-Contact**

- Direct infectious diseases are commonly transmitted through direct person-to-person contact when an infected person touches or exchanges body fluids with someone else. Sexually transmitted diseases (STDs) can be transmitted this way.
- Indirect (coughing and sneezing)-FLU AND TB
- Vectors (insects) ex:((malaria transformed by anopheles))

#### **b-Inhalation**

- aerosols or droplets transmission has been defined as person-to-person transmission of pathogens through the air by means of inhalation of infectious particles)

#### **c-Ingestion** (faecal-oral transmission or ingestion of contaminated water or food)

### **2-Vertical transmission**

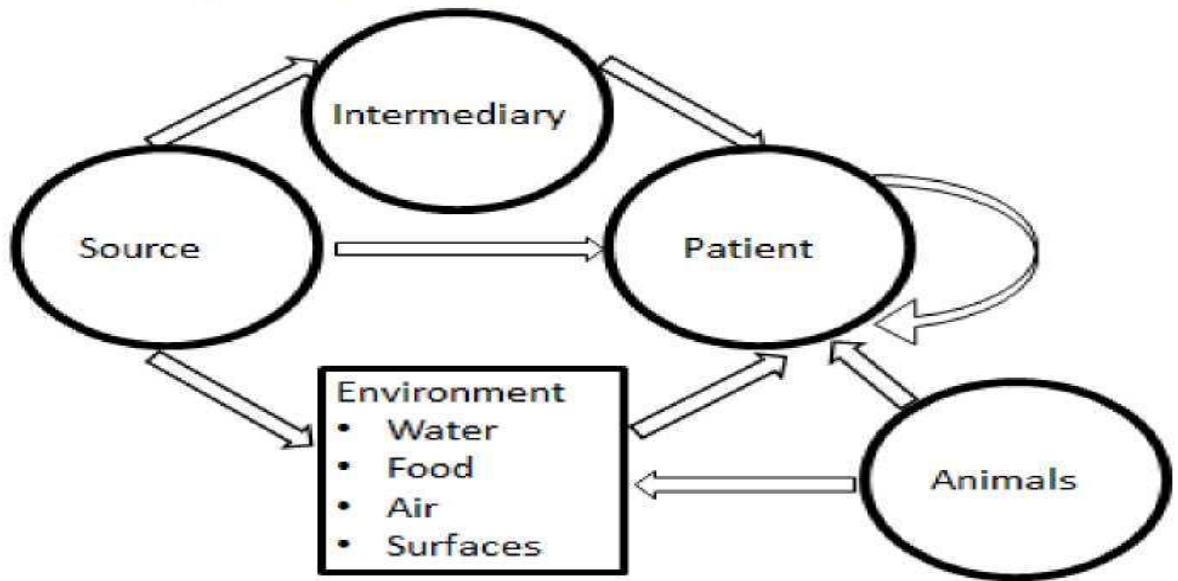
-Mother to child, before birth (HBV& *Rubella*) or at and after birth(HIV&*S.typhi*)

## **How do people get infections?**

Infection can be transmitted in a variety of ways:

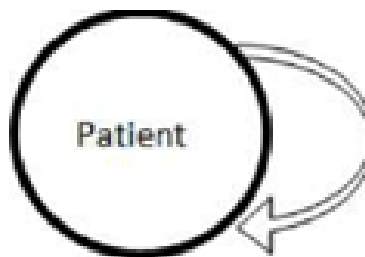
These include skin contact, body fluids(STDs), contact with feces(HAV), airborne particles(TB) ,transmission from animal products to human(zoonotic disease-anthrax & toxoplasmosis)) and touching an object that an infected person has also touched.

## How do people get infections?

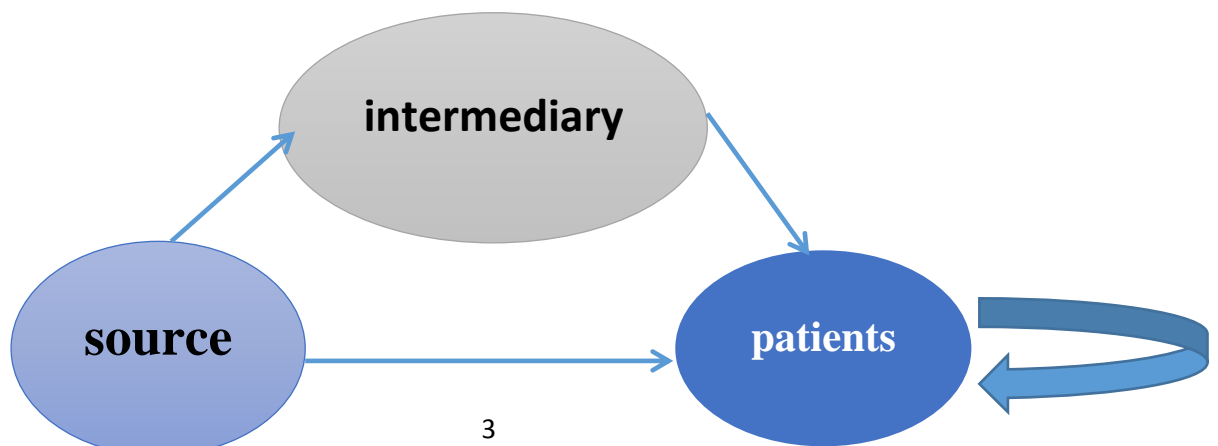


### 1- Microbiota = "commensals"

- micro-organisms carried on skin and mucosal surfaces
- normally harmless or even beneficial
- transfer to other sites can be harmful



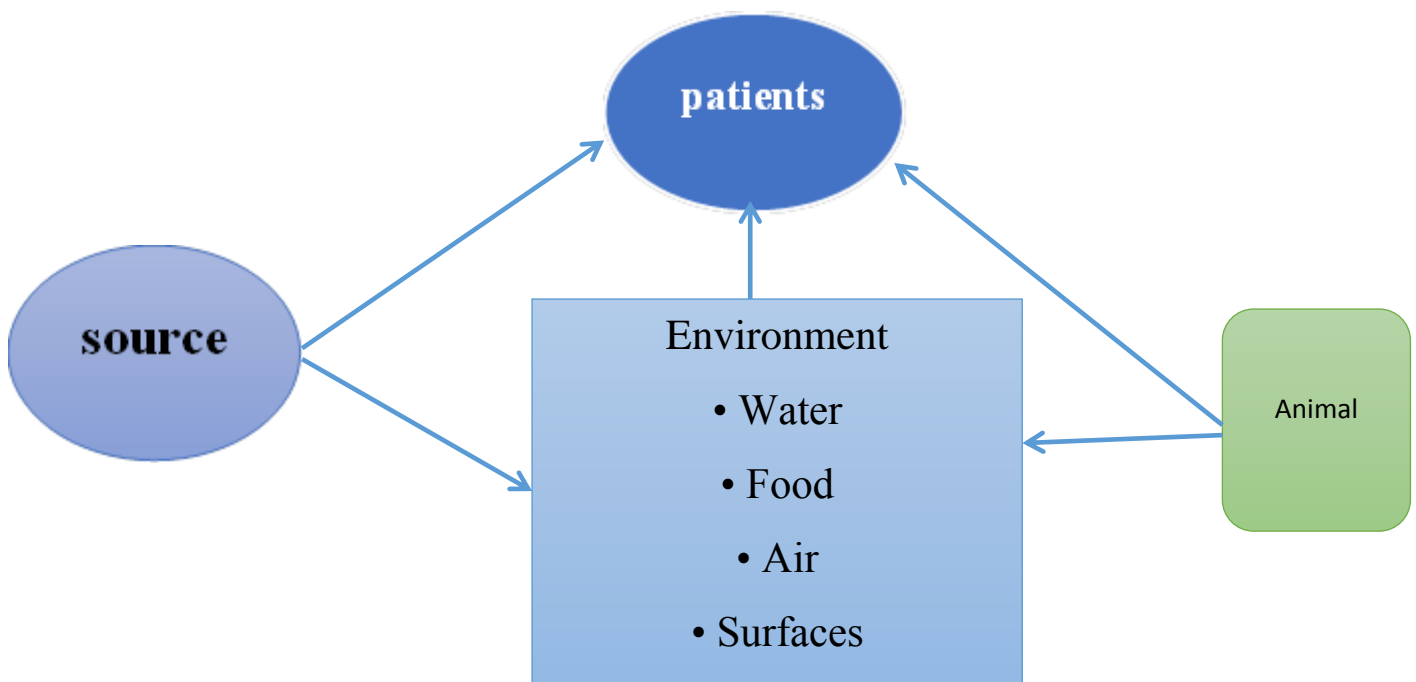
### 2-Direct Contact and intermediary with infected or colonized objects



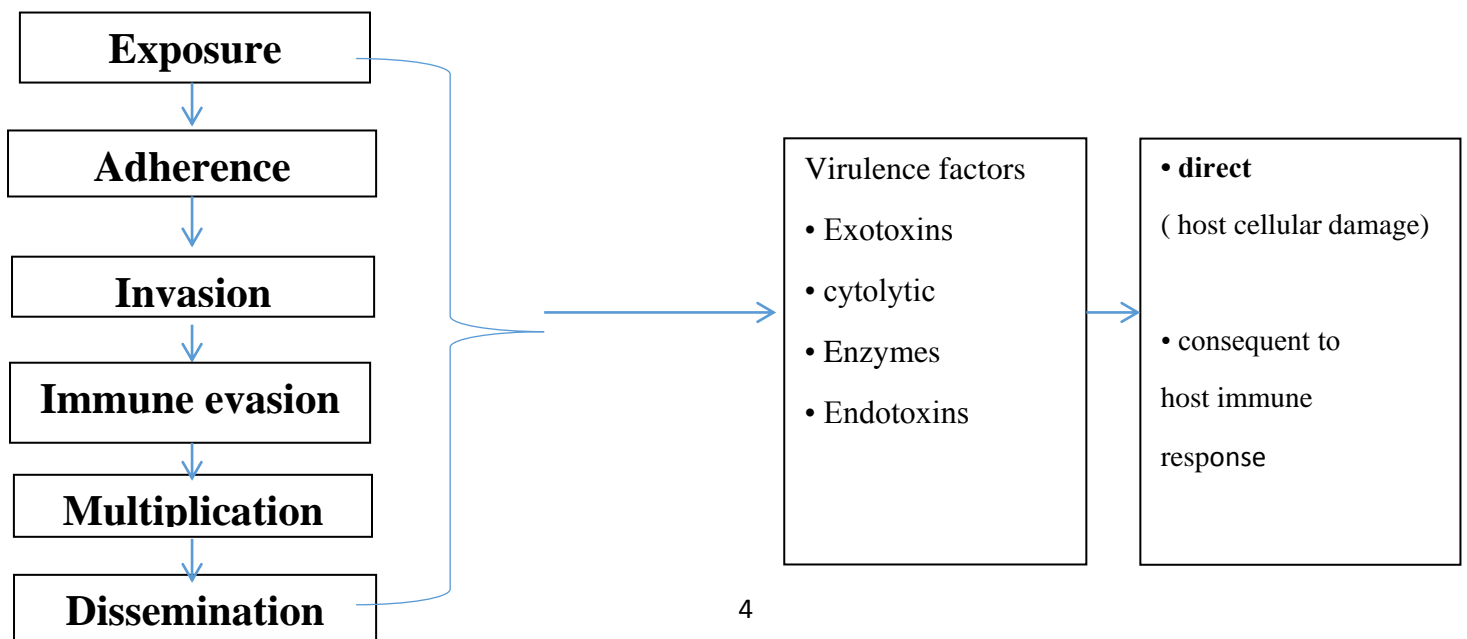
- Physical contact required for some infections, e.g Sexually Transmitted Infections
- Airborne spread may be sufficient for other infections, e.g. chickenpox & TB
- Vector may be necessary, e.g. mosquito for malaria.

### **3-Ingestion, inhalation and contact**

- Transmission due to ingestion of contaminated food or water
- Inhalation of air contaminated by environmental organisms
- Contact with contaminated surfaces, including medical devices



### **How do pathogens causing disease?**



## **Disease determinants**

### **1-Pathogen**

- virulence factors
- inoculum size (the number of bacteria or pathogen that can start infection in a host ex: A single cell of mycobacterium tuberculosis can start tuberculosis  
100000 bacterial cells are required for Salmonella typhi to start typhoid whereas fever
- Antimicrobial resistance

### **2- Patient**

- Site of infection(E.coli is normal flora in large intestine but pathogenic in UT)
- Co-morbidities (comorbidity is the presence of one or more additional diseases or disorders co-occurring with the primary disease. For example, in longstanding diabetes mellitus, the extent to which coronary artery disease.HIV&TB.

## **How do we know patients have an infection?**

### **1- History**

**A– Symptoms ( FEVER,TENDER,SWELLING, REDNESS, LOSE OF FUNCTION)**

**-Focal OR systemic**

**- Severity** (Sever ,moderate mild) which is determined by

1-Pathogen itself

2- Body factors: like age, sex, gender, weight, race, comorbid conditions , habits (smoking)

3- Resistance: (Immunization status) Example: A person who has been immunized against typhoid, cholera, diphtheria, pertussis, tetanus (lethal unless you have been immunized by Tetanus Toxoid Vaccination) almost never has severe disease

- Duration( Acute or chronic)

**B– Potential exposures:** (insect bites , needle stick, direct contact with other patients,.....

## **2- Examination**

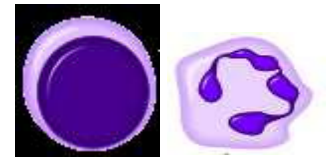
– Organ dysfunctions ,wheezy chest in pneumonia, hepato-splenomegaly)

## **3- Investigations**

**A– Specific :**(ASOT for rheumatic fever ,Rose Bengal test for malta fever , culture by selective medium ex :L.J medium for *Mycobacterium tuberculosis*

**B– Supportive**

- Full blood count – neutrophils, lymphocytes
- C reactive protein (CRP)
- blood chemistry – liver and kidney function tests
- imaging – x-ray, ultrasound, magnetic resonance imaging (MRI)



– histopathology

***Hot topics in infection***

- new pathogens
- antimicrobial resistance
- healthcare infections
- re-labelling of established diseases as infections
- Epidemic and pandemic of a disease