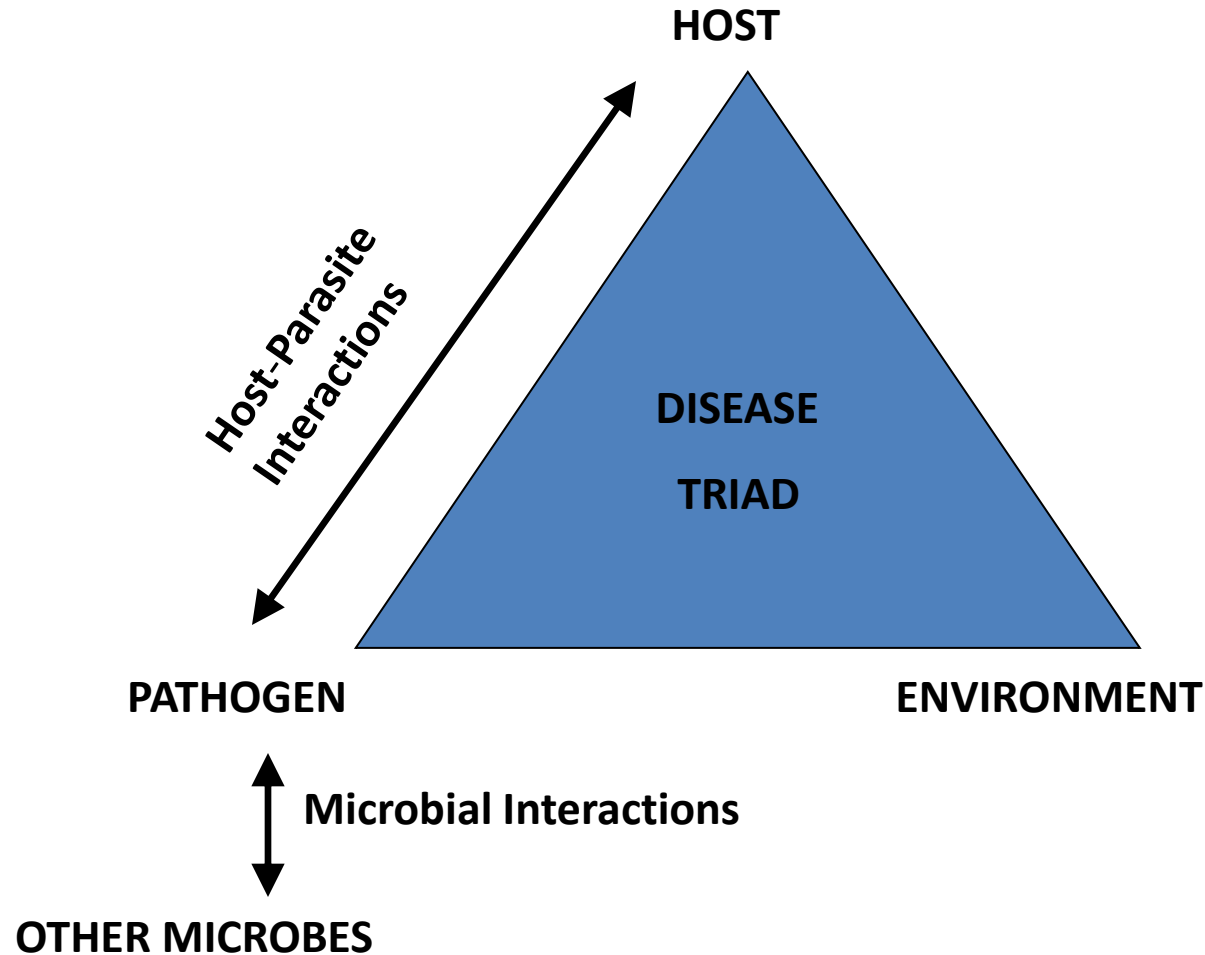


Pathogenicity of Infectious Diseases

Pathogenicity of Infectious Diseases



KOCH'S POSTULATES

Four criteria that were established by Robert Koch to identify the **causative agent of a particular disease**, these include:

1. The microorganism (pathogen) must be **present in all cases of the disease**
2. The pathogen can be **isolated** from the diseased host **and grown in pure culture**
3. The pathogen from the pure culture must cause the **same disease when inoculated** into a healthy, susceptible laboratory animal
4. The pathogen must be **reisolated** from the new host and **shown to be the same** as the originally inoculated pathogen

PATHOGENICITY

PATHOGENICITY

The pathogenesis of bacterial infection includes the initiation of the infectious process and the mechanisms leading to the development of signs and symptoms of bacterial disease

The pathogenicity of pathogen is related to :

1. Invasiveness
2. Virulent
3. Mutation (variability)

Terms related to pathogenicity

Infectivity:

- Ability of agent to cause infection
- Infectious dose (ID₅₀)
- In person-to-person transmission, secondary attack rate is a measure of infectivity

Virulence:

- Degree of organisms capability to cause a disease, Quantitative measure
- Lethal dose (LD₅₀)
- Measured by case fatality rate or proportion of clinical cases that develop severe disease

e.g. Shigellosis Vs salmonellosis

Terms related to pathogenicity

Virulence factor

Characteristics of organisms that enable them to cause a disease

Toxigenicity

The ability of a microorganism to produce a toxin that contributes to the development of disease

Invasion

The process whereby bacteria enter the host cells or tissues and spread in the body

Terms related to pathogenicity

Pathogen

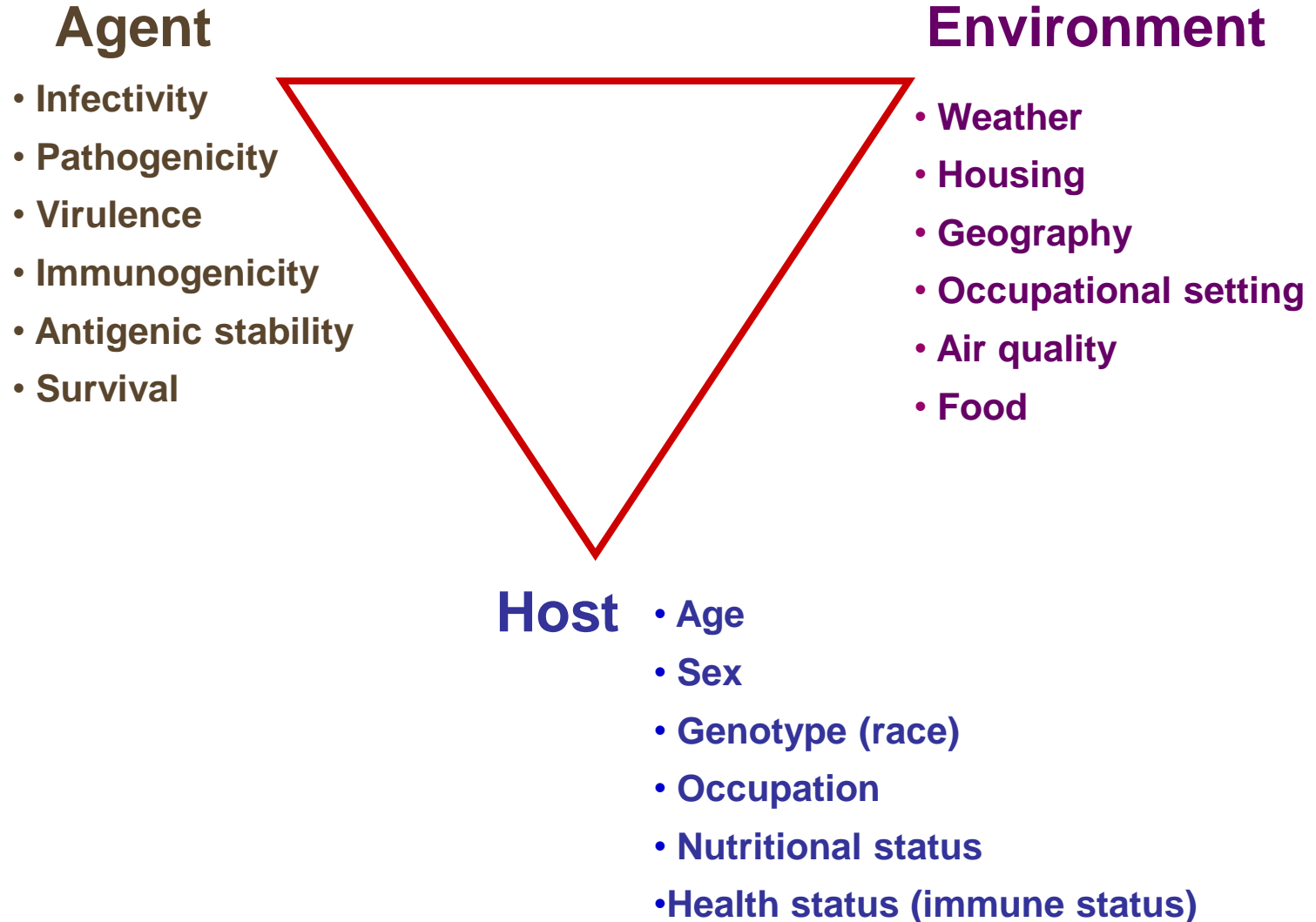
Non-pathogen

Opportunistic pathogen

Characteristics of Pathogenic Bacteria

1. Transmissibility
2. Adherence to host cells
3. Invasion of host cells and tissue
4. Evasion of the host immune system
5. Toxigenicity

Factors Influencing Disease



Infection and Immunity

Manifestations of infectious process (Infection spectrum):

- 1) Clearance of pathogen (no infection)
- 2) Covert infection (subclinical infection)
- 3) Overt infection (Clinical infection or apparent infection)
- 4) Carrier states

- ✕ Health carrier after covert infection.
- ✕ Convalescent carrier after overt infection.
- ✕ Incubatory carrier before onset of disease.

According to carrier time : #acute (transient) carrier

#chronic carrier

- 5) Latent infection.

Definitions

- **Disease:**

An abnormal condition of a part, organ, or system of an organism resulting from various causes such as infection, inflammation, environmental factors, or genetic defect and characterized by an identifiable group of signs, symptoms, or both

- **Infection:**

The invasion and multiplication of microorganisms such as bacteria, viruses, and parasites that are not normally present within the body. An infection may cause no symptoms and be subclinical, or it may cause symptoms and be clinically apparent

Classification of infectious diseases

By duration

- **Acute** – develops and runs its course quickly
 - Common cold
- **Chronic** – develops more slowly and is usually less severe, may last for a long indefinite period of time
 - Tuberculosis
- **Latent** – periods of no symptoms between outbreaks of illness
 - Herpes zoster (cold sores)

Classification of infectious diseases

By location

Local – Localized in a specific area of the body

Systemic – generalized infection affecting most tissues

By timing

Primary – initial infection in a previously healthy person

Secondary – infection that occurs because of weakened immune system caused by another infection

Manifestations of disease

Symptoms

Subjective characteristics of disease felt only by the patient

Signs

Objective manifestations of disease observed or measured by others

Syndrome

Symptoms and signs that characterize a disease or abnormal condition

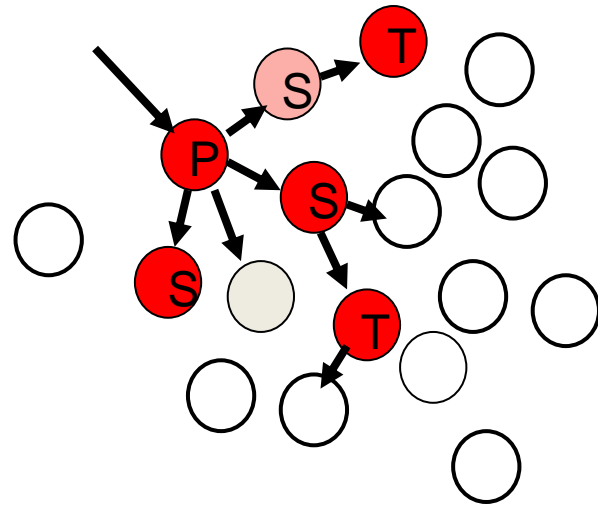
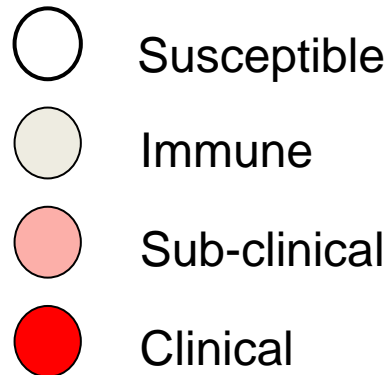
Asymptomatic (subclinical)

Infections lack typical symptoms of the disease but may still have signs of infection

Transmission

Cases

- ⚙ Index – the first case identified
- ⚙ Primary – the case that brings the infection into a population
- ⚙ Secondary – infected by a primary case
- ⚙ Tertiary – infected by a secondary case



Infectious Diseases

Incubation period

- Time between exposure and onset of symptoms or signs of infection.
- Each disease has typical incubation period but varies widely.
- Requires replication of the organism to some threshold level for producing symptoms

Normal Microbial flora

Definitions

Indigenous flora (Resident Flora)

microorganisms native or belonging naturally to a region

Transient Flora

Microbes that live in or on your body for a period of time (hours, days, weeks, months) then move on or die off

Colonization

establishment of a site of reproduction of microbes on a person without necessarily resulting in tissue invasion or damage (colonization resistance)

Symbiotic Relationship

1. Neutralism

2. Mutualistic

- *Escherichia coli*
- Protozoa in Termites

2. Commensalistic

- *Demodex*

3. Parasitism

- *Trypanosoma gambiense*

4. Opportunistic

Commensalistic

- We have no Commensalistic relationships with Bacteria
- If Bacteria are in or on our body, they are either helping us (Microbial Antagonism) or harming us.

Opportunistic

Especially in hosts rendered susceptible by:

1. Immuno-suppression (AIDS)
 2. Radiation therapy & Chemotherapy
 3. Perforated mucous membranes
 4. Rheumatic heart disease...etc.
- *Escherichia coli* - normally in our digestive tract where it causes no problems, but if it gets into the urinary tract it can become pathogenic.
 - *Staphylococcus aureus* – commonly found in the upper respiratory tract, but if it gets into a wound or a burn it can become pathogenic

Normal flora

1. A diverse microbial flora

Human body Area: the skin and mucous membranes

Number: 10^{14} bacteria \rightarrow 10^{13} host cells

2. Normal flora may:

- a. Aid the host

- b. Harm the host (in sometimes)

3. Viruses and parasites \rightarrow NOT normal microbial flora

Most investigators consider that they are not commensals and do not aid the host.

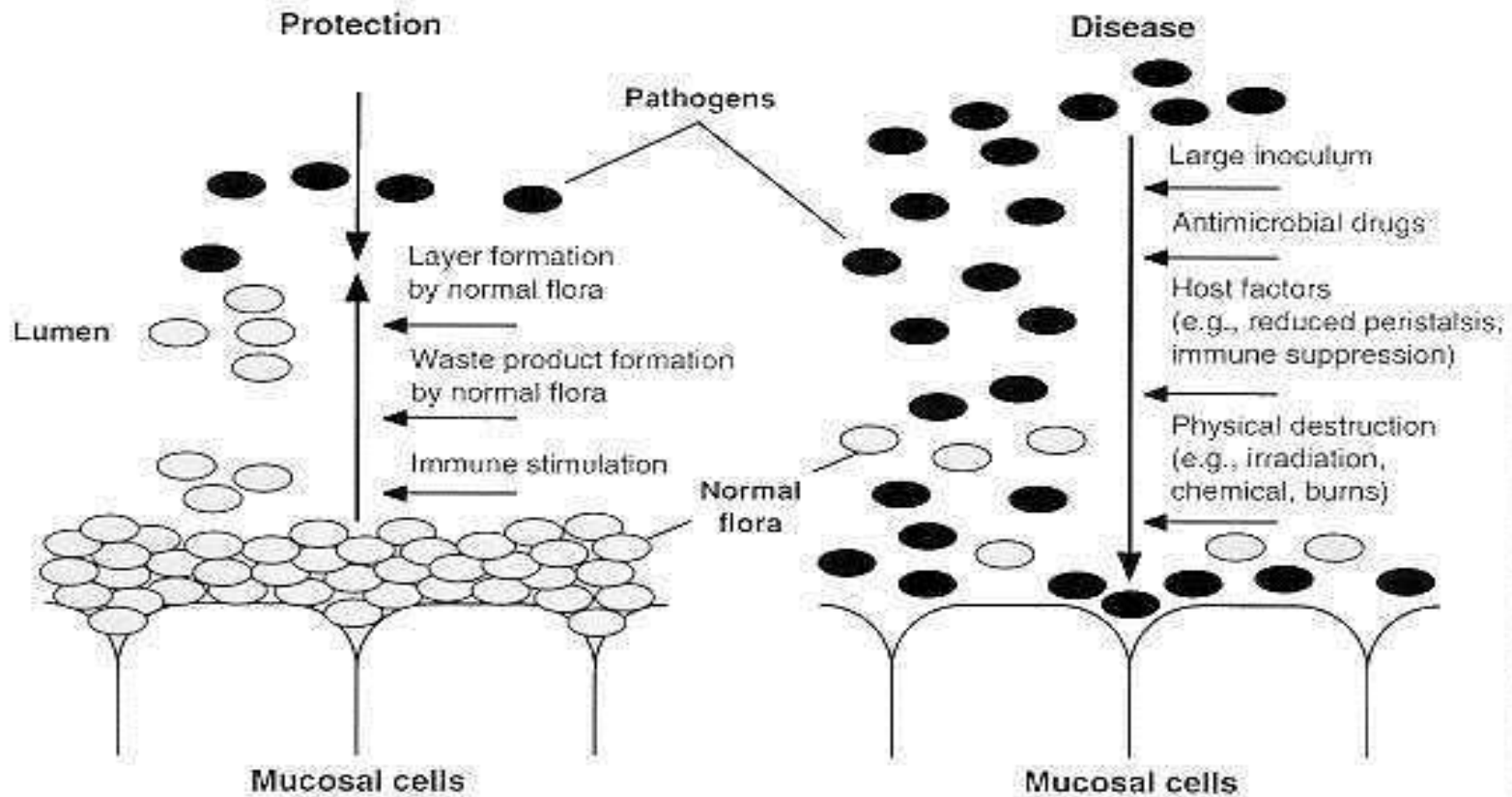
Significance of normal flora

The normal flora influences the anatomy, physiology, susceptibility to pathogens, and morbidity of the host.

Normal flora may aid the host in several ways:

- ✓ Aid in digestion of food and produce vitamins eg, Vit. K or B
- ✓ Help the development of mucosal immunity.
- ✓ Protect the host from colonization with pathogenic microbes.

Significance of normal flora



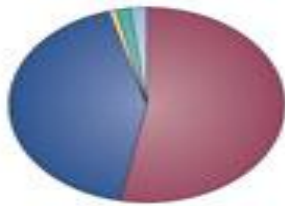
Factors influencing microbial flora

1. Local Environment (pH, temperature, redox potential, O₂, H₂O, and nutrient levels...).
2. Diet
3. Age
4. Health condition (immune activity...)
5. Antibiotics,.....etc

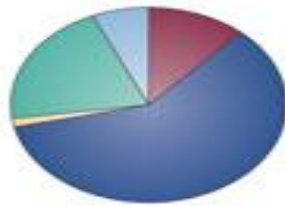
Distribution of normal flora in the body

- A. Skin
- B. Eye
- C. Mouth and nose
- D. Intestinal tract
- E. Urogenital tract

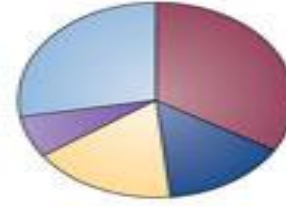
External auditory canal



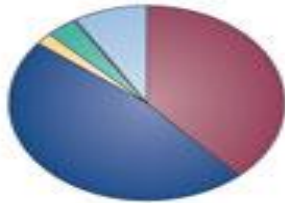
Hair on the head



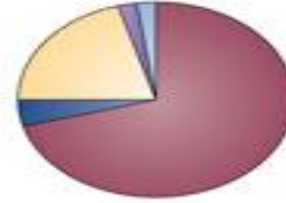
Mouth



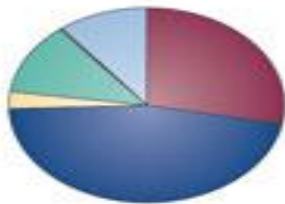
Nostril



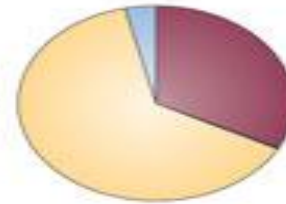
Oesophagus



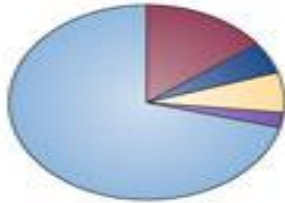
Skin



Gastrointestinal tract



Penis



Vagina

