Pathogenic Bacteria

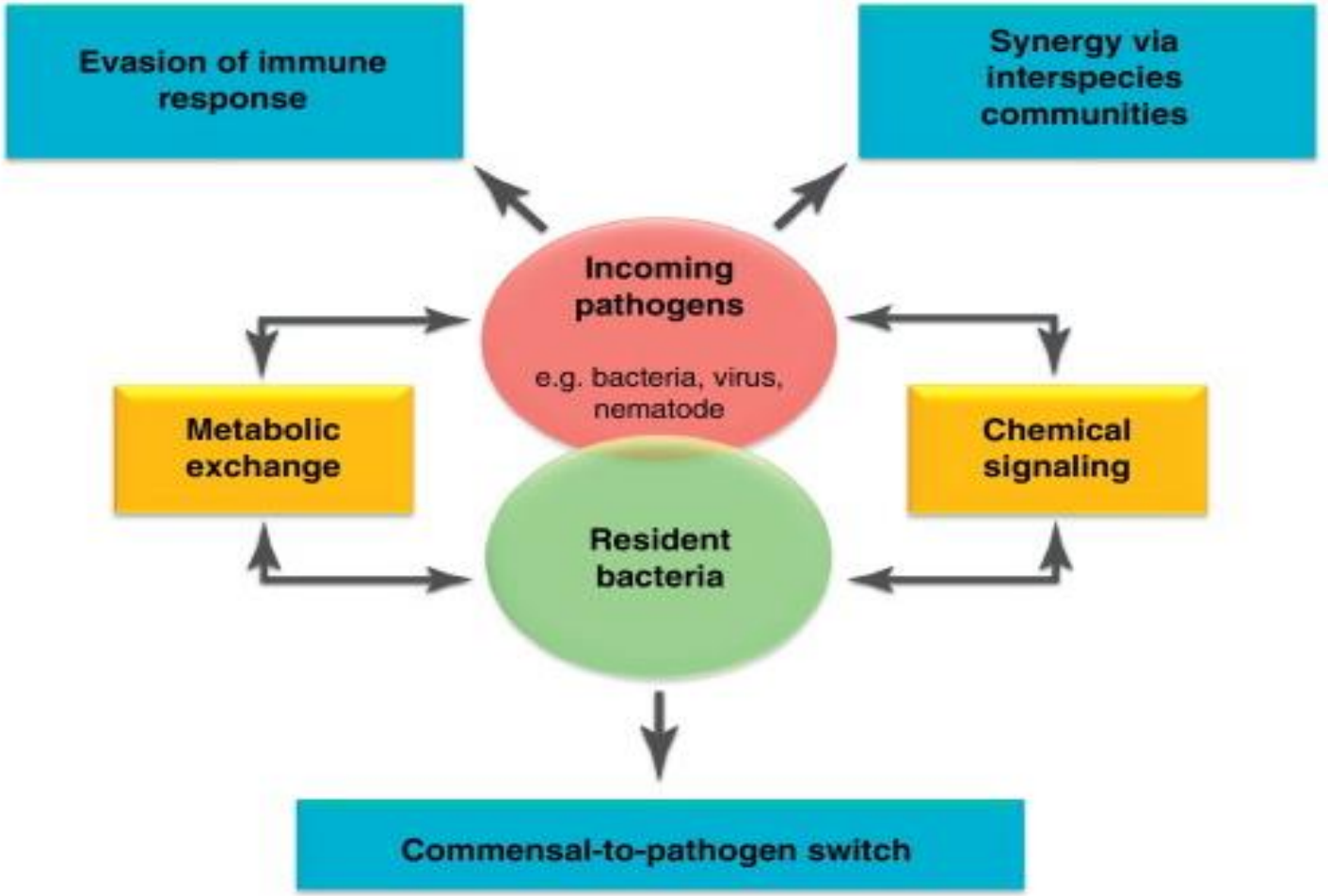
Lab. 3

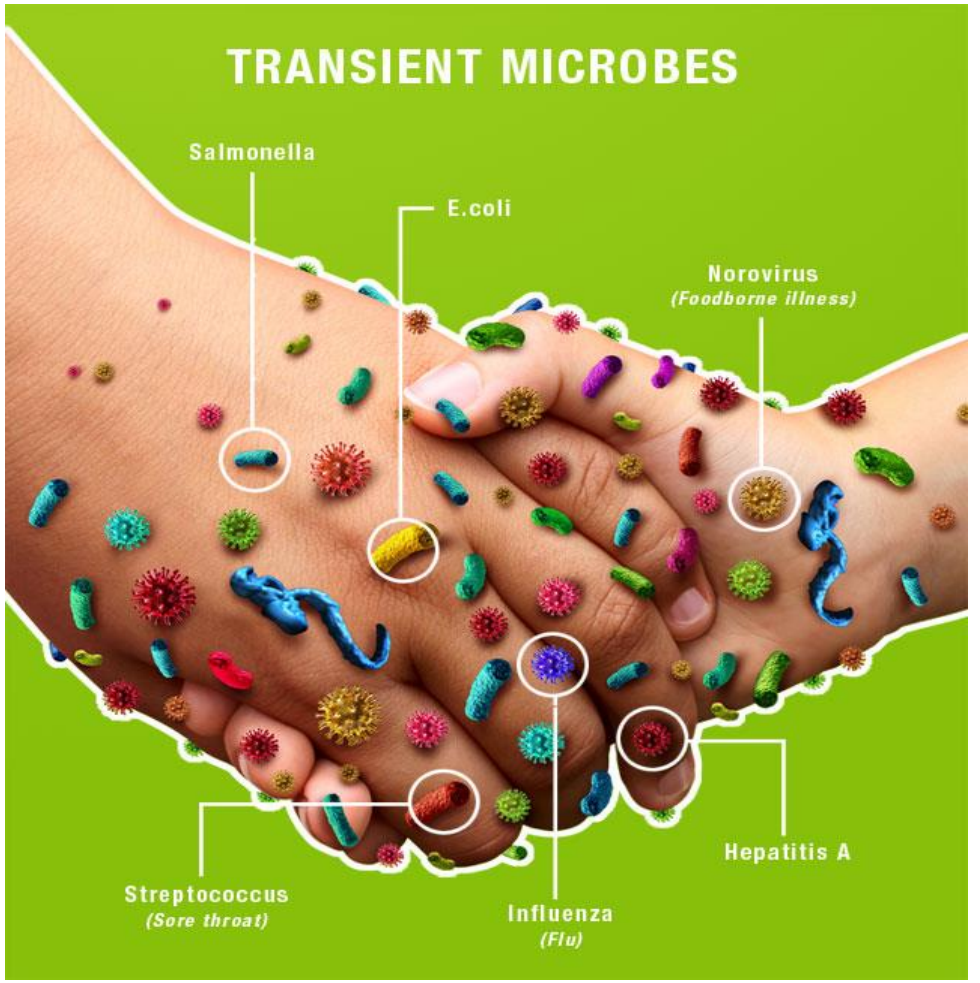
Dr. Suhayla Hamad Shareef

Normal flora

- is microorganisms such as bacteria that are frequently found in various body sites in normal, healthy individuals.
- The constituents and numbers of the flora vary in different areas and sometimes at different ages and physiologic states. These bacteria are known as commensal or “good” bacteria, because they perform some vital and useful functions in the human body.
- In the gut they aid digestion & produce essential vitamins (folic acid & vitamin K). Prevent other, pathogenic bacteria from colonization, **by taking up space or competing for nutrients**. Whereas can cause disease in certain circumstances such as if they get into the wrong site.

- **Residents** are strains that have an established niche at one of the many body sites, which they occupy indefinitely.
- **Transients** are acquired from the environment and establish themselves briefly but tend to be excluded by competition from residents or by the host's innate or immune defense mechanisms.





- **Microbiology** – study of microorganisms (simple forms of life visible only with a microscope) such as (**Viruses , bacteria, fungi, protozoa and some algae are all in this category)**
- **How do microorganisms cause disease?**
- Organisms cause disease by using nutrients needed by cells and tissues, damaging cells directly, or producing toxins.

What is Medical Microbiology?

the study of microorganisms (including bacteria, viruses, fungi and parasites) which are of medical importance and are capable of causing diseases in human beings.

Why is it Important?

Infection is one of the most important causes of mortality and morbidity in the population.

Approximately 30% of hospital patients are on antibiotics at any one time

1 in 10 patients acquires an infection whilst in hospital.

Microorganisms and Human Beings

Beneficial activities: Most microbes are of benefit to human beings, some are necessary(nitrogen, carbon cycles, etc)

Harmful activities: A portion of microbes cause diseases and are poisonous to human, and these are really that concern us in the study of medical microbiology, etc.

Bacteria are unicellular organisms, i.e. organisms that consist of one single cell.

They come in many shapes and sizes. Common shapes are rod-shaped (bacillus), sphere-shaped (coccus) and helix-shaped (spirilla). These shapes are caused by the growth of the cell wall of the bacterium.

The cell wall usually acts to protect the bacterium against invasion, by other organisms or by chemicals. However, sometimes, in particular environments, bacteria can exist without cell walls.

Steps in diagnostic isolation and identification of bacteria

Step 1. Samples of body fluids (e.g. blood, urine, cerebrospinal fluid) are streaked on culture plates and isolated colonies of bacteria (which are visible to the naked eye) appear after incubation for one to several days .

Each colony consists of millions of bacterial cells. Observation of these colonies for size, texture, color, and (if grown on blood agar) hemolysis reactions, is highly important as a first step in bacterial identification. Whether the organism requires oxygen for growth is another important differentiating characteristic.

Step 2. Colonies are Gram stained and individual bacterial cells observed under the microscope.

Step 3. The bacteria are specialized using these isolated colonies. This often requires an additional 24 hours of growth.

The identification of a bacterial species is based on many factors, including cell and colony morphology, chemical composition of cell walls, biochemical activities, and nutritional requirements. In order to begin identifying a bacterial species, you must start with a pure culture.

In addition to the Gram stain, microorganisms are also classified according to colony morphology and cell morphology. Bacterial colonies grow from a single cell and are composed of millions of cells. Each colony has a characteristic size, form or shape, edge, texture, degree of opacity, and color.

THE SPECIMEN

The primary connection between the clinical encounter and diagnostic laboratory is the specimen submitted for processing. If it is not appropriately chosen and/or collected, no degree of laboratory skill will rectify the error. Failure at the level of specimen collection is the most common reason for failure to establish an etiologic diagnosis.

Direct Samples: specimens are collected from normally sterile tissues (lung, liver) and body fluids (cerebrospinal fluid, blood) by using needle or surgical biopsy.

Indirect Samples: samples are specimens of inflammatory exudates (expectorated sputum, urine).

Specimen Collection and Transport

The sterile swab is the most commonly used tool for specimen collection; however, it provides the poorest conditions for survival and can only absorb a small volume of inflammatory exudate.

The best is a collection of 5 to 10 mL or more of the infected fluid or tissue. The volume is important because infecting organisms present in small numbers may not be detected in a small sample.

Specimens should be transported to the laboratory as soon after collection as possible, because some microorganisms survive only briefly outside the body.

CULTURAL CHARACTERISTICS

Cultural characteristics include the demonstration of properties such as unique nutritional requirements, pigment production, and the ability to grow in the presence of certain substances (sodium chloride, bile) or on certain media (MacConkey, nutrient agar). Demonstration of the ability to grow at a particular temperature or to cause hemolysis on blood agar plates is also used.

BIOCHEMICAL CHARACTERISTICS

The ability to attack various substrates or to produce particular metabolic products has broad application to the identification of bacteria.