

**LAB 1:**

**Bacteria:** Bacteria are one-celled microscopic living organisms (ranged from 0.5-2.0 micron in diameter) it can be seen just under light microscope with the aid of oil immersion lenses (100x).

Bacteria could be found everywhere. They can be either

- **Beneficial bacteria**, as in the process of fermentation (such as in vinegar and dairy production), also many bacteria play important role in decomposition.

or

- **Pathogenic bacteria** that could cause a disease when enters any living body (human or animal) and it can spread through water, air, soil and through physical contact

**Classification of Bacteria**

**1-Shape:** The bacteria can classify according to their shape

**\*Cocci (Spherical)**

Diplococci e.g.: *Streptococcus pneumoniae*

Chain (Cocci) e.g.: *Streptococcus pyogenes*

Cluster or Grape like shape e.g.: *Staphylococcus aureus*

**\*Bacilli**

Short Bacilli e.g.: *Bacillus subtilis*.

Long Bacilli e.g.: *Lactobacillus*. spp.

Coccobacilli e.g.: like members of Enterobacteriaceae family (*Escherichia coli*, *Shigella*, *Salmonella*).

\***Kidney shape:** e.g.: *Neisseria gonorrhoea*.

\***comma shape:** e.g.: *Vibrio cholera*.

\* **Spiral shape:** e.g.: *Helicobacter pylori*

## **2- Ability to form spores:**

The bacteria are divided to two groups according to their ability to form spores.

\***Non-spore - former Bacteria:** e.g. - *Staphylococcus* spp., *Escherichia coli*, *Streptococcus* spp.

\***spore - former Bacteria:** e.g.: *Bacillus*, *Clostridium* and *Sporolactobacillus*.

## **3- Oxygen requirements:**

\***Obligates (strict) aerobes bacteria:** e.g.: *Bacillus*, *Pseudomonas*.

\***Obligates (strict) anaerobes bacteria:** e.g.: *Clostridium*.

\***Facultative anaerobes** e.g.: Enterobacteriaceae e.g.: *Escherichia coli*, *Shigella*, *Salmonella* and *Staphylococcus* spp.

\***Microaerophiles** e.g. *Helicobacter pylori*.

\***Aerotolerant** e.g. *Streptococcus*

**4-Reaction to the Gram stain:** The Bacteria are divided in two groups according to the reaction with Gram stain.

- Gram positive bacteria. e.g.: *Streptococcus*, *Staphylococcus*, *Bacillus* and *Clostridium*.

- Gram Negative Bacteria. e.g. All the members of Enterobacteriaceae (*Escherichia coli*, *Shigella*, *Salmonella*,.....)

## **5- Bacterial Nutrition**

**A) Autotrophic bacteria:** These bacteria synthesize all their food from inorganic substances (CO<sub>2</sub> and hydrogen donor), the autotrophic bacteria are including two types:

(i) Photosynthetic bacteria.

(ii) Chemosynthetic bacteria.

**B) Heterotrophic bacteria:** The heterotrophic bacteria obtain their-ready made food from organic substances, living or dead. These bacteria including three types:

- (i) Saprophytic bacteria.
- (ii) Parasitic bacteria.
- (iii) Symbiotic bacteria.

**6-Mode of energy production:** (glycolysis, cellular respiration).

### **Laboratory diagnosis of bacterial disease:**

It depended on clinical specimens reaching to the lab

- 1-Blood: septicemia.
- 2- Urine: urinary tract infections.
- 3- Stool: gastrointestinal infections.
- 4- Sputum: respiratory infection
- 5- Vaginal swabs: Vaginal infections.
- 6- Nose & ear swabs: Nose & ear infection
- 7- Cerebral spinal fluid. CNS infections.
- 8-Food & vomit: food poisoning.
- 9- Pus: Acne, wounds, burns.
- 10-Seminal fluid, urethral discharge.

### **Methods for bacterial identification:**

- 1- Phenotypic characters:
  - a- Microscopic morphology- Gram Staining, shapes, arrangements, motility.
  - b- Macroscopic morphology - colony appearance, motility.

- 2- Physiological/ biochemical characteristics (Growth requirement) aerobic, anaerobic, photosynthetic, growth on selective media
- 3- Chemical analysis- e.g. peptides and lipids in cell membranes
- 4- Phage Typing- which phage infects the bacterium
- 5- Serological analysis - what antibodies are produced against the bacterium
- 6- Genetic and molecular analysis
- 7- Growth requirement.

### **Lab. safety Directions**

- 1-Wear lab Coat before start working and safety glasses if it necessary.
- 2-Wash your hands with disinfectant soap when you arrive at the lab and again before you leave.
- 3-Disinfect work areas before and afterwork by using 70% ethanol or fresh 10% bleach.
- 4-Don't Eat or Drink in the Lab also don't taste or Sniff Chemicals
- 3-Dispose Lab Waste Properly.
- 4-Inoculating loops and needles should be flame sterilized in a Bunsen burner before you lay them down.
- 5-Sterilize equipment and materials.
- 6-Never pipette by mouth.