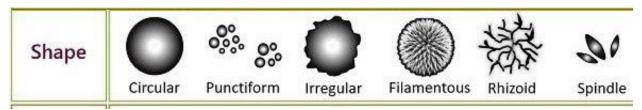
# Phenotypic diagnosis (cultural characteristics of bacterial colonies)

In order to identify the types of bacteria and diagnose bacterial colonies, we must identify the cultural characteristics of the colony, i.e. the characteristics observed with the naked eye of the colony on the medium or inside it, or the changes that bacteria cause to the medium. As we know that the culture media are different, the characteristics will be studied on solid media, semi sold media, and liquid media, each separately.

# **♣** The cultural characteristics of bacteria on solid media:-

1. Colony shape: - By looking at the colony from above, it appears to us in different shapes.

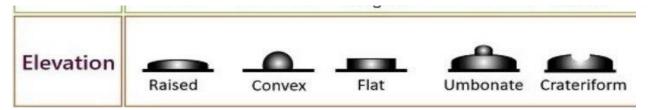


2. Size or diameter of the colony:-

It is divided into three sections: The diameter of the colony is measured in millimeters mm

- a- Very small: Its diameter is usually less than 1 mm and is called a pinhead.
- b- Medium size: Its diameter is between 1-2 mm
- c-Large size: Its diameter is greater than 3 mm.

# 3- Colony Elevation:-



# 4. Colony edge shape:-



### 5. Colony surface:-

- a-Smooth
- b-Rough
- c-Ringed

### 6. Optical properties of a colony

This means the transparency of the colony, which appears by shining light on the surface of the colony or on the back of the dish, where it gives the following properties:

- a-Opaque: does not allow light to pass through it.
- b-Translucent (Semi-transparent): allows light to pass through it but does not allow full vision.
- **c-** Transparent :to see things behind it.

- d- Fluorescent
- e- Metallic shine.
- 7. Consistency:- It means the characteristic that the colony has when it comes into contact with the loop, where the following characteristics can be observed:
  - a-Mucous: where bacterial growth is attached to the loop.
  - b-Butyraceous: like the consistency of butter.
  - **c-Membranous:** Thin, continuous growth that disappears completely when touched by the loop.
  - d-Friable: dry growth that breaks down upon contact with the loop.
  - 8. Colony color and pigment production:-
  - ❖ Water-insoluble dyes: Some types of bacteria secrete water-insoluble dyes, which color the colonies but do not color the medium. The colonies may be yellow, red, or other colors, as in the case of *Staphylococcus aureus*, which appears golden yellow.
  - \* Water-soluble dyes: other types of bacteria secrete water-soluble dyes that color the medium, such as some types of pseudomonas, which secrete a yellow-green dye.



#### 9. Odar:-

Bacterial growth on culture media produces metabolites with distinctive odors for these bacteria, such as the smell of rotting apples produced by Pseudomonas bacteria and the smell of rotting fish produced by Proteus bacteria.

#### 10- Phenomenon:-

Some bacteria are characterized by their ability to cause some visual phenomena such as the phenomenon of swarming, which is caused by bacteria in rich media, where their growth is characterized by waves as a result of the rapid movement of the bacteria and their migration towards the outside of the center of the colony.



### 11. Blood hemolysis:-

It refers to the ability of bacteria to break down red blood cells when they grow on a blood agar medium, where 3 types of hemolysis can be observed.

### a- Alpha hemolysis $\alpha$ :-

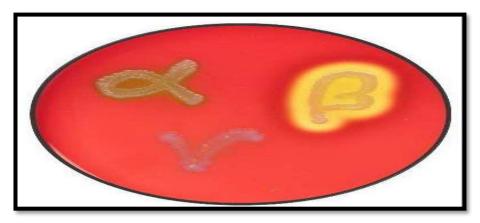
The decomposition is partial and is characterized by the presence of a greenish decomposed area around the growing colonies, as a result of the reduction of hemoglobin in red blood cells to methemoglobin.

# b- Beta hemolysis β:-

The hemolysis is complete; it means a clear area around the colony.

# c- Gamma hemolysis γ:-

There is no hemolysis.



Types of hemolysis

# The cultural characteristics of bacteria on slant solid media:-

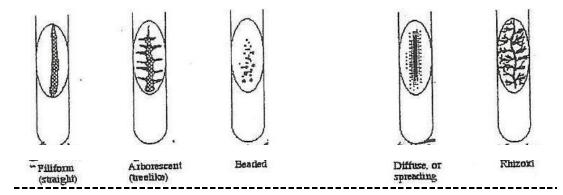
### 1. Amount of bacterial growth

- a- Low
- b- Medium
- c- High

# 2. Odor

- a- No odor
  - b- If there is an odor, state how similar it is to known odors.

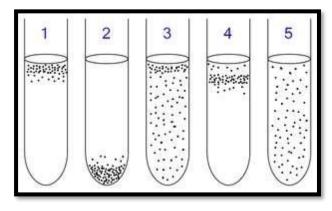
# 3. Growth pattern



- a-Straight
- b- Tree shape
- **c** Beaded
- d- diffuse
- E- Rhizoid

# Cultural characteristics of bacteria on liquid media:-

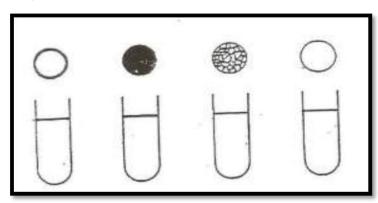
One of the easiest ways to deal with bacteria is to grow them in test tubes containing liquid culture media such as nutrient broth medium. The growth will appear in one of the following forms:





# Surface growth

- 1-No surface growth
- 2-Ring surrounding the surface
- 3-Thin crust covering the surface
- 4-Aggregate surface growth (bacterial masses Attached to each other floating on the surface)
- 5-Thick membrane growth.



#### Growth below the surface

- 1- Turbidity: It varies in density depending on the type of bacteria and the amount of injection.
- 2- Gas formation: It is observed by the presence of gas bubbles that are produced when mixing the tube as in bacteria *E.coli* .
- 3- Exopigmentation: The color of the medium changes as in *Pseudomonas* .

### Sediment formation

It appears as a precipitate of cells that settles at the bottom of the tube and rises in a spiral or helical shape when the tube is shaken gently. The precipitate is in the form of:

- 1- No precipitate
- 2- Granular precipitate
- 3- Agglomerated precipitate
- 4- Viscous precipitate
- 5- Flaky precipitate