Bacteria

What are Bacteria?

Bacteria are single-celled microbes. The cell structure is simpler than that of other organisms as there is no nucleus or membrane-bound organelles. Instead their control center containing the genetic information is contained in a single loop of DNA. Some bacteria have an extra circle of genetic material called a plasmid.

Bacteria come in a wide variety of shapes and sizes, also they are found in every habitat on Earth: soil, rock, oceans and even arctic snow. Some live in or on other organisms including plants and animals including humans.

Classification of bacteria

We can classify bacteria microscopically and according to:

A. Shape

1. Cocci :*Streptococcus, Staphylococcus*
2. Bacilli :*Bacillus anthracis* ,*Clostridium tetani*
3. Spirillum : *Spirillum volutans*
4. Filamentous : *Leptothrix, Crenothrix, Actinomycetes*
5. Comma (vibrios): *Vibrio cholera*
6. Corkscrew (spirochaetes): *Treponema pallidum*
7. Coccobacilli: *Haemophilus influenzae*
8. Star: *Stella*
9. Rectangular: *Haloarcula*, a genus of Halophilic archaea
10. Pleomorphic: is the ability of some bacteria to alter their shape or size in response to environmental conditions. Mycoplasma species have extremely variable shape: *M. genitalium* is flask-shaped while *M. pneumoniae* is more elongated.

B. Cell wall structure and the Gram Stain

1. Gram Positive as *Staphylococcus* sp. And *Streptococcus* sp.
2. Gram Negative as *Escherichia coli* and *Klebsiella pneumoniae*

C. Arrangement

1. Cocci

a. Monococcus as *Micrococcus flavus*
b. Diplococci or Pairs as *Neisseria gonorrhoeae*
c. Tetrads (groups of four) as *Micrococcus luteus*
d. Sarcina (groups of eight) as *Sarcina urea*
e. Streptococci (bead-like chains) as *Streptococcus pyogenes*
f. Staphylococcus (grape like clusters) as *Staphylococcus aureus*

2. Bacilli

a. Single Rod; like *Bacillus cereus*
b. Diplobacilli; the bacilli are arranged in pairs like *Moraxella bovis*
c. Streptobacilli; the bacilli are arranged in chain like S*treptobacillus moniliformis*
d. Coccobacilli; they look like coccus and bacillus like *Haemophilus influenzae*

D. Classifying Bacteria by Growth Factors

1. Energy source

a. Chemotroph: chemical compounds as an energy source (most pathogenic bacteria are chemotrophs) .
b. Phototroph: light as energy source

2. **Nutrient source**
   a. Heterotroph: derive carbon from preformed organic nutrients such as sugar (most pathogenic bacteria are heterotrophs).
   b. Autotroph: derive carbon from inorganic sources such as carbon dioxide
3. **O2 requirement**:
   a. Aerobic Bacteria
   b. Anaerobic Bacteria

E. Spore Formation:

1. Spore – Forming Bacteria; *Closteridium tetani*
2. Non – Spore Forming Bacteria; like *Pseudomonas* sp.

F. Capsule Forming:

1. Capsulated Bacteria; like *Klebsiella pneumoniae*
2. Non – Capsulated Bacteria; like *Shigella dysentriae*

G. Flagella formation

1. Motile as *E. coli*
2. Non-motile *Klebsiella pneumoniae*

According to the some features of colony, Bacteria can be classified:

A colony is defined as a visible mass of microorganisms all originating from a single mother cell, therefore a colony constitutes a clone of bacteria all genetically alike.

a. Shape of Colonies:

1. Circular (Round), 2. Filamentous, 3. Irregular, 4. Punctiform (Granular), 5. Rhizoid, 6. Spindle

b. Elevation of Colonies:

1. Flat, 2. Raised, 3. Convex, 4. Umbonate, 5. Pulvinate.

c. Edge and Margin of Colonies:

1. Entire (Smooth), 2. Lobate, 3. Filamentous, 4. Undulate (wavy), 5. Curled

d. Consistency of Colonies:

1. dry, 2. moist, 3. viscid (sticks to loop, hard to get off), 4. brittle (dry, breaks apart), 5. mucoid (sticky, mucus-like)

e. Pigmentation of Colonies:

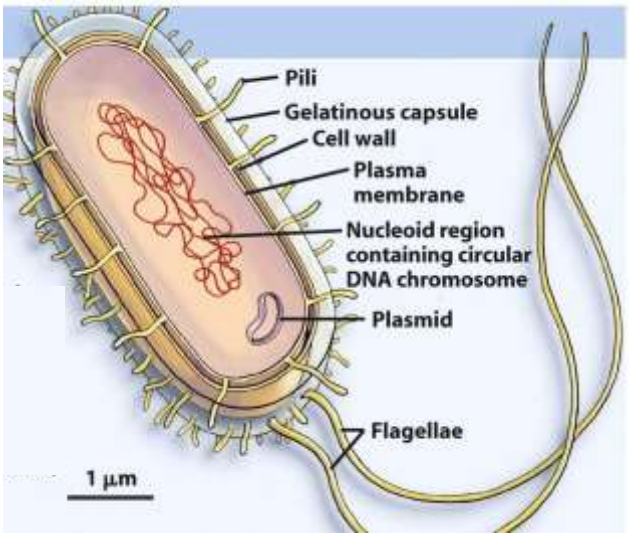
1. Non – Pigmentation Bacteria,
2. Pigmentation Bacteria
   a. Endo – Pigmentation; like *Sarcinia* sp. and *Staphylococcus aureus*
   b. Exo – Pigmentation; like *Pseudomonas aeruginosa*

f. Odor of Colonies:

1. Colonies that have odor: *Pseudomonas aeruginosa*: grape odor, *Proteus* sp. fishyodour
2. Colonies have not odor

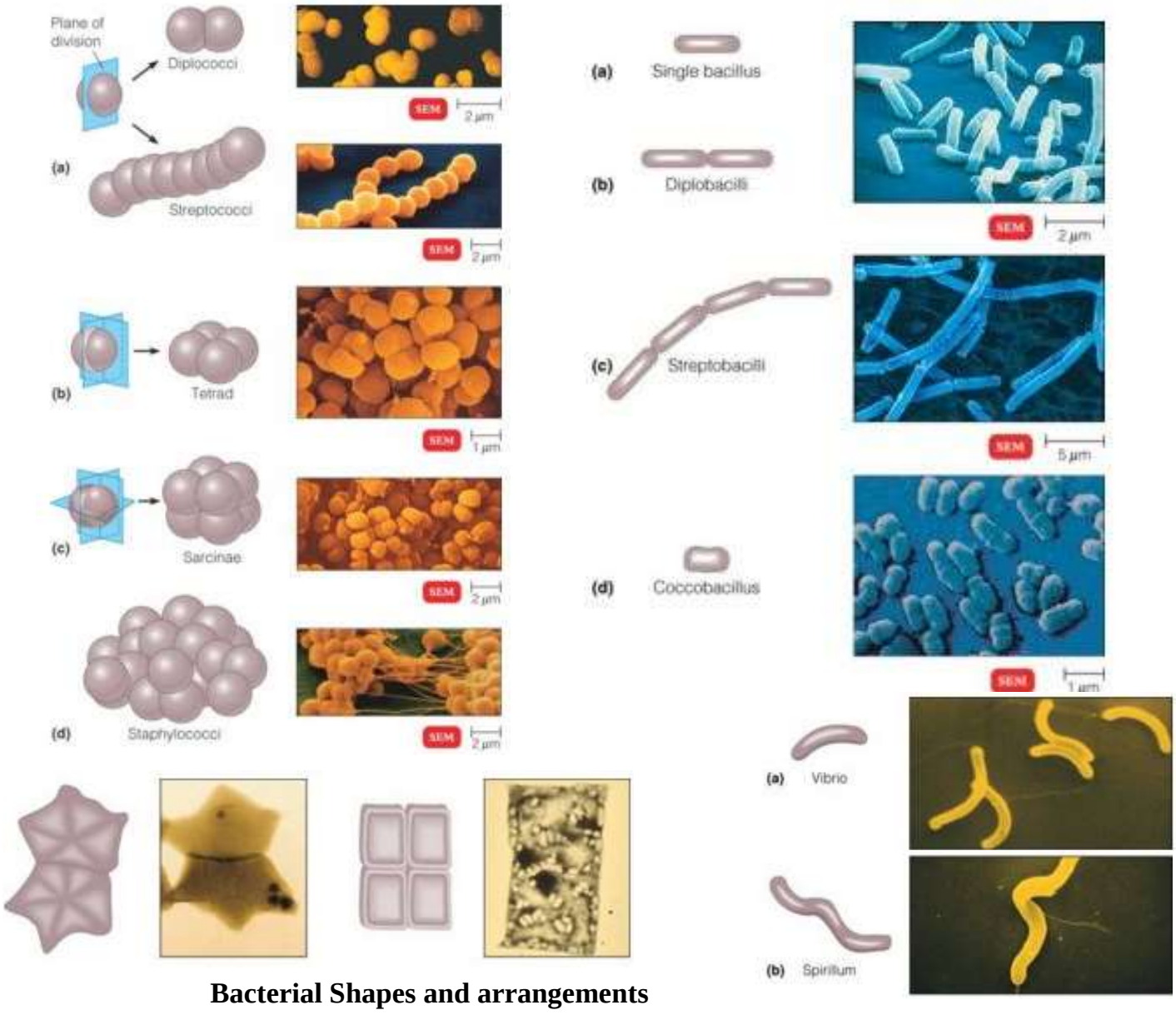
g. Optical Feature of Colonies:

1. Transparent (clear)
2. Opaque
3. Translucent

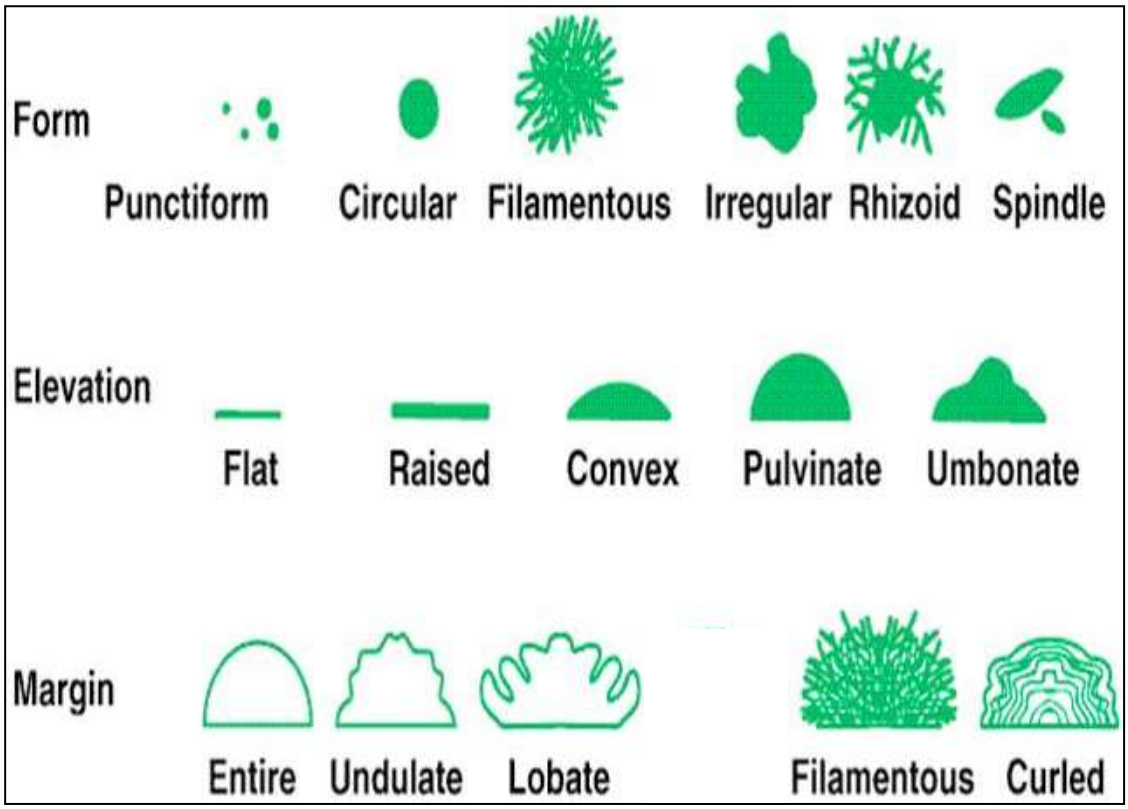


Bacterial cell

Bacterial colony



Bacterial Shapes and arrangements



Features of colony