# MORPHOLOGY OF BACTERIA

# Definition of Bacteria

- Bacteria prokaryotic microorganisms a single-celled microscopic organisms that lack nuclei and other organized cell structures.
- "Bacteria" is the plural form of "bacterium.“ While several bacterial species are pathogenic (capable of causing disease), most are non-infectious, and many have critical roles in decay, fermentation, nutrient recycling, and nitrogen fixation.
- Bacteria are usually classified as grampositive or gram-negative based on a basic microbiological staining procedure called the gram stain

# Size of Bacterial Cell

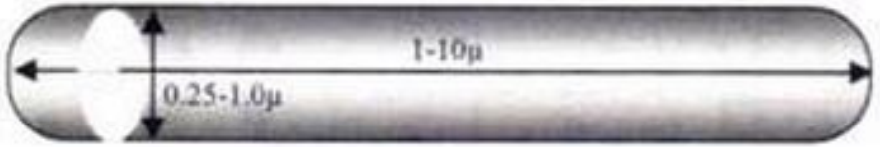
- Individual bacterial cells are not visible to the unaided eye.
- In general, bacterial cells do not exceed 1 µm (micrometer or micron) in diameter, though their length may vary widely. Some bacteria discovered in recent years, are much larger than the common ones.
- For example, a bacterium named *Epulopiscium fishelsohnii* measuring 80 µm in breadth and 200 µm in length has been discovered in 1991 and another spherical archaebacterium, called *Thiomargarita namibiensis* has been isolated from sea-bottom in 1999.
- This organism measures 750 µm in diameter and is visible to the unaided eye. But such giants among bacteria are extremely rare exceptions.

- Bacteria are of about 0.1 to 60 × 6 µm in size.
- However, there is variation in dimension of
- bacilli (5 × 0.4-0.7 µm),
- pseudomonads (0.4-0.7 µm diameter, 2-3 µm length) and micrococci (about 0.5µm diameter).

**Table 4.2 : Cell size of some common bacteria**

| *Bacteria* | *Disease* | *length (µm)* |
|---|---|---|
| *Clostridium botulinum* | Food poisioning | 3.8 |
| *C. tetani* | Tetanus | 2-5 |
| *Corynebacterium diphtheriae* | Diphtheria | 1-8 |
| *Mycobacterium tuberculosis* | Tuberculosis | 0.5-4 |
| *Neisseria meningitidis* | Meningitis | 1 |
| *Pasturella pestis* | Plague | 1-2 |
| *Salmonella typhii* | Typhoid | 0.5-4 |
| *Staphylococcus* sp. | Boils | 0.8 |
| *Streptococcus pneumoniae* | Pneumonia | 1.25 |
| *Treponema pallidum* | Syphilis | 6-14 |


Spherical bacteria



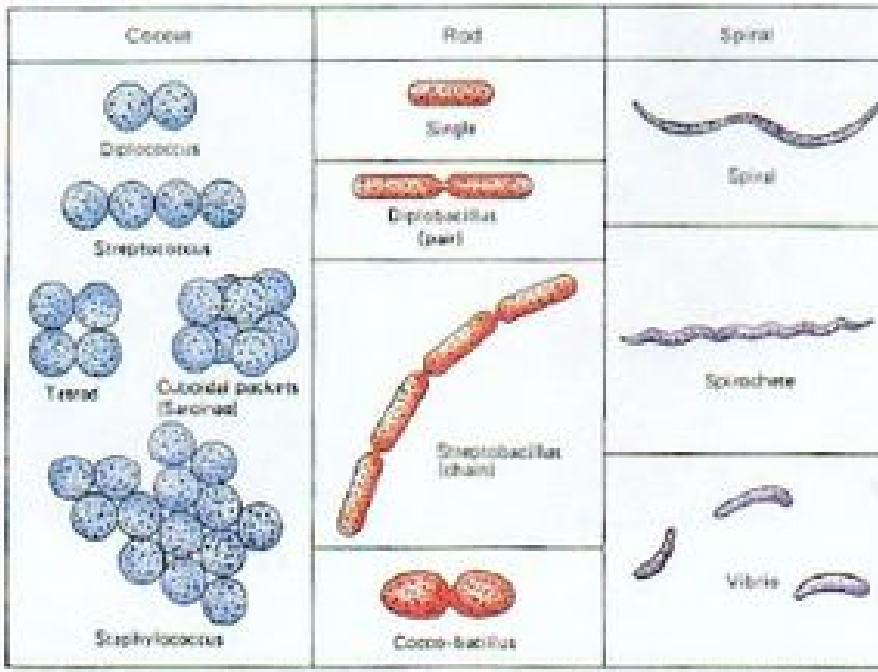

Rod-shaped bacteria

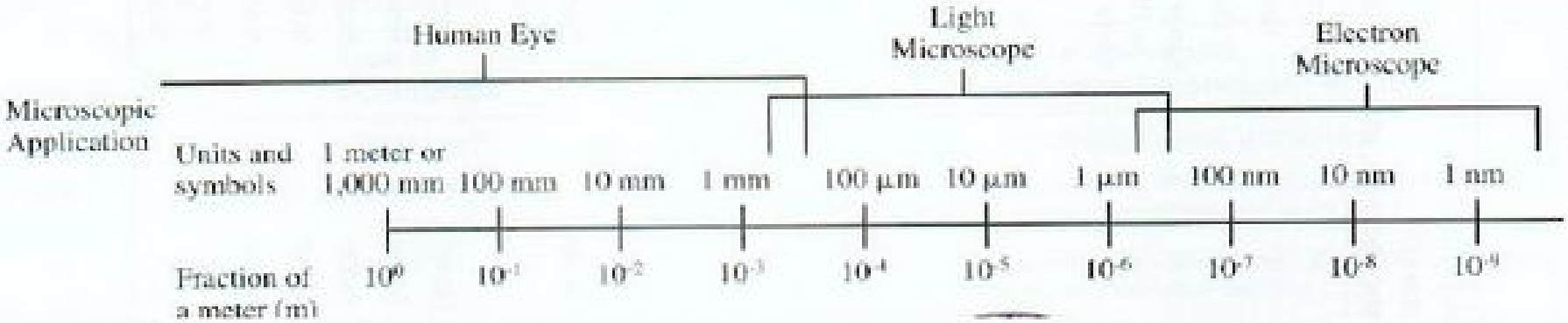
Figure 2.1: Size of bacteria

# SIZE OF BACTERIA

- Unit for measurement :
  Micron or micrometer,μm:
  1μm=10-3mm
- Size:

  Varies with kinds of bacteria, and also related to their age and external environment.




- Cocci: sphere, 1μm
- Bacilli: rods , 0.5-1 μm in width -3 μm in length
- Spiral bacteria: 1~3 μm in length and 0.3-0.6 μm in width

# SHAPE

- Bacterial cells are bound externally by a rigid wall which gives bacteria their characteristic shape.
- The mycoplasmas are exceptions in this regard, because they lack a cell wall and they do not have also any characteristic shape.
- That the cell wall is responsible for giving shape to bacterial cells is also shown when the wall is removed by enzymes.
- A cylindrical bacterial cell on losing the wall assumes a spherical shape.

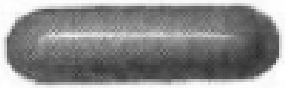
# SHAPE OF BACTERIA

- There are three shapes of bacteria.
- **a) Spherical or cocci shape.**
- If the cells are spherical or ball shape then the cells are called as cocci or spherical shape bacteria.
- **b) Cylindrical or rod shape.**
- If the cells are rod or cylindrical in shape it is called bacilli.
- **c) Spiral shape.**
- A bacteria which is twisted two or more time along the axis is called a spiral form bacteria.

Coccus

Coccobacillus

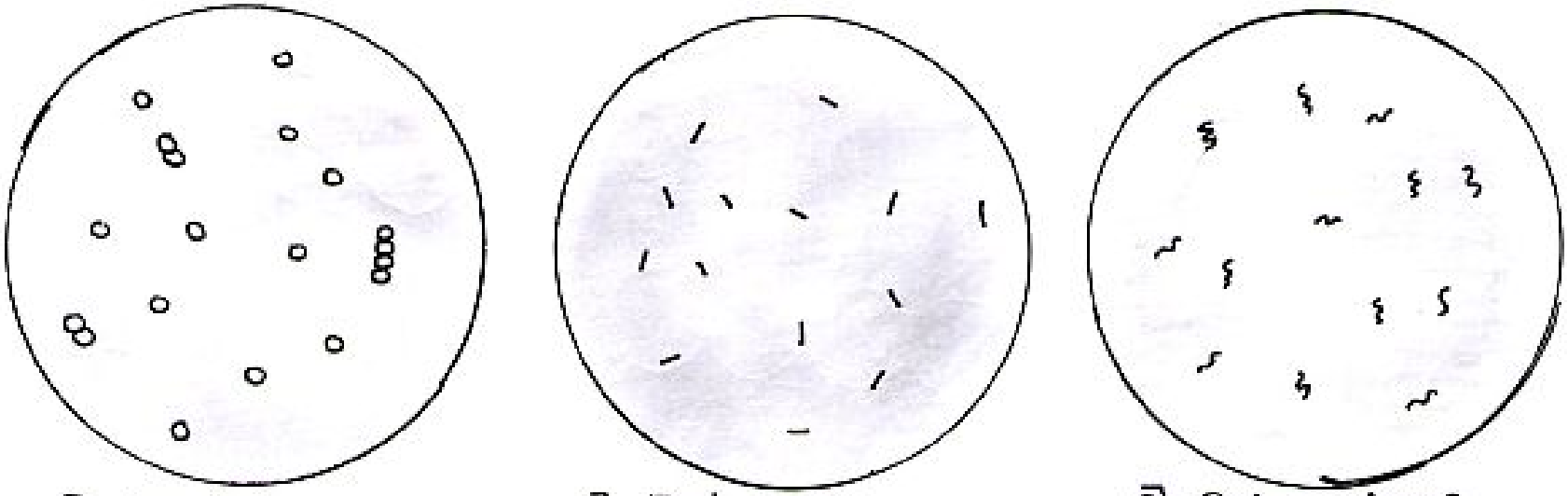
Vibrio



Bacillus

Spirillum

Spirochete



A] Cocci shape Bacteria

B] Rod shape Bacteria

C] Spiral shape Bacteria.

Microscopic observation of bacterial cells

# Coccus

- The rounded or spherical forms are called cocci (singular coccus) in which the cells are more or less spherical.
- They are smallest forms among bacteria.
- After division the cells may either separate from each other or may remain joined together to form groups of two cells in Diplococcus, a tetrad of four cells in Micrococcus tetragenus and a chain of cells in Streptococcus.
- The cocci range in diameter from 0.5µ-1.25µ.

# Arrangement of bacterial cells.

- Variety of arrangement of cells is observed in cocci and rod shape bacteria.

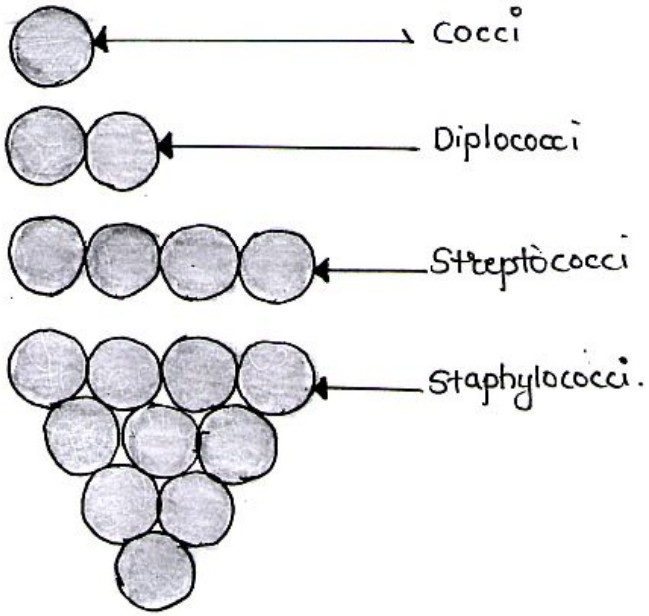



Figure :- Arrangement of Cocci Shape bacteria.

# (1) Bacillus

- The straight rod-like bacteria are called bacilli (singular bacillus), which possess rod-like, kidney-like or elongated cells.
- They vary greatly in their length and diameter ranging from 0.6p-1.2μ long and 0.5-0.7μ wide to 3.8μ long and l-1.2μ wide.

# Arrangement of rod shape bacteria.

- Bacillus cells show very less variety in arrangement of cells as these cells can be divided only in one plane.

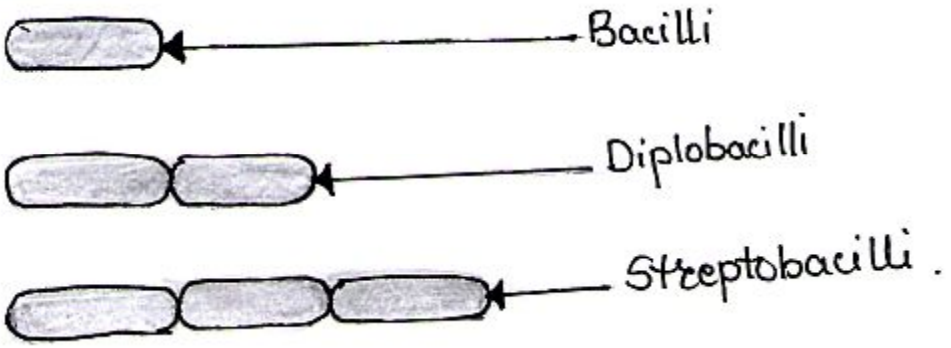



Figure :- Arrangement of rod shape bacteria.

# Spirillumm

- The spiral or curved forms are called spirilla (singular spirillum), in which the cells are spirally coiled or coma-shaped or variously curved. They vary in size from 1.5μ to 4μ long and 0.2μ-0.4μ wide in Vibrio to upto 50p long in Spirillum.