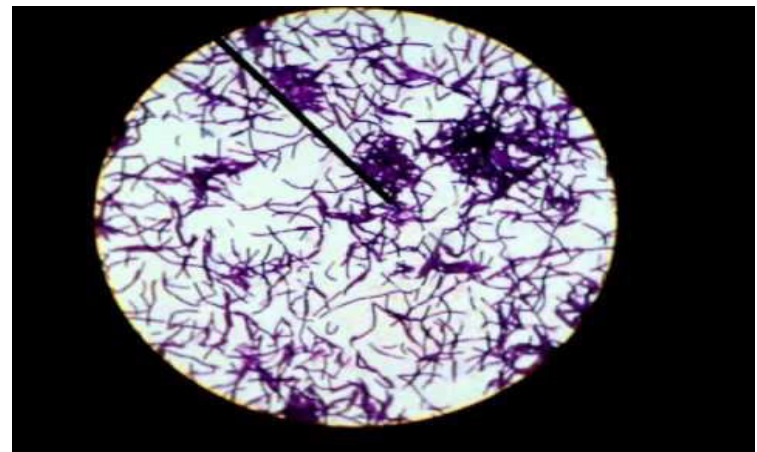
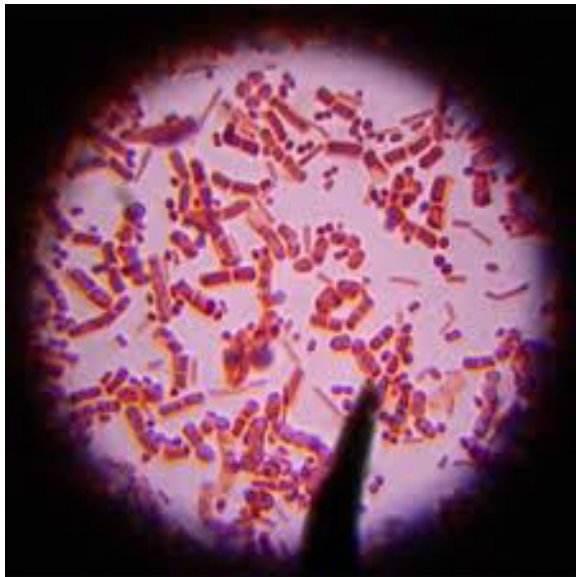





Staining of Bacteria



Morphology of Bacteria

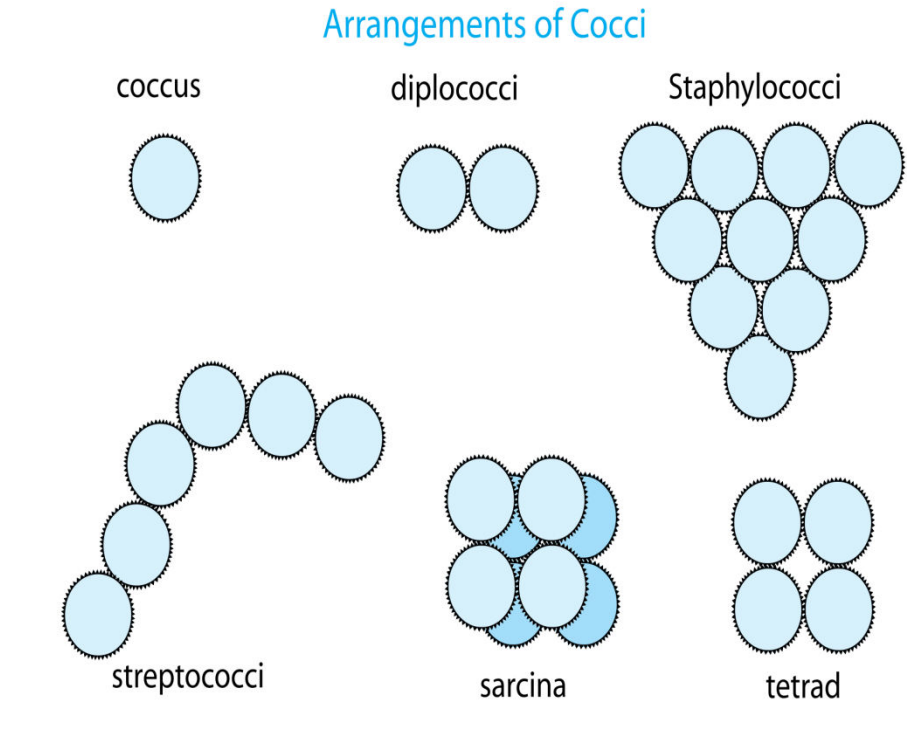
- Bacteria are prokaryotic cells that have different shape:
 - Spherical or round called: cocci 
 - Rod called: bacilli 
 - Coiled or spiral 

Arrangements of Bacteria

Morphology: Cocci

Arrangement:

1. Single (coccus)
2. In pairs (diplococci)
3. In chain (streptococci)
4. In cluster (staphylococci)
5. Packet of 4,6,8 cocci (micrococci)



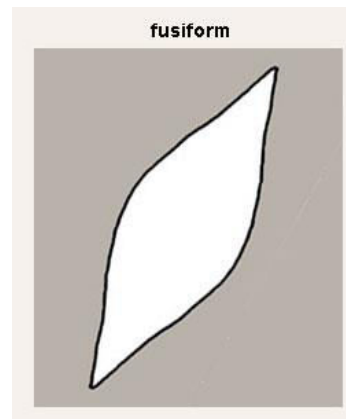
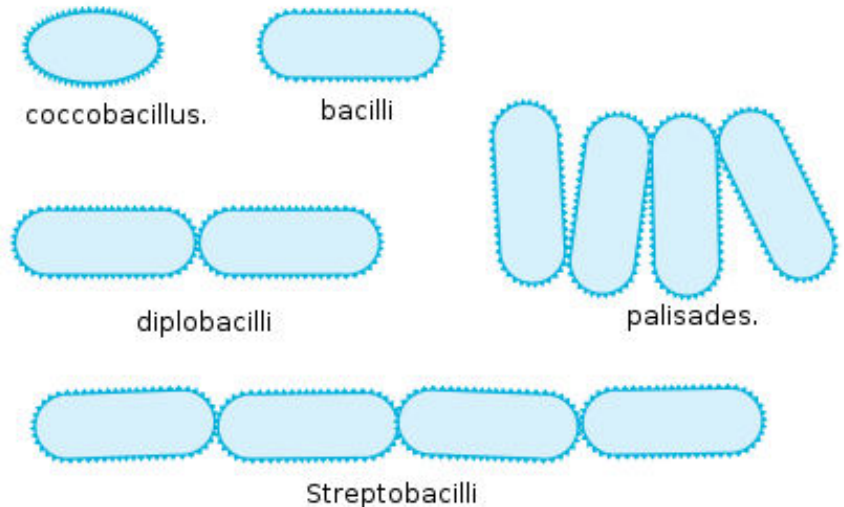
Arrangements of Bacteria

Morphology: Bacilli

Arrangement:

1. Single (bacilli)
2. In pairs (diplococci)
3. In chains (streptococci)
4. Very short bacilli (coccobacilli)
5. Narrow bacilli (fusiform)

Arrangements of Bacilli



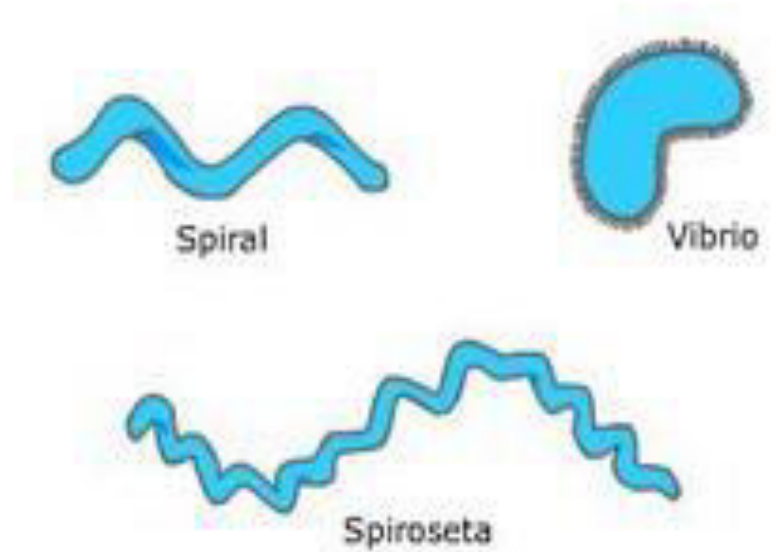
Arrangements of Bacteria

Morphology: spiral

Arrangement:

1. One rigid curve (spiral)
 2. Several curves or waves (spirochaetes)
 3. Short, curved bacteria (comma shape)
- **Pleomorphism:** when there are variation in sizes and shapes of bacteria

Bentuk-Bentuk Bakteri Spirilia



Staining of Bacteria

Stains (dyes):

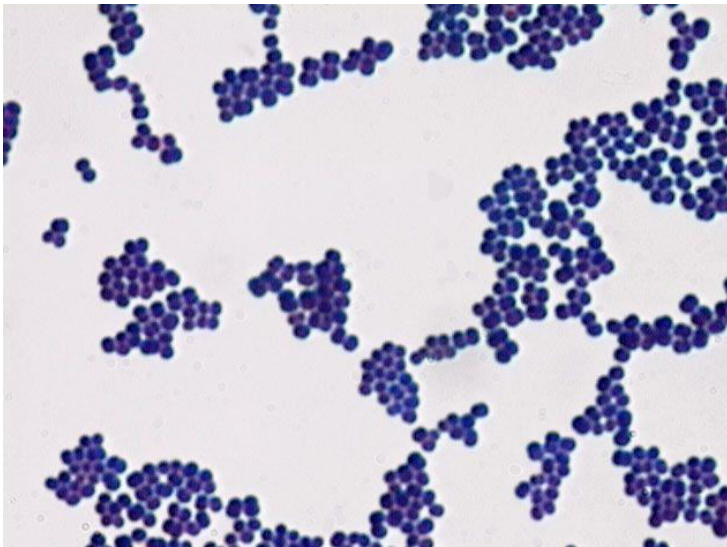
They are colored compounds used for staining microorganisms.

Ex: Methylene blue (MbCl).

- **Basic dye:** it is dye which has positive charge & bind to negatively charged molecules
- **Acidic dye:** it is dye which has negative charge so they bind to positively charged cell structures

Bacteria stained by Methylene blue (MB)

Staphylococci stained by MB



Streptobacilli stained by MB



How to make bacterial smear?

- Use clean glass slide (no dust or oil on top of it)
- Place the bacteria in the slide by using loop and spread the bacteria
- Place the slide on the **slide warmer**:
 - To kill the bacteria.
 - And to fix the bacteria on the slide by coagulate the protein substance of the bacterial cells

Now bacterial smear is ready,, stain it with suitable stain

Types of Stains

Simple stain	Differential stain
Consist of one stain	Consist of 2 or more stain
Show shape and arrangement of bacteria only	Show shape, arrangement, spores, capsule and give different colors
Ex. : Methylene blue	Ex. : gram stain Spore stain Capsule stain

Gram stain

Consist of 4 reagents:

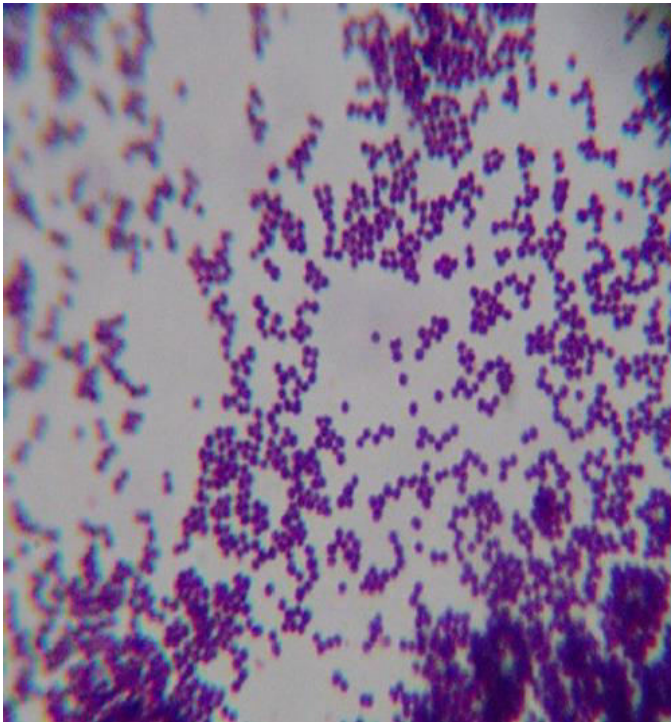
1. Crystal violet: primary stain (1min)
2. Iodine: mordant (1 min)
3. Alcohol or acetone: de-colorizer (7sec)
4. Safranin: counter stain (1min)

Result:

- Violet bacteria: gram +ve bacteria.
- Red bacteria: gram -ve bacteria

Gram +ve Bacteria

Gram +ve staphylococci (cocci in cluster)

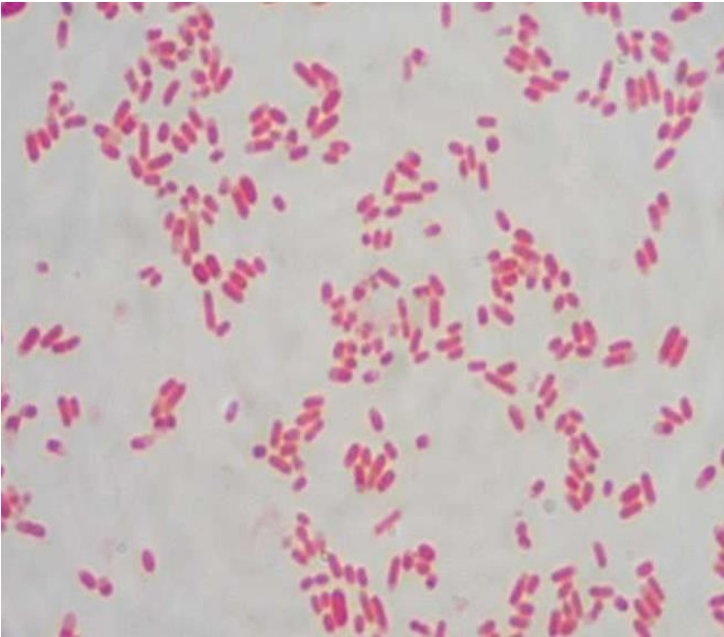


Gram +ve streptobacilli (bacilli in chain)

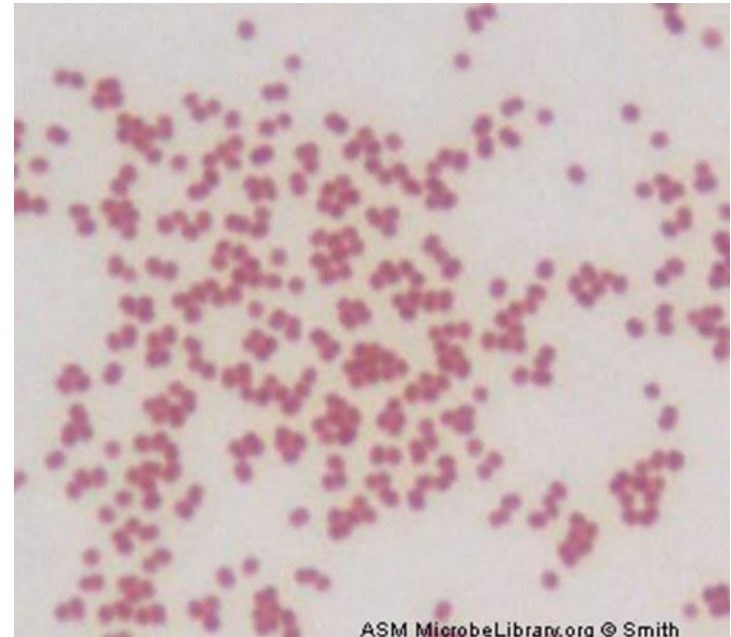


Gram -ve Bacteria

Gram -ve bacilli



Gram -ve cocci



Spore Stain

- Spores are formed by some bacteria.
- Spores resist heat, chemical & improper condition & they are difficult to stain.

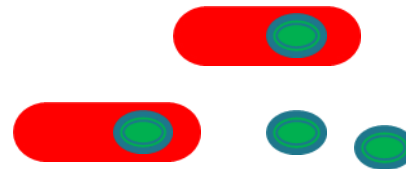


Steps for staining spore are:

1. Malachite green: primary stain (strong stain).
2. Apply heat and leave it for 5-10 min.
3. Safranin: counter stain (1 min)

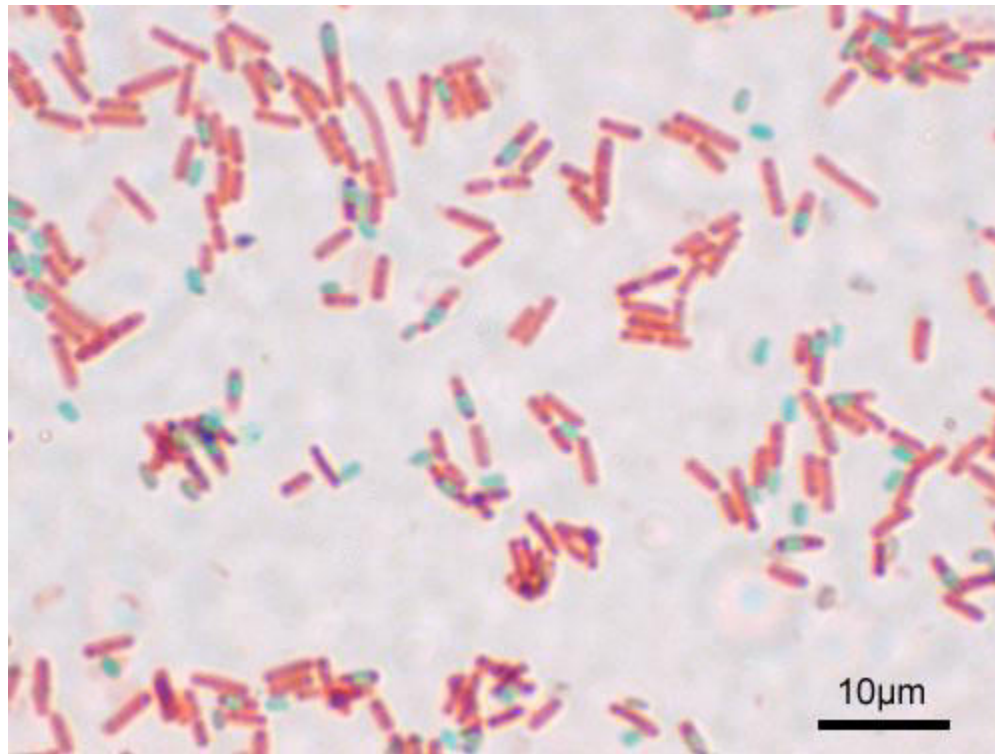
Result:

Red bacilli with green spores.



Spore stain

Red bacilli with green spores



Capsule Stain

- Capsule stain also called **Negative stain**,, why??

Because the capsule made of inert polysaccharide (uncharged) so it will not stained (Only the background and the bacteria will be stained)

- **To stain the capsule we use:**

- Black india ink OR
- Nigrosin + safranin.

Result:

Dark background with round uncolored capsule and red bacteria inside the capsule.

Capsule stain

dark background with uncolored capsule and red bacteria inside the capsule

Capsule Staining

