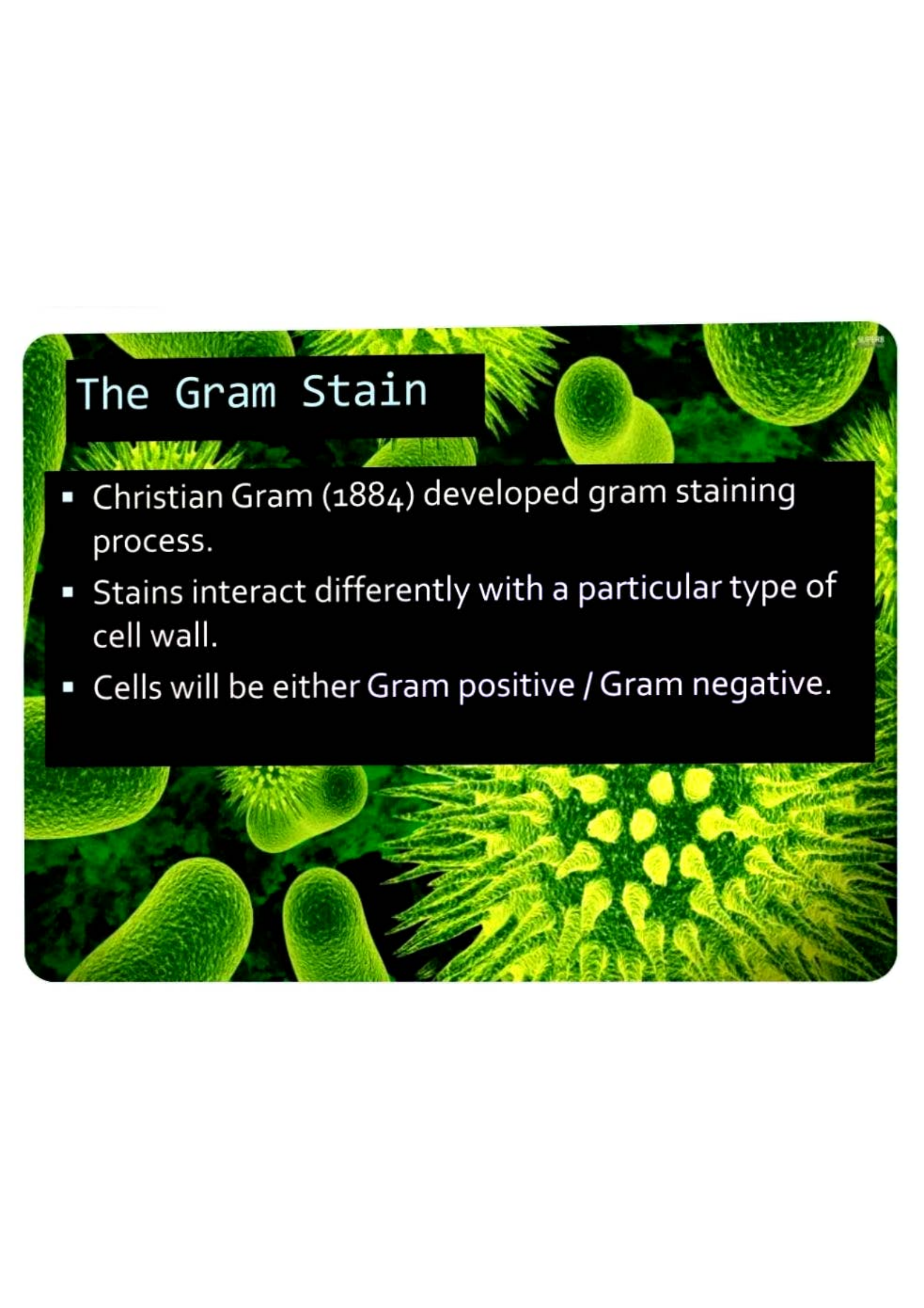


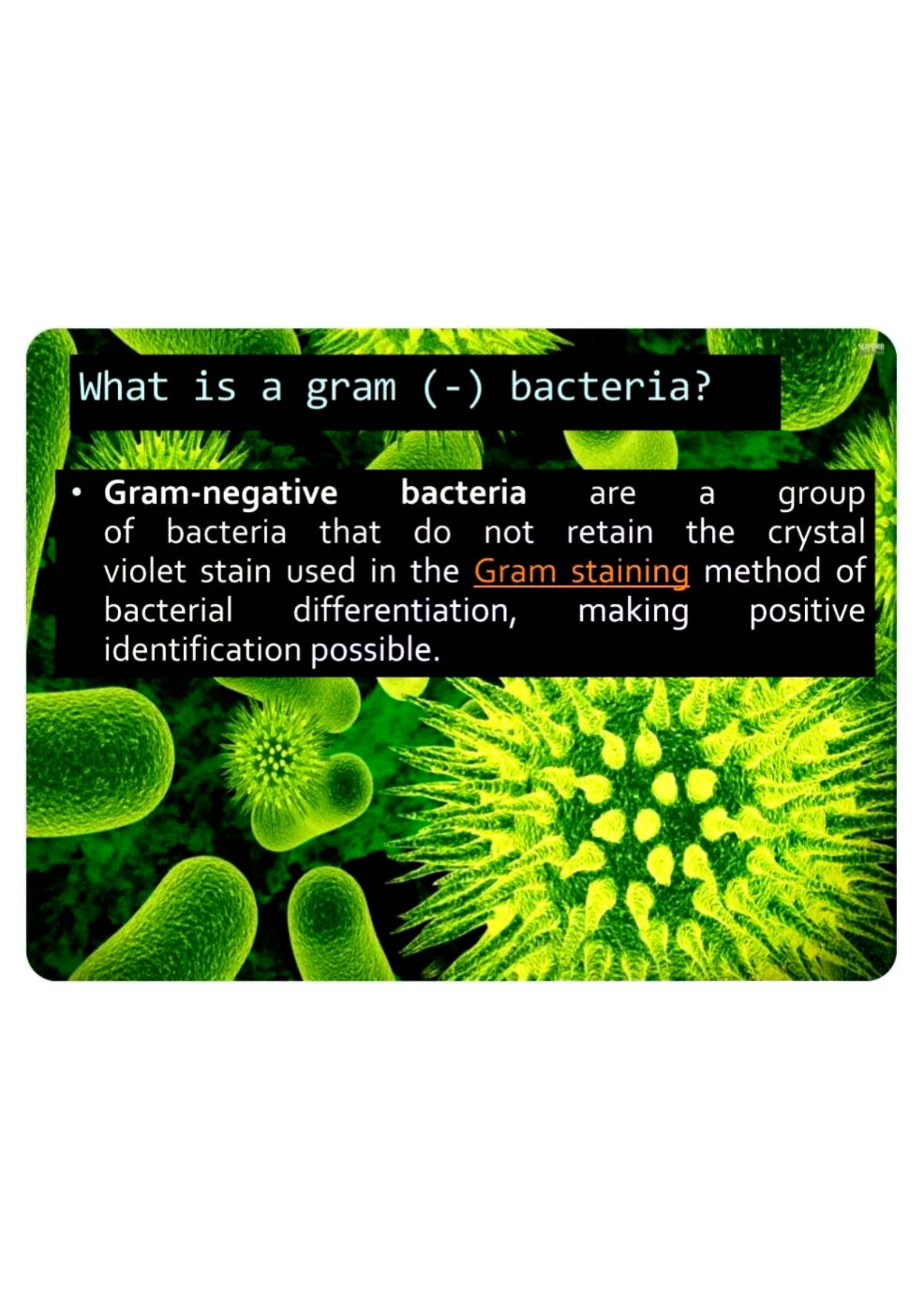
A scanning electron micrograph (SEM) showing various Gram-negative bacteria. The image features several rod-shaped bacteria, some with flagella, and several spherical bacteria, some with flagella. The bacteria are shown in a cluster, with some appearing to be in the process of division. The background is dark, and the bacteria are highlighted in shades of green and yellow. A black rectangular box with white text is overlaid in the center of the image.

The Gram Negative Bacteria



The Gram Stain

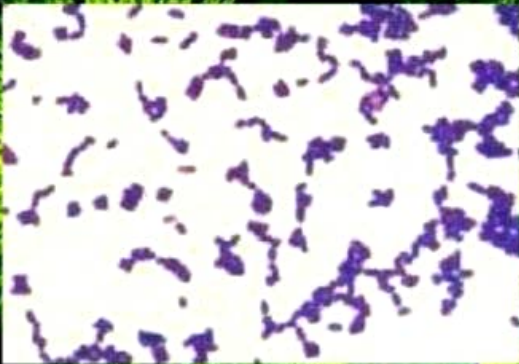
- Christian Gram (1884) developed gram staining process.
- Stains interact differently with a particular type of cell wall.
- Cells will be either Gram positive / Gram negative.



What is a gram (-) bacteria?

- **Gram-negative bacteria** are a group of bacteria that do not retain the crystal violet stain used in the Gram staining method of bacterial differentiation, making positive identification possible.

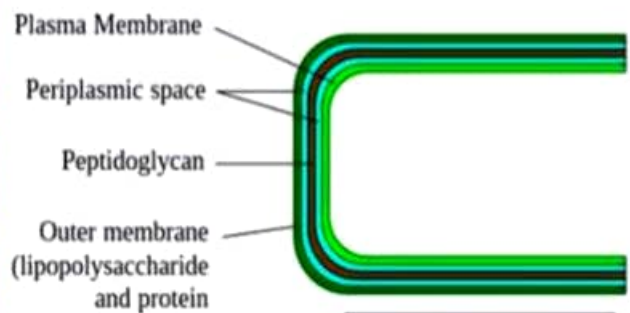
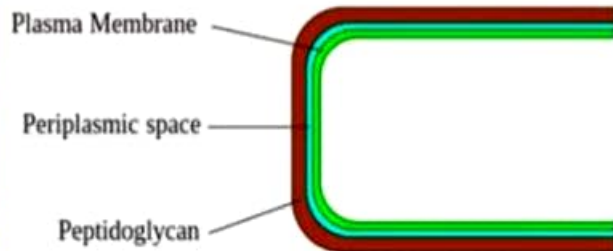
Gram negative bacteria



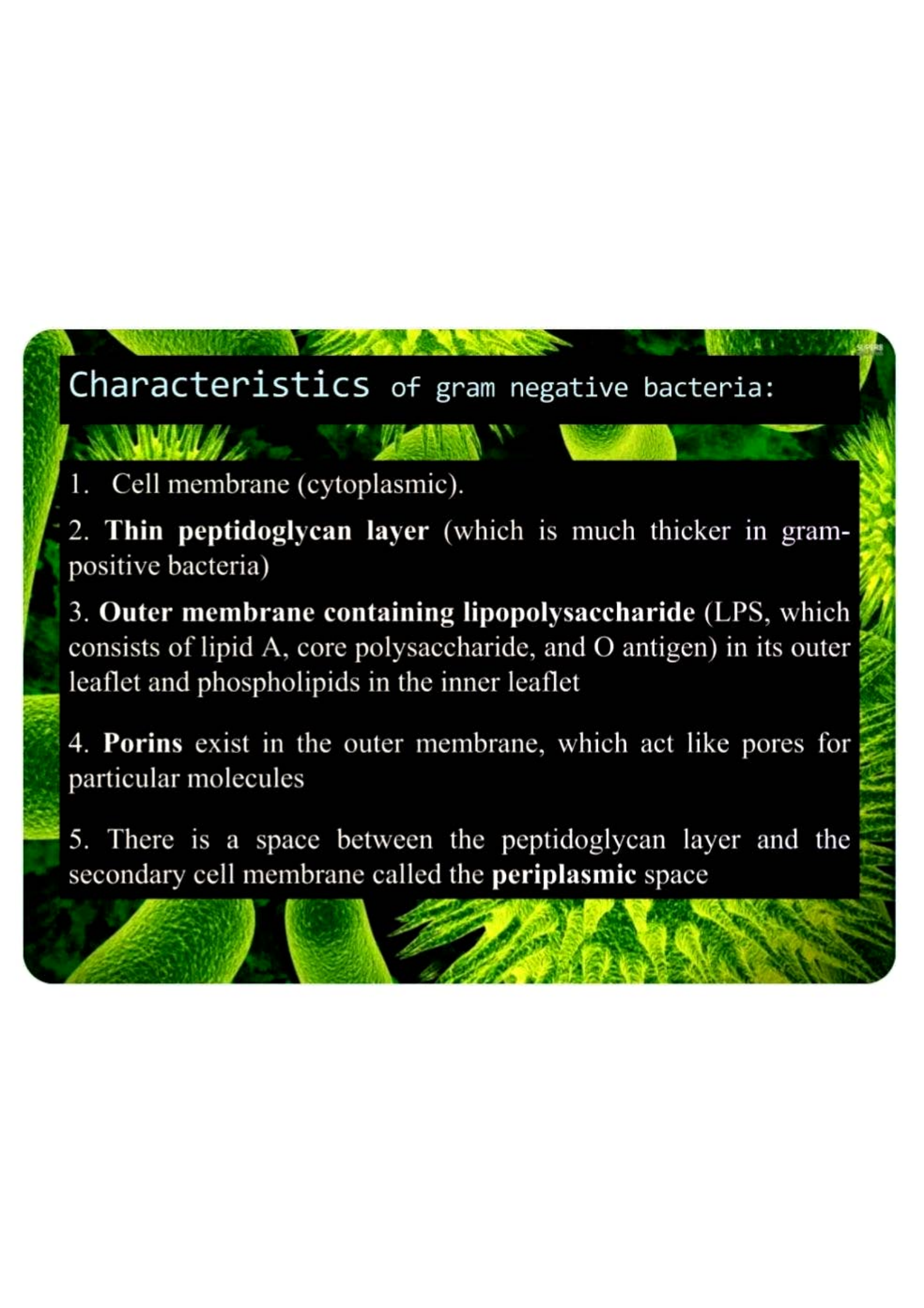
- **Gram negative:** A group of bacteria that do not retain the crystal violet dye after the differential staining procedure known as Gram staining. They appear pink due to the counterstain.
- **Gram positive appears purple.**
- The difference between Gram negative and Gram positive bacteria is the cell wall structure, which accounts for the different staining characteristics

Gram negative bacteria

Gram Positive

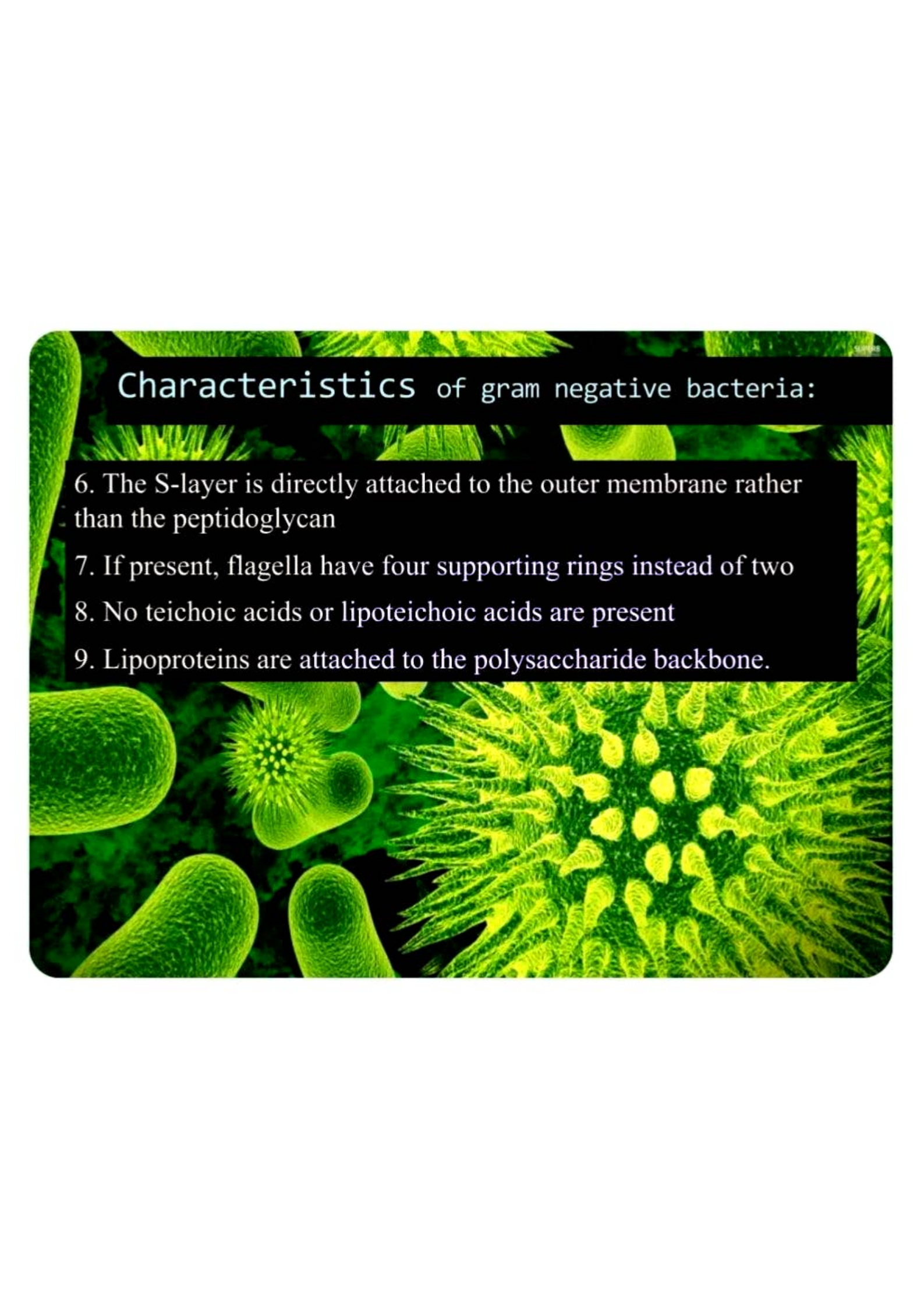


Gram Negative



Characteristics of gram negative bacteria:

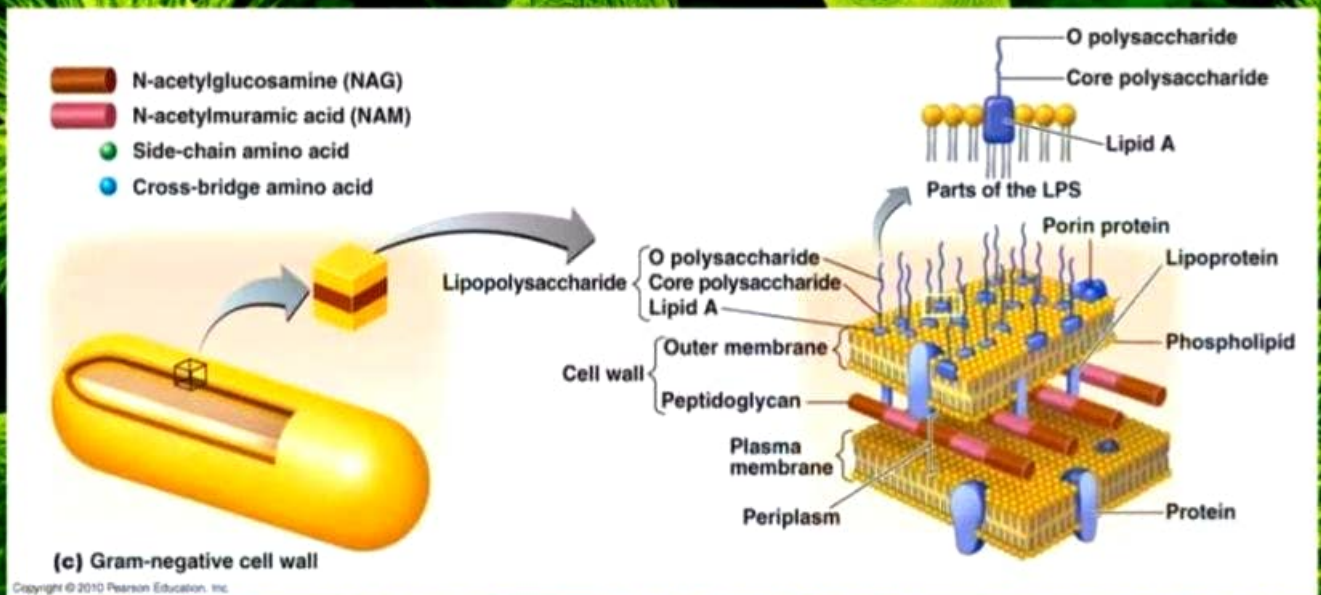
1. Cell membrane (cytoplasmic).
2. **Thin peptidoglycan layer** (which is much thicker in gram-positive bacteria)
3. **Outer membrane containing lipopolysaccharide** (LPS, which consists of lipid A, core polysaccharide, and O antigen) in its outer leaflet and phospholipids in the inner leaflet
4. **Porins** exist in the outer membrane, which act like pores for particular molecules
5. There is a space between the peptidoglycan layer and the secondary cell membrane called the **periplasmic space**

A scanning electron micrograph (SEM) showing various gram-negative bacteria. In the foreground, there are several rod-shaped bacteria with a textured surface. To the right, a larger, more complex structure is visible, possibly a bacterial spore or a cluster of cells, with a central core and radiating, hair-like structures. The background is dark, highlighting the intricate details of the bacterial surfaces.

Characteristics of gram negative bacteria:

6. The S-layer is directly attached to the outer membrane rather than the peptidoglycan
7. If present, flagella have four supporting rings instead of two
8. No teichoic acids or lipoteichoic acids are present
9. Lipoproteins are attached to the polysaccharide backbone.

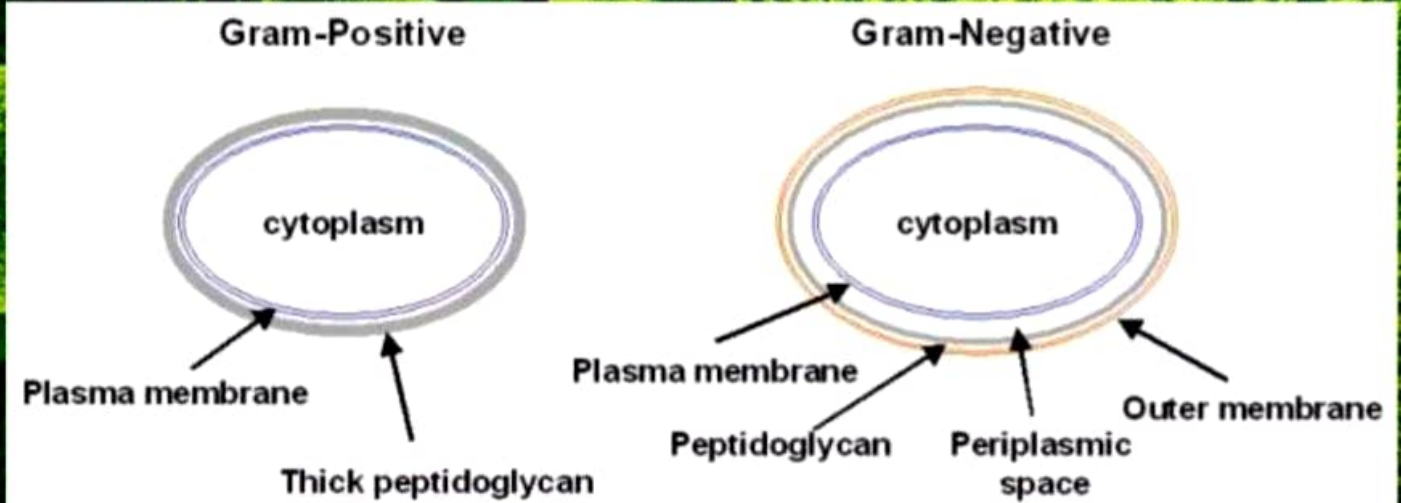
Gram Negative



The Gram-negative cell wall is composed of a thin, inner layer of peptidoglycan and an outer membrane consisting of molecules of phospholipids, lipopolysaccharides (LPS), lipoproteins and surface proteins. The lipopolysaccharide consists of lipid A and O polysaccharide.

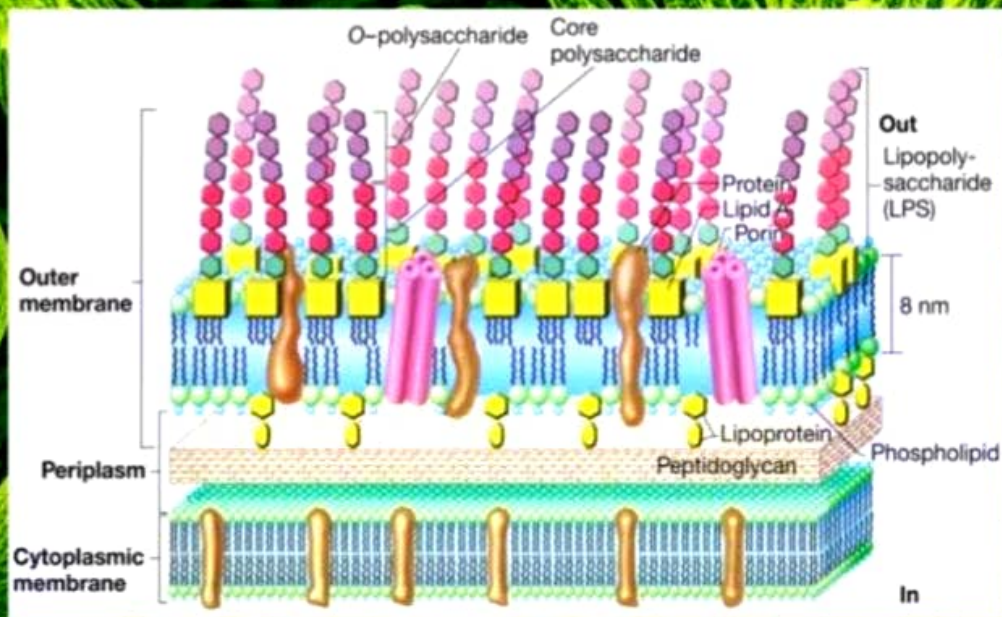
Characteristics of gram negative bacteria:

Thin peptidoglycan layer
(which is much thicker
in gram-positive
bacteria)

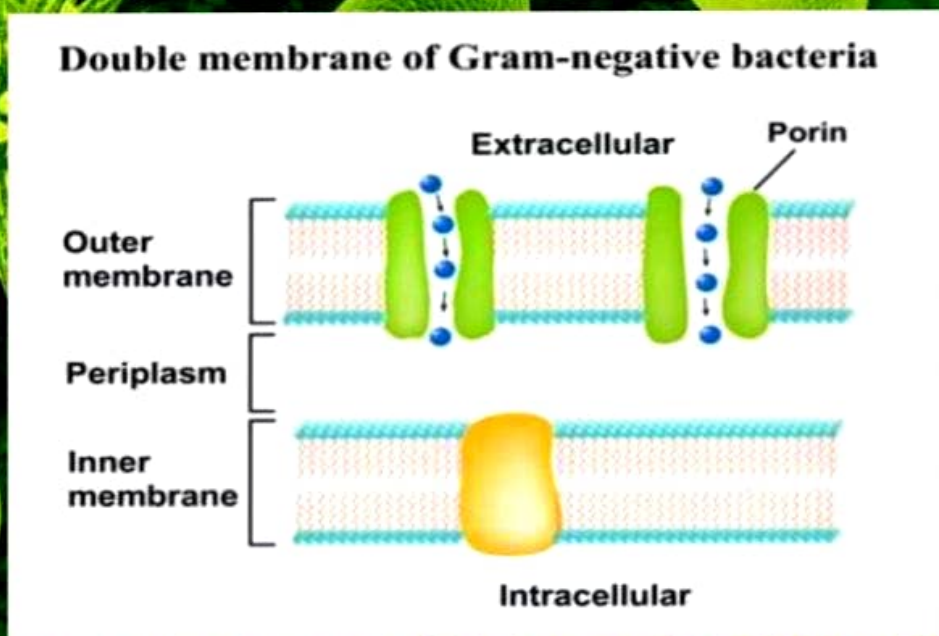


Characteristics of gram negative bacteria:

Outer membrane containing lipopolysaccharide (LPS, which consists of lipid A, core polysaccharide, and O antigen) in its outer leaflet and phospholipids in the inner leaflet



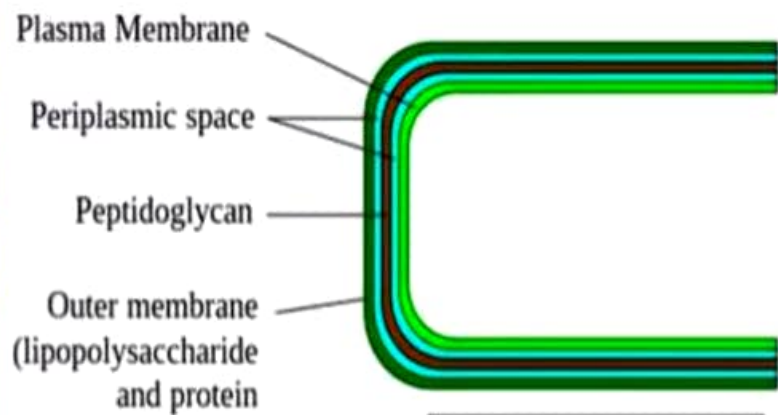
Characteristics of gram negative bacteria:



Porins exist in the outer membrane, which act like pores for particular molecules

Characteristics of gram negative bacteria:

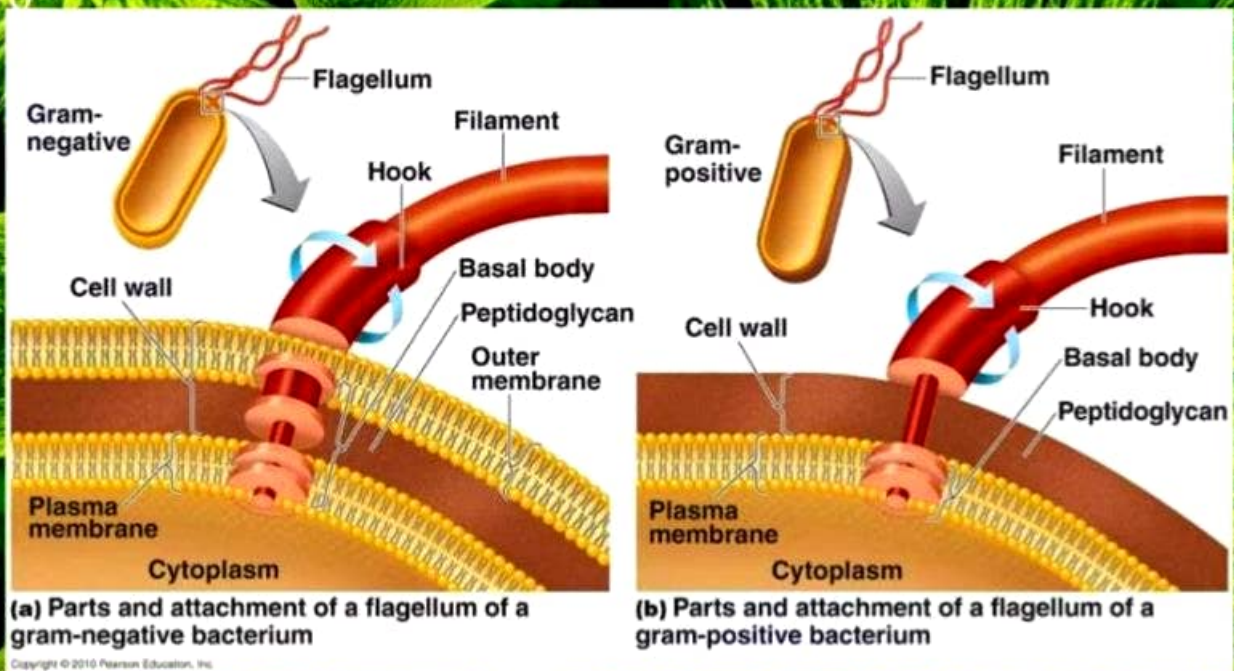
There is a space between the peptidoglycan layer and the secondary cell membrane called the **periplasmic space**



Gram Negative

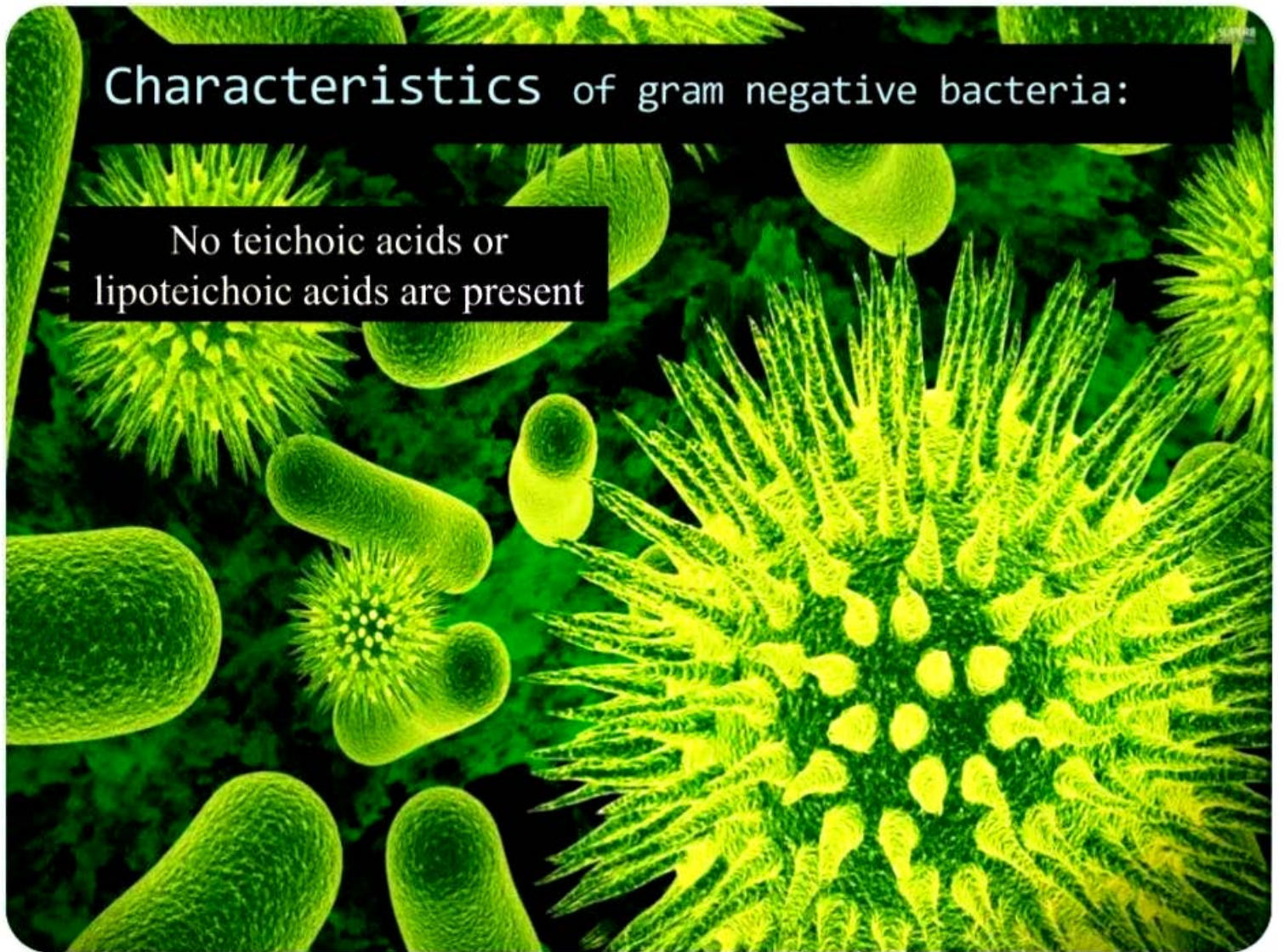
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