

GRAM-POSITIVE VS GRAM-NEGATIVE

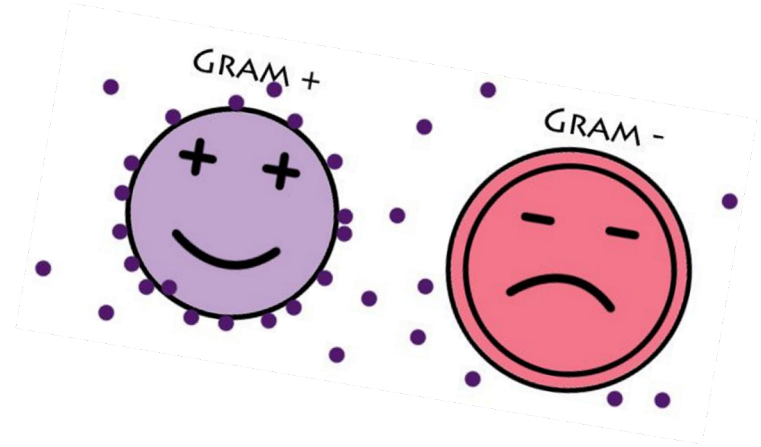
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TOPICS :

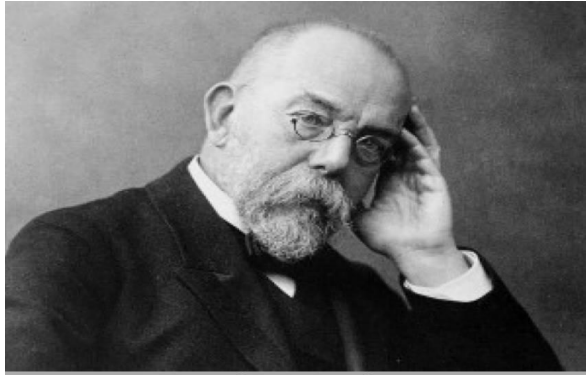
- Who discovered the bacteria ?
- Who discovered the gram staining technique ?
- What is the gram-positive bacteria and its cell wall structure ?
- What is the gram-negative bacteria and its cell wall structure ?
- What are the main differences between gram positive and gram negative bacteria?



1.
Who discovered the bacteria
&
Who discovered the gram staining technique



Let's start with the first slide



Hans Christian Gram (1853 - 1938)

The Gram staining method, named after the Danish bacteriologist who originally devised it in 1882 (published 1884), Hans Christian Gram, is one of the most important staining techniques in microbiology. It is almost always the first test performed for the identification of bacteria.



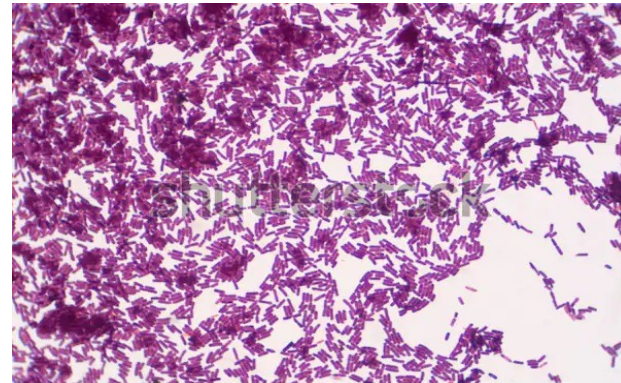
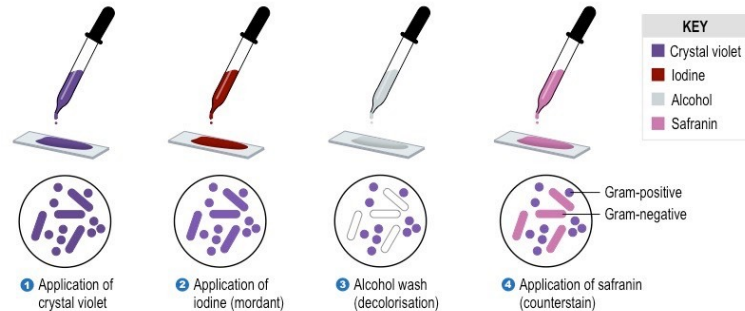
Antony van Leeuwenhoek (1632 - 1723)

He constructed the first microscope and is regarded as the father of microbiology. It is the first to discover bacteria year 1676



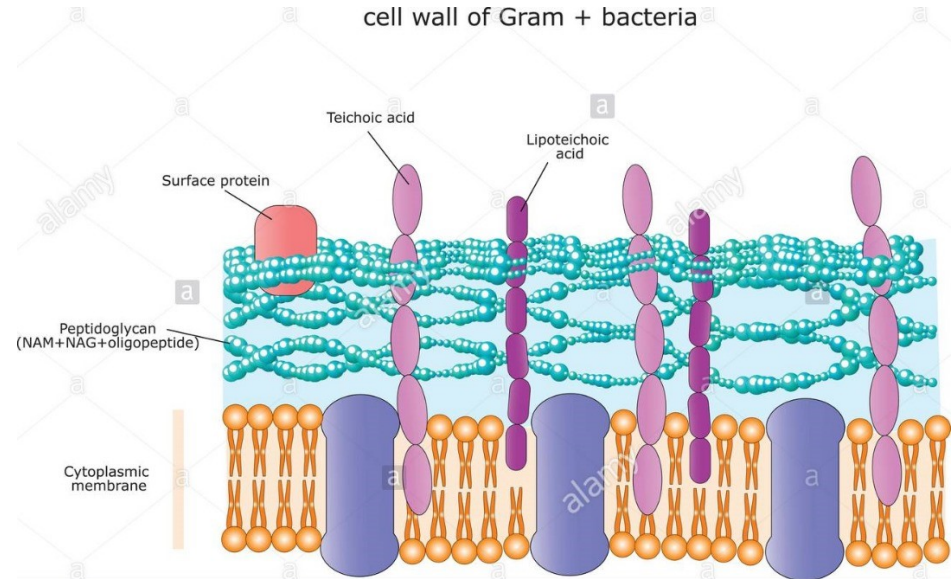
2. Gram-positive bacteria

Gram Positive Bacteria which retain the crystal violet stain during gram staining, giving the positive color for tests, are called gram positive bacteria. They appear in purple color under the microscope by staining. The thick peptidoglycan layer present in the gram positive bacteria is responsible for retaining the stain even after decolorization. One of the most characteristic features of gram positive bacteria is that they are more susceptible to antibiotics due to a lack of an outer membrane.



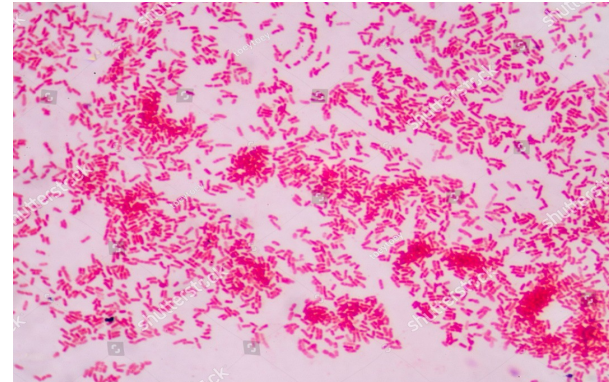
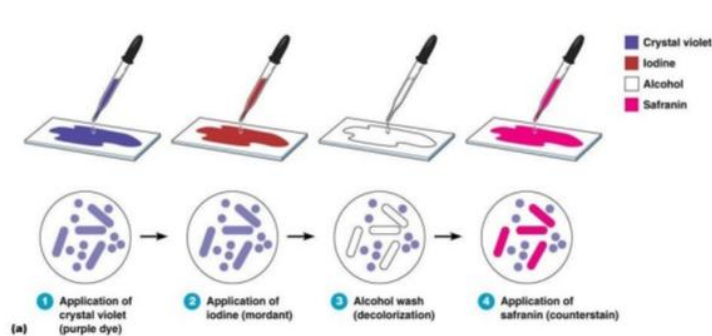
2.1. Cell wall structure of gram-positive bacteria .

Gram positive bacteria contain a continuous cell wall called the sacculus, which is composed of peptidoglycans known as murein (20-80nm) thick. Peptidoglycans contain a glycan backbone, which is made up of both N-acetylated muramic acid (NAM) and glucosamine acid (NAG). This glycan backbone is highly cross-linked with oligopeptides. Teichoic acid is found, covalently linked to the peptidoglycan backbone. Teichoic acid bears a strong negative charge and they are strongly antigenic.



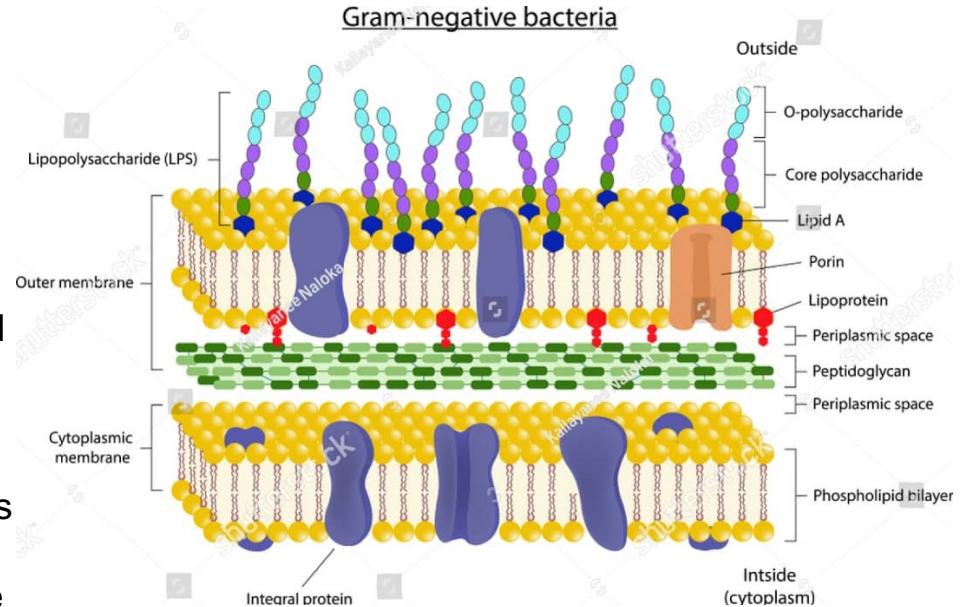
3. Gram-Negative bacteria

Gram Negative Bacteria which do not retain the crystal violet stain during gram staining are called gram negative bacteria. The peptidoglycan layer which is responsible for retaining crystal violet stain is thin in gram negative bacteria and it is sandwiched between the inner cytoplasmic membrane and the outer membrane of the bacteria. Therefore, gram negative bacteria can be stained by the counter stain, safranin, during the gram staining technique, giving the red to pink color. Gram negative bacteria are more pathogenic due to their less susceptibility to antibiotics.



3.1. Cell wall structure of gram-Negative bacteria

The cell wall of gram negative bacteria is (7.5-10nm) thin containing monolayer of peptidoglycan. The peptidoglycan backbone is partially cross linked in gram negative bacteria. Teichoic acid is not found in the cell wall of gram negative bacteria. Gram negative bacteria are composed of cell envelope in the outside of the cell wall, called the outer membrane, In the outer membrane of the gram negative bacteria, lipopolysaccharides which serves as endotoxins are found. The outer membrane is non covalently anchored into lipoproteins, and it's called Braun's lipoproteins, which are covalently bound to the peptidoglycan layer.

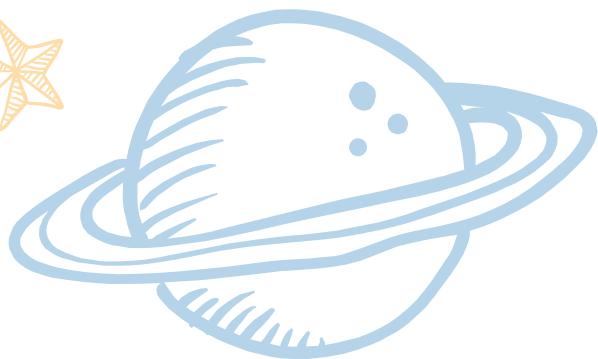




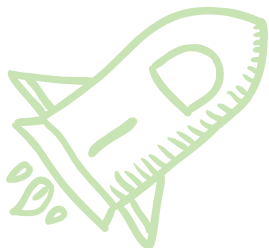
4. What are the main differences between gram positive and negative bacteria?

Gram positive bacteria	Gram negative bacteria
Gram positive bacteria retain the crystal violet stain during gram staining	Gram negative bacteria do not retain the crystal violet stain during gram staining
Appear in purple color under the microscope	Appear in pink color under the microscope
Outer membrane is present	Outer membrane is absent
Peptidoglycan layer is thick and multilayered	Peptidoglycan layer is thin and single-layered
Periplasmic space is absent	Periplasmic space is present
Cell wall is around 20-80 nm	Cell wall is around 5-10 nm
Cell wall is smooth	Cell wall is wavy
Cell wall contains virtually non lipopolysaccharide content	Cell wall high lipopolysaccharide content
Lipid and lipoprotein content is low in the cell wall	Lipid and lipoprotein content is high in the cell wall
More susceptible to antibiotics	Less susceptible to antibiotics





References



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Thank
you

