

The Gram Stain

The Gram stain is an empirical method of differentiating bacterial species into two large groups (Gram-positive and Gram-negative) based on the chemical and physical properties of their cell walls. The method is named after its inventor, the Danish scientist Hans Christian Joachim Gram (1853 – 1938), who formatted the technique in 1884.

Gram-positive bacteria have a thick mesh-like cell wall made of peptidoglycan (50-90% of cell wall), which stain purple and Gram-negative bacteria have a thinner layer (10% of cell wall), which stain pink. Gram-negative bacteria also have an additional outer membrane which contains lipids, and is separated from the cell wall by the periplasmic space. There are four basic steps of the Gram stain, which include applying a primary stain crystal violet to a heat-fixed smear of a bacterial culture or specimen, followed by the addition of a mordant (Gram's iodine), rapid decolorization with alcohol or acetone and counterstaining with safranin.

The Gram stain is the most common staining procedure in clinical microbiology. This tool can aid the physician in determining if infection is present, a possible etiology and a guide to choosing the appropriate antibiotic in just 15 minutes.