

## Gram Staining

- **Teichoic acids** are polymers constructed from alternating glycerol units
  - These polymers confer a net negative charge onto the cell wall
  - They also help stabilize the overall cell envelope

Gram Positive Cell Envelope	Gram Negative Cell Envelope
Has a simple structure	Has a complex structure
Features a thick peptidoglycan layer (20–80 nm)	Features a thin peptidoglycan layer (2–7 nm)
The outer membrane is absent	The outer membrane is present
Has a small periplasmic space	Has a large periplasmic space
Cells retain the violet dye during the cell stain procedure	Cells do not retain the violet dye during the cell stain procedure

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## Bacterial Structure and Growth

- **Flagella** are long, thin, hollow, and rigid structures (usually around 20nm to 20um)
  - They spin in a propeller motion to allow for mobility
  - If they get damaged, they can regenerate
  - They can be seen using a light microscope, but only if they are pre-stained!
- **Fimbriae** are fine hair-like appendages
  - They are only visible if you use an electron microscope
  - Fimbriae are present on most Gram positive and Gram negative bacteria
  - Their main job is attachment to surfaces
  - They also get involved in motility and the uptake of DNA during transformation

## Types of Mobility

- Motile bacteria always move with purpose (with cause)
  - Movement is typically towards available nutrients
  - Movement is also away from accumulated waste products and other harmful substances
- **Flagellar motility** is known as "true" bacterial motility and is the most common form
  - This type involves the rotation of flagella in a propeller-like motion