

Structures External to the Cell Wall

Glycocalyx

1. The glycocalyx (capsule, slime layer, or extracellular polysaccharide) is a gelatinous polysaccharide and/or polypeptide covering.
2. Capsules may protect pathogens from phagocytosis.
3. Capsules enable adherence to surfaces, prevent desiccation, and may provide nutrients.

Flagella

4. Flagella are relatively long filamentous appendages consisting of a filament, hook, and basal body.
5. Prokaryotic flagella rotate to push the cell.
6. Motile bacteria exhibit taxis; positive taxis is movement toward an attractant, and negative taxis is movement away from a repellent.
7. Flagellar (H) protein is an antigen.

Axial Filaments

8. Spiral cells that move by means of an axial filament (endoflagellum) are called spirochetes.
9. Axial filaments are similar to flagella, except that they wrap around the cell.

Fimbriae and Pili

10. Fimbriae help cells adhere to surfaces.
11. Pili are involved in twitching motility and DNA transfer.

The Cell Wall

Composition and Characteristics

1. The cell wall surrounds the plasma membrane and protects the cell from changes in water pressure.
2. The bacterial cell wall consists of peptidoglycan, a polymer consisting of NAG and NAM and short chains of

- amino acids.
3. Penicillin interferes with peptidoglycan synthesis.
 4. Gram-positive cell walls consist of many layers of peptidoglycan and also contain teichoic acids.
 5. Gram-negative bacteria have a lipopolysaccharide-lipoprotein-phospholipid outer membrane surrounding a thin peptidoglycan layer.
 6. The outer membrane protects the cell from phagocytosis and from penicillin, lysozyme, and other chemicals.
 7. Porins are proteins that permit small molecules to pass through the outer membrane; specific channel proteins allow other molecules to move through the outer membrane.
 8. The lipopolysaccharide component of the outer membrane consists of sugars (O polysaccharides), which function as antigens, and lipid A, which is an endotoxin.

Cell Walls and the Gram Stain Mechanism

9. The crystal violet-iodine complex combines with peptidoglycan.
10. The decolorizer removes the lipid outer membrane of gram negative bacteria and washes out the crystal violet.

Atypical Cell Walls

- II . Mycoplasma* is a bacterial genus that naturally lacks cell walls.
12. Archaea have pseudomurein; they lack peptidoglycan.
 13. Acid-fast cell walls have a layer of mycolic acid outside a thin peptidoglycan layer.

Damage to the Cell Wall

14. In the presence of lysozyme, gram-positive cell walls are destroyed, and the remaining cellular contents are referred to as a protoplast.
15. In the presence of lysozyme, gram-negative cell walls are not completely destroyed, and the remaining cellular contents are referred to as a spheroplast.
16. L forms are gram-positive or gram-negative bacteria that do not make a cell wall.
17. Antibiotics such as penicillin interfere with cell wall synthesis.

References: 1- Microbiology an introduction TENTH EDITION. Gerard. Tortora.2010.

2- Microbiology an introduction TWELFTH EDITION. Gerard. Tortora.2016.