4.4E: Cell Walls of Archaea

Archaeal cell walls differ from bacterial cell walls in their chemical composition and lack of peptidoglycans.

Learning Objectives

• State the similarities between the cell walls of archaea and bacteria

Key Points

• Archaea are single-celled microorganisms that lack a cell nucleus and membrane-bound organelles.
• Like other living organisms, archaea have a semi-rigid cell wall that protects them from the environment.
• The cell wall of archaea is composed of S-layers and lack peptidoglycan molecules with the exception of methanobacteria who have pseudopeptidoglycan in their cell wall.

Key Terms

• cellulose: A complex carbohydrate that forms the main constituent of the cell wall in most plants and is important in the manufacture of numerous products, such as paper, textiles, pharmaceuticals, and explosives.
• chitin: A complex polysaccharide, a polymer of N-acetylglucosamine, found in the exoskeletons of arthropods and in the cell walls of fungi; thought to be responsible for some forms of asthma in humans.
• cytoplasm: The contents of a cell except for the nucleus. It includes cytosol, organelles, vesicles, and the cytoskeleton.

As with other living organisms, archaean cells have an outer cell membrane that serves as a protective barrier between...
the cell and its environment. Within the membrane is the cytoplasm, where the living functions of the archeon take place and where the DNA is located. Around the outside of nearly all archaeal cells is a cell wall, a semi-rigid layer that helps the cell maintain its shape and chemical equilibrium. All three of these regions may be distinguished in the cells of bacteria and most other living organisms.

![Archaea: Cluster of halobacterium (archaea)](https://bio.libretexts.org/Bookshelves/Microbiology/Book%3A_Microbiology_(Boundless)/4%3A_Cell_Structure_of_Bacteria%…)

A closer look at each region reveals structural similarities but major differences in chemical composition between bacterial and archaeal cell wall. Archaea builds the same structures as other organisms, but they build them from different chemical components. For instance, the cell walls of all bacteria contain the chemical peptidoglycan. Archaeal cell walls do not contain this compound, though some species contain a similar one. It is assembled from surface-layer proteins called S-layers. Likewise, archaia do not produce walls of cellulose (as do plants) or chitin (as do fungi). The cell wall of archaees is chemically distinct. Methanogens are the only exception and possess pseudopeptidoglycan chains in their cell wall that lacks amino acids and N-acetylMuramic acid in their chemical composition. The most striking chemical differences between Archaea and other living things lie in their cell membrane. There are four fundamental differences between the archaenal membrane and those of all other cells: (1) chirality of glycerol, (2) ether linkage, (3) isoprenoid chains, and (4) branching of side chains.