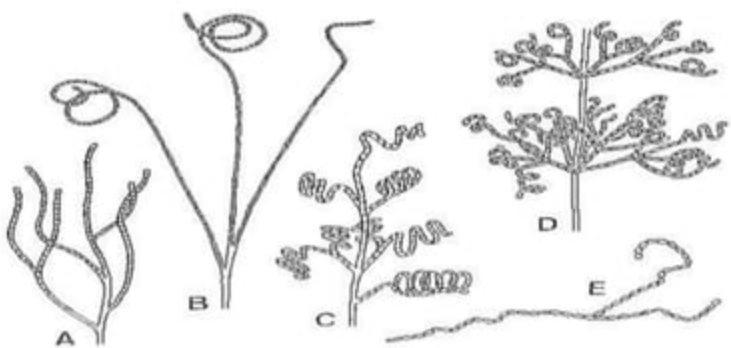
6. Actinomycetes

- The characteristic shape is due to the presence of rigid cell wall. Eg: Streptomyces.
- They are branching filamentous bacteria.
- Eg: Streptomyces species.



Capsule

- Bacteria synthesize loose amorphous organic exopolymer which is deposited outside and tightly to cell wall called capsules.
- Capsules may be composed of complex polypeptides or polysaccharides. Water (98%) is the main component of bacterial capsule.
- Some times the capsular material is loosely associated with the bacterium, it can be easily washed away. The loose layer is called slime layer.
- Capsulated bacteria produces smooth colonies and non capsulated bacteria produces rough colonies on the surface of agar media.

Functions

1. They protect the cell from drying.
2. They protects the bacterial cell against anti-bacterial agents and phages.

Cell wall

- Cell wall is rigid structure which gives definite shape to cell, situated between the capsule and cytoplasmic membrane.
- It is about 10 – 20 nm in thickness and constitutes 20-30 % of dry weight of cell.
- The cell wall cannot be seen by direct light microscopy and does not stain easily by different staining reagents.
- The cell wall of bacteria contains diaminopimelic acid (DAP), muramic acid and teichoic acid. These substances are joined together to give rise to a complex polymeric structure known as peptidoglycan or murein or mucopeptide.
- Peptidoglycan is the major constituent of the cell wall of gram positive bacteria (50 to 90 %) where as in gram negative bacterial cell wall its presence is only 5 -10 %.

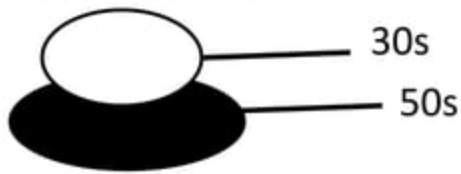
A comparison of cell walls of gram positive and gram negative bacteria

Table 4.2 : A comparison of cell walls of Gram-positive and Gram-negative bacteria

Component	Gram-positive	Gram-negative
1. Thickness	Thick (20 to 25 nm)	Thin (10 to 15 nm)
2. Peptidoglycan	More (50 – 90%)	Less (5 to 10%)
3. Teichoic acid	Present	Absent
4. Polysaccharide	Present	Absent
5. Lipids	Less or absent	More
6. Cell wall	Simple	Complex
7. Outer membrane and periplasmic space	Absent	Present
8. Effect of lysozyme	Easily destroyed	Resistant
9. Type of amino acids	Few	Several
10. Susceptibility to streptomycin and tetracycline	Slight	Marked
11. Susceptibility to penicillin and sulfonamides	Marked	Much less
12. Examples	*Bacillus anthracis* *Clostridium tetani* *Staphylococcus aureus* *Corynebacterium diphtheriae*	*Escherichia coli* *Salmonella typhi* *Vibrio cholerae* *Haemophilus influenzae*

Ribosomes

- Ribosomes are the center of protein synthesis.
- They are slightly smaller than eukaryotic ribosomes.
- The sedimentation constant is 70s.
- This 70s ribosomes are made up of two subunits namely a large subunits 50s and a small subunit 30s.



- During active protein synthesis the ribosomes are associated with mRNA and such associations are called polysomes.