CELL WALL AND CELL MEMBRANE OF GRAM-NEGATIVE BACTERIA

SUBMITTED BY-

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INTRODUCTION

The cell membrane or plasma membrane is a biological membrane that separates the interior of all cells from the outside environment. The cell wall acts to protect the cell mechanically and chemically from its environment, and is an additional layer of protection to the cell membrane. Different types of cell have cell walls made up of different materials; plant cell walls are primarily made up of pectin, fungi cell walls are made up of chitin and bacteria cell walls are made up of peptidoglycan. Many cells also have structures which exist wholly or partially outside the cell membrane.

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WHAT IS THE CELL WALL AND CELL MEMBRANE?

- Cell wall -The rigid outermost cell layer found in plants and certain algae, bacteria, and fungi but characteristically absent from animal cells.
- Cell membrane - The semipermeable membrane that encloses the cytoplasm of a cell. Also called *cytoplasmic membrane*, *plasmalemma*, *plasma membrane*.

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HISTORY

1653	Robert c. hooke discovers the cell
1855	C. Nugeli and C. Cramer were coined the term cell membrane
1989	Albrts was termed the protoplast
1931	J. Q. Plowe was given the term plasmalemma

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HISTORY

1972	Singer and Nicolson explained the fluid mosaic model

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OCCURANCE

cell	cell wall	Cell membrane
Prokaryotes	Present	Present
Bacteria		
Gram +ve	Present	Present
Gram –ve	Present	Present
Eukaryotes		
Plant cell	Present	Present
Animal cell	Absent	Present

Chemical composition of Bacterial cell envelopes

Structure	**Chemical Constituents**
Plasma Membrane	Phospholipids, proteins, enzymes for energy, membrane potential, transport.
Cell Wall	
Gram +ve Bacteria	
Peptidoglycan	Glycan chains of GlcNAc and MurNAc cross linked by peptide bridge
Teichoic Acid	Polyribitol phosphate or glycerol phosphate cross linked to peptidoglycan.

Chemical composition of Bacterial cell envelopes

Lipoteichoic Acid	Lipid linked teichoic acid.
Gram -ve Bacteria	
Peptidoglycan	Thinner version of that found in Gram positive bacteria.
Periplasmic Space	Enzymes involved in transport, degradation, and synthesis.
Outer Membrane	Phospholipids with saturated fatty acids.
Proteins	Porins, lipoprotein, transport proteins.
LPS	Lipid A, core polysaccharide, O antigen.

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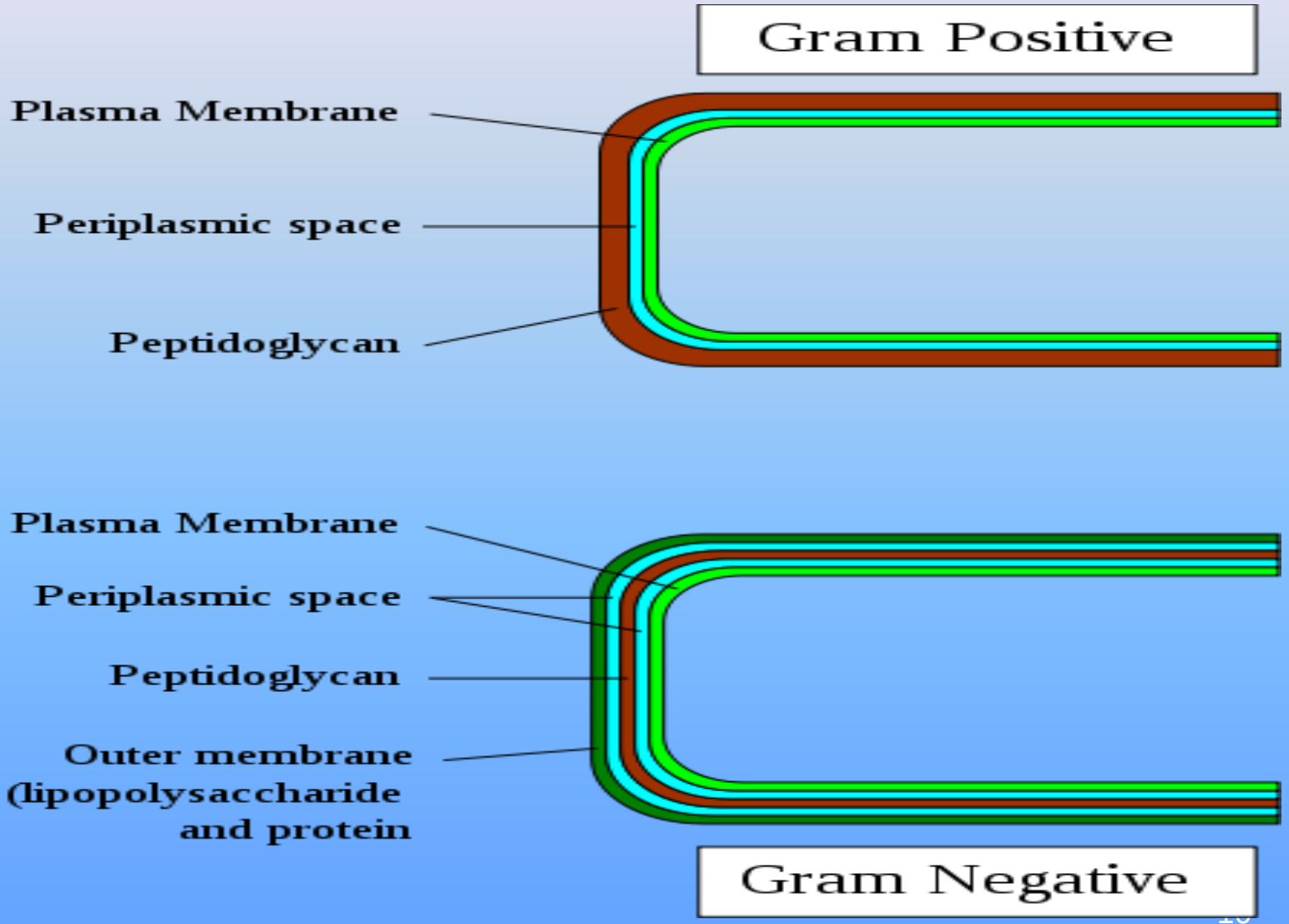
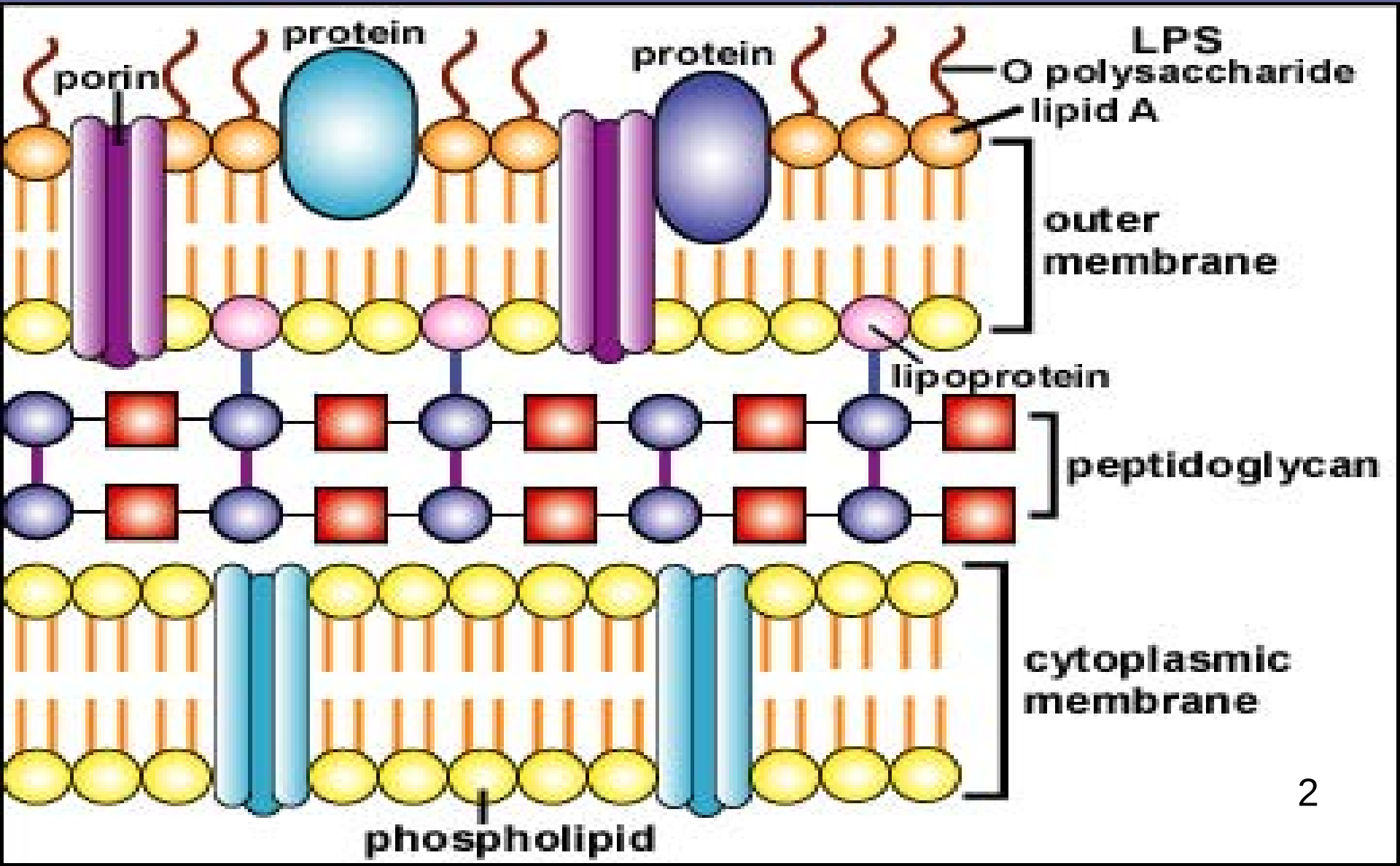
STRUCTURE



- Gram-negative bacteria have a relatively thin cell wall consisting of a few layers of peptidoglycan surrounded by a second lipid membrane containing lipopolysaccharides and lipoproteins. they have a plasma membrane and an outer membrane separated by a periplasmic space. Other prokaryotes have only a plasma membrane. Prokaryotic cells are also surrounded by a cell wall composed of peptidoglycan (amino acid and sugar and chloroplasts).

STRUCTURE OF GRAM NEGATIVE BACTERIA CELL ENVELOP



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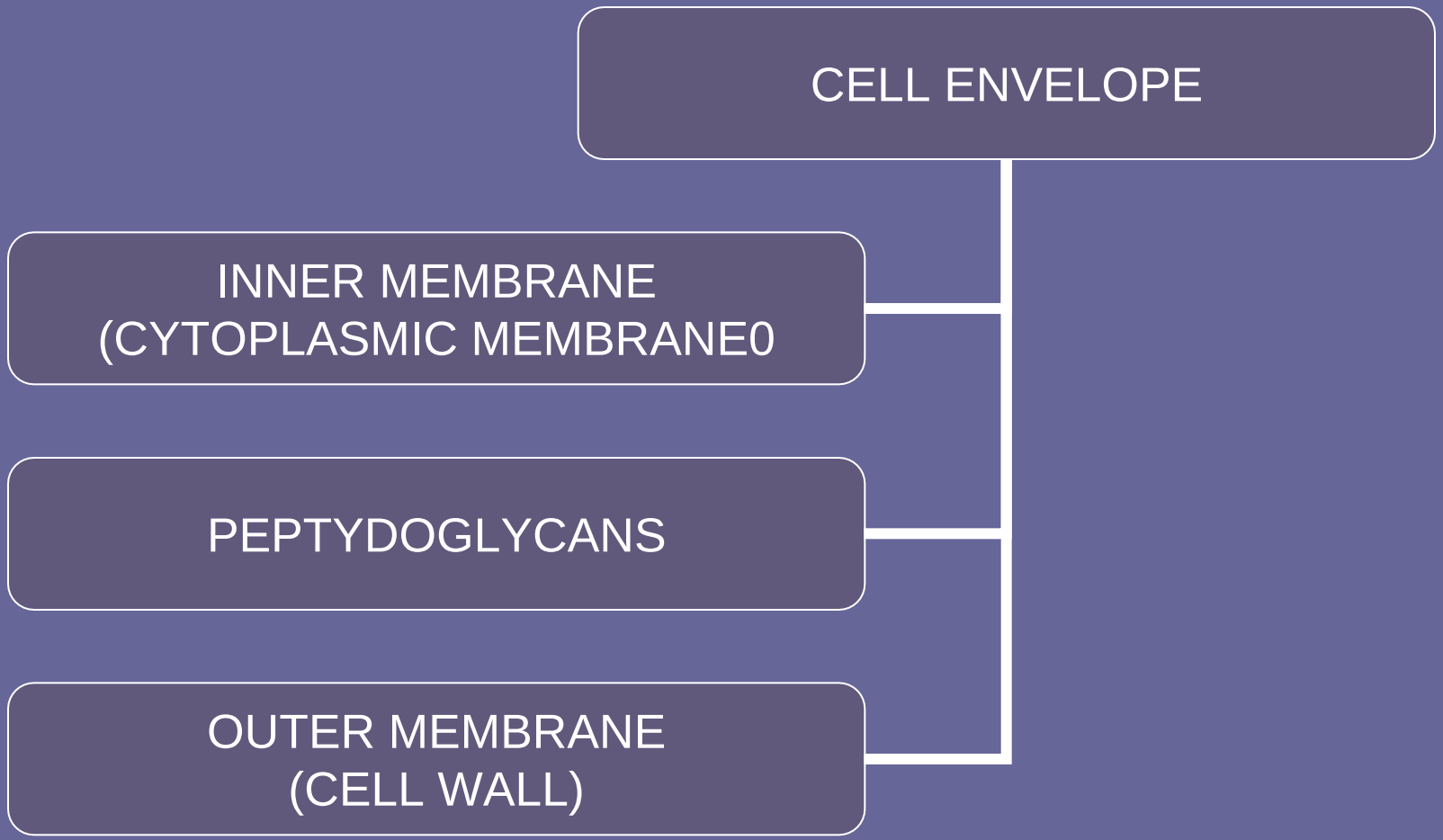

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Periplasmic Space

- A gap between outer-membrane and plasma membrane of Gram-negative bacteria
- A gap between cell wall and plasma membrane of Gram-positive bacteria
- Filled with periplasm
    - Proteins used for metabolism, protection and export

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Peptidoglycan Structure

- Large polymer made up of alternating subunits of:
  - N-acetylglucosamine (NAG)
  - N-acetylmuramic acid (NAM)
- Unique to prokaryotic cells

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FUNCTION

CELL WALL-

- Shape provided
- Protection for osmotic shock (lysis)
  - If water moves in → lysis (in a hypotonic environment)
  - If water moves out → plasmolysis (shriveling) (in a hypertonic environment)
- Contribute to pathogenicity (e.g. LPS)
- Protection from toxic compounds