

PROKARYOTIC ANATOMY II: CELL WALLS, PLASMA MEMBRANE

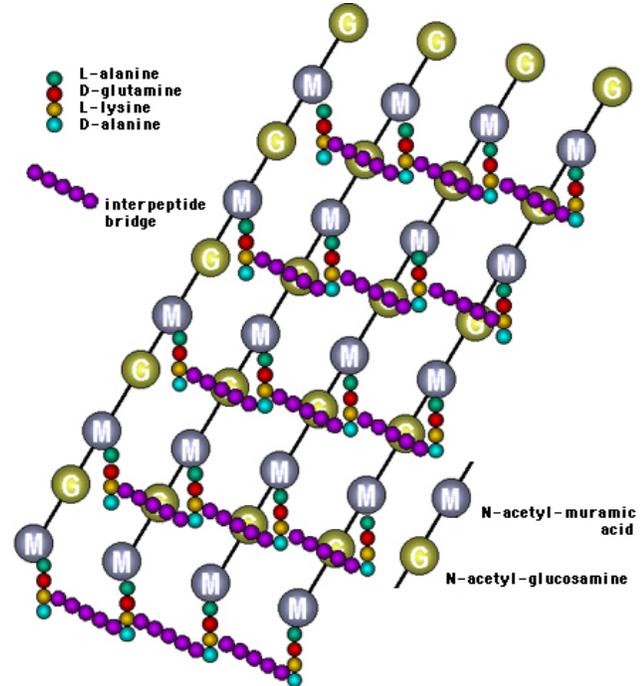
6/30/83, rvsd 8 July 1995, 25 June 99, 13 July 01, 7 July 03, 14 July 04, 11 July 05, 13 July 05, 5Apr06, 9 July 07, 14 July 08, 13July09, 14July10, 19Sept12
 TFC, 7th p 77-99, Alcamo, p. 87-, Atlas, pp 111-139, TFC, 8th p 76-96, Black 6th: 90-95, Bauman 2nd, 65-92, Bauman 4th: 63-77

CELL WALL: (p 65) Many bacteria are grouped according to cell wall antigenicity. Ex: **group A strept.**

Bacteria interior pressure: 300 psi!
 Cell wall holds it in, giving structure & protection

PEPTIDOGLYCAN (murein) is the main strengthening agent

- glycan:** polysaccharide alternating NAG-NAM, β 1,4 links
- NAG: N acetylglucoseamine (p 64)
- NAM: N-acetylmuramic acid (10 to 65 in row)
- peptide:** tetra peptide cross linking anchors via 1-5 AA (alternating D and L)



CONTRAST Gm +/Gm- CELL WALLS: (p 65)

- Gram pos** peptidoglycan 25 nm thick
- teichoic acid** antigenic, ties together (PO_4 + glycerol or ribitol or phospholipid)
- Gram neg** peptidoglycan only 3 nm thick wall
- second membrane** (with lipopolysaccharide)
- periplasmic space** between membranes: contains protective enzymes

As a result of the extra barrier in Gm- bacteria, they are more resistant to antibiotics, salts, dyes and heavy metals

LIPOPOLYSACCHARIDE (LPS) in outer membrane of Gm- bacteria, two parts:

Lipid A (p. 66) **endotoxin**, part of outer membrane, cell death releases
 Causes macrophages to release of **cytokines which cause:**
 fever & chills, vasodilation, weakness, gen. aches, shock, death.

O polysaccharide projects out, constitutes "O" antigen as in O157:H7 of pathogenic *E. coli*.

AGENTS AGAINST CELL WALLS:

- Lysozyme** (found in tears, etc) cuts polysaccharide
- Penicillin** inhibits synthesis, growing cells form protoplast, lyse

Mycoplasma lack a cell wall, cholesterol strengthens membrane

PLASMA MEMBRANE: (p 67)

- fluid mosaic model** 60% protein, 40% phospholipid,
- Mesosomes: invaginations of plasma membrane, form septum. DNA attached here incr absorb

Antiseptics which damage cell memb: Alcohols, quaternary ammonium compds, polymyxins

MOVEMENT ACROSS MEMBRANE: (p 69)

- Diffusion** movement of solute from high to low concentration
- Osmosis** (p 70) Diffusion of water across a semipermeable membrane from hypo to hypertonic region
- Hypertonic solutions act as preservatives: draw water out, cell collapses
- Facilitated diffusion, active transport** (p 69)

CYTOPLASM: Inclusions (stored nutrients), classification of which aid in classification:

- volutin: stored poly PO_4 (red with methylene blue, diagnostic of *Corynebacterium diphtheria*)
- metachromatic with methylene blue staining (variable staining)
- polysaccharide starch or glycogen, iodine shows as black/purple grains
- lipid: poly β -hydroxybutyric acid, sudan dyes shows (p 75).

