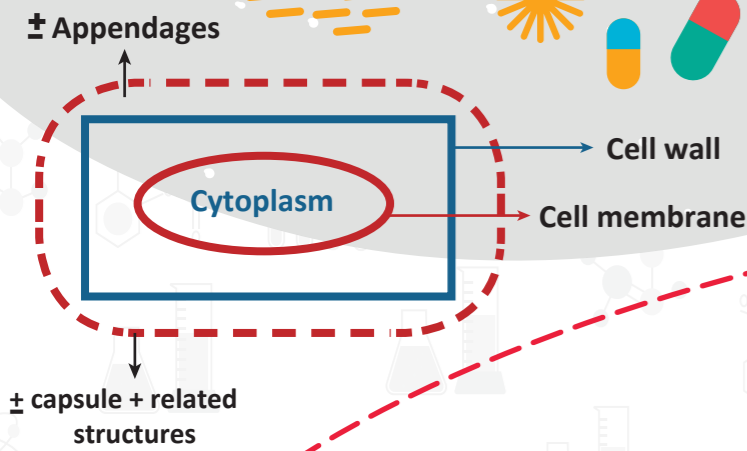


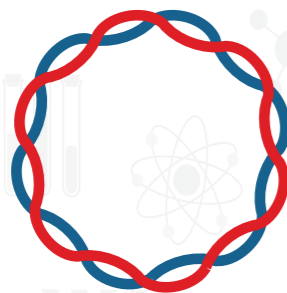
Bacterial ultra structure and their functions

By E/M



Cytoplasm

1 Nucleoid = Bact. chromosome
(Genetic information)



- Single circular dsDNA
- 1 mm → supercoiled

2 Inclusion granules

- Granules of nutrient materials (Energy reserve)
- Metachromatic or volutin granules
- PO₄
- Used for ATP synthesis

3 Plasmid

- Small circular extra chromosomal ds DNA
- Genes → not essential for life
- Replicate independent of the chromosome (Additional genetic information)

4 Mseosomes

- Cell membrane invagination
- Cell division and sporulation
- Membranous support for Resp. Enz. (As mitochondria in eukaryotes)

5 Ribosome

- Site of ptn synthesis
- Prokaryotes 70S
- Eukaryotes 80S
- ↓
- Difference make it selective target for ABs



Cell membrane

(Plasma membrane)
(Cytoplasmic membrane)

- Thin , • Elastic
 - P.L. protein bilayer
- As in eukaryotes except it lacks sterols (Except Mycoplasma)

Functions

1 Selective transport

- 1) Simple diffusion (No carrier, no energy)
- 2) Facilitated diffusion (Carrier only , no energy)
- 3) Active transport (Carrier, energy)

2 Respiration

- Contain resp. enz. (As mitochondria in eukaryotes)

3 Secretion of E.C. enz.

- Hydrolytic (Digestive) Large → Small subunits
- Destroy harmful chemicals (Penicillin degrading enz)

4 Cell wall synthesis

- Enz. → Cell wall synthesis
- Carrier lipids → Cell wall subunits are assembled

5 Reproduction

- Specific ptn attached to DNA → Separate duplicated chromosomes
- Septum formation

6 Chemotactic system

- Attractant and repellants
- ↓
- Specific receptor
- ↓
- Signal to cell interior
- ↓
- cell respond to surface message

General Micro (2)

Cell Wall

10-25 nm thick
Strong, Rigid, Complex

هدف

function

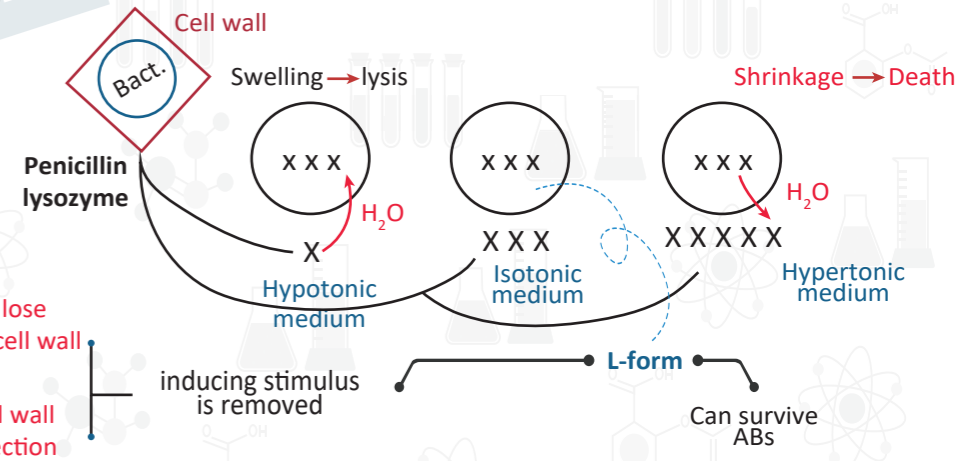
- Shape
- Protection #High osmotic pressure
- Cell division
- Stain of bact.

Wall Deficient bact.

- Mycoplasma**
only Naturally wall-less bact.
- No Defined Shape
- resist cell wall inhibitors (penicillins, Cephalosporins)

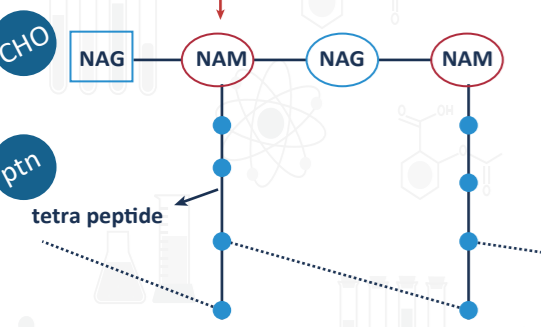
(Lister Institute in London)

L-forms



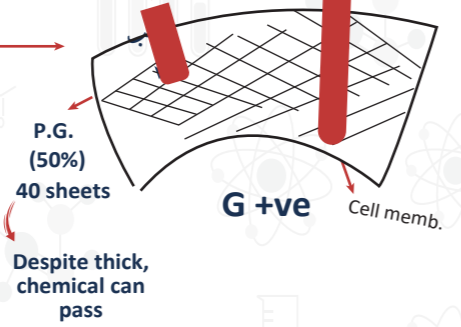
سبب

P.G. = muco peptide = murein

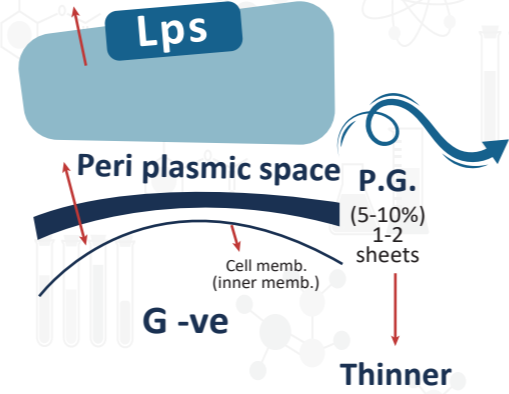


Teichoic acids

- Ribitol -P or Glycerol -P
- Ag



O.M. p.L. ptn bilayer
Lps Lipid A (endotoxin)
P.S. (O Ag = Somatic Ag)



- Space between O.M. and inner memb. (cell memb.)
- Contain P.G. gel-like solution of ptns

Capsule and related structures

Capsule

- L/M → well defined halo
- protection #phagocytosis (IMP. virulence factor)

Glyco calyx

- Loose meshwork of P.S. fibrils
- Attach to surfaces → establish infection
- e.g. Strept. mutans (Glycocalyx)
- Stick to tooth enamel
- Dental caries

Slime layer

- surface layer loosely distributed around the cell

Protect bact. # Antibact. agents (Bacteriophage, complement, lysozyme, colicins)

Bacterial Spore (endospore)

Vegetative bact.

unfav. env. condition

Die

Sporulation

endospore

-Bacillus
-Clostridium

Germination (15min.)

Highly resistant resting phase

Do not grow or reproduce
Absolute dormancy

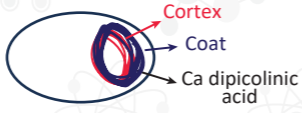
Moist heat
121°C for
10-20 min
to kill spores
(60°C to kill vegetative bact.)

Contain

- 1- Bact. ch.
- 2- Some Ribosomes
- 3- Other cytoplasmic materials needed for germination

Spore cell

Thick cortex
Thin tough coat



Marked resistance is due to

- 1- High content of Ca^{+2} and dipicolinic acid (unique to spore) → Thermal resistance
- 2- Thick cortex and coat → impermeable
- 3- Low H_2O content
- 4- Very low metabolic activity

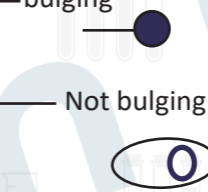
Formed in Vitro

Characteristic of the species

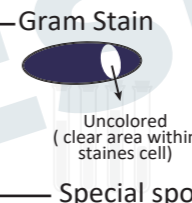
Help identification of bact.

Morphology

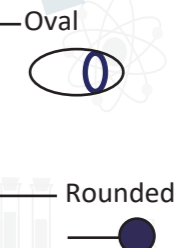
Size



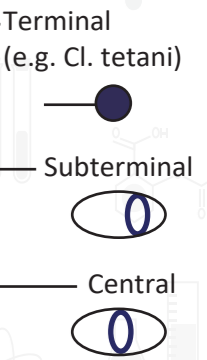
Stain



Shape



Site



Appendages

Axial Filaments (endo flagella)

- Spirochaetes move by axial filaments
- 2 groups of fibers from opposite ends of the cell and overlap in the middle

Flagella

- Larger, Thicker
- Seen by E/M
- Flagellin ptn (H Ag)
- Distribution

Pili

- Smaller, Thinner
- Seen by E/M
- Pilin ptn (not Ag)
- All around the cell (fimbriae)

Movement (Chemotaxis)

towards Nutrients
(-VE chemotaxis)
away from disinfectants

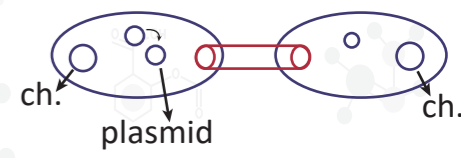
Function

Adherence to host cells:
(by fimbriae = Short pili)

- establish infection
- Virulence factor
- e.g N.gonorrhoea (adhere to urethral mucosa)

Conjugation (Adherence to other bacteria)

by sex pilus = F pilus "long"



Gene transfer from 1 bacteria to another by sex pilus

Monotrichous (single polar flag)

Lophotrichous (multiple polar flag)

Amphitrichous (single polar flag from each side)

Peritrichous (Flagella all around the bact.)