

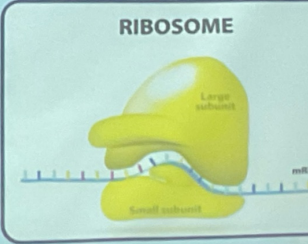
# Bacterial structure

1- Nucleoid

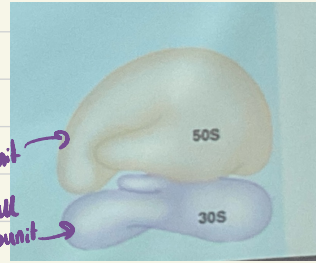
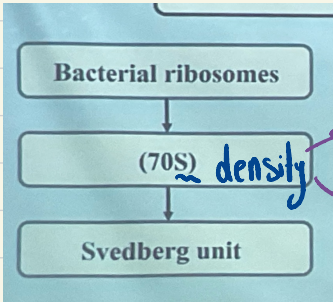
2- RNA

2) Ribosome

- 1 Ribo=RNA
- 2 Some=body
- 3 Site of Protein synthesis



The diagram shows a yellow ribosome with a larger 'Large subunit' and a smaller 'Small subunit'. A blue strand of mRNA is shown passing through the center of the ribosome.

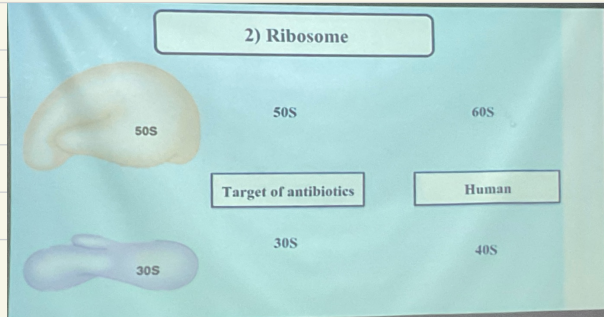


density ~ when two subunits comes together  
70S

some antibiotics target ribosomes

2) Ribosome

50S	50S	60S
30S	30S	40S
Target of antibiotics		Human



The diagram compares bacterial and human ribosomes. On the left, bacterial subunits are shown: 50S (large) and 30S (small). On the right, human subunits are shown: 60S (large) and 40S (small). A box labeled 'Target of antibiotics' is placed between the bacterial subunits, and a box labeled 'Human' is placed between the human subunits.

### 3) Inclusion granules

store of nutrients

#### Store of nutrient

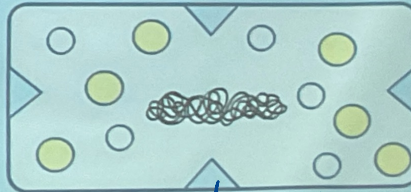
- 1- Glycogen
- 2- Starch
- 3- Phosphate

Volutin granule  
(Metachromatic granules)



### A) Definition of the cell membrane

Thin, fragile membrane  
located just  
inside the cell wall

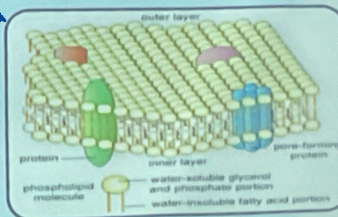


mesosome  
Essential

### B) Composition of cell membrane

Phospholipid bilayer  
+ Protein  
(No sterols)

Except *Mycoplasma*



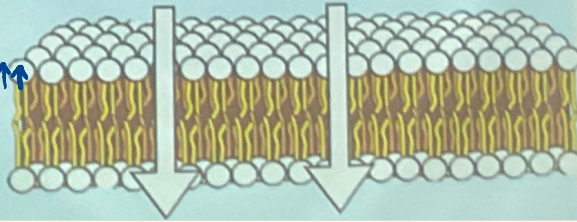
C) Function of the cell membrane

1

Selective transport

(Passive)

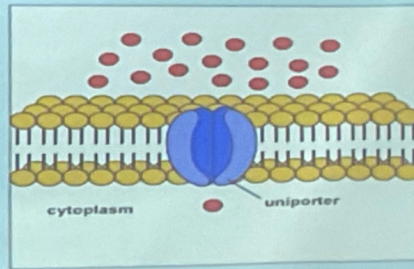
concentration outside ↑



C) Function of the cell membrane

1

Selective transport (Active)



C) Function of the cell membrane

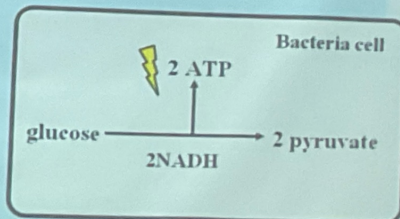
2

Mesosomes

Respiration enzyme

(Making energy)

(Like Mitochondria)



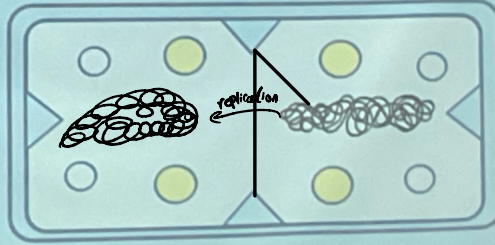
### C) Function of the cell membrane

2

Cell division

Separate DNA

Septal mesosome

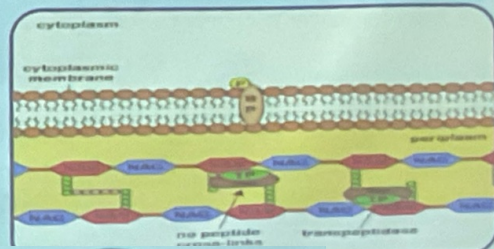


### C) Function of the cell membrane

3

Biosynthesis of cell wall

Blocking units, Building units → cell walls



4

Excretion of extracellular enzymes

(Hydrolytic enzymes)

(penicillinase) → protection of antibiotics

Enzymes digest

Penetrate cell membrane

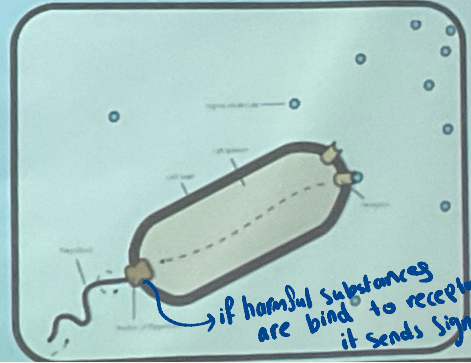
Large food

### C) Function of the cell membrane

only with cells with flagella

6

### Chemotactic system



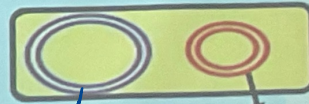
if harmful substances are bind to receptors it sends signals to flagella to go away

### V) Plasmid

EXTRA chromosomal dsDNA

not bacterial chromosome

- 1 Replicate autonomously (Independent of bacterial chromosome)
- 2 Toxin production      Drug resistance



Bacterial chromosome  
growth & survival

Plasmid → carries genetic material → characteristics of bacteria  
↓  
Toxin production  
Drug resistance

# Objectives

## Cell wall

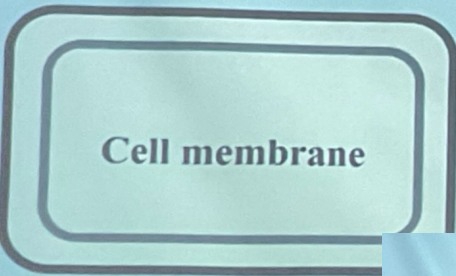
- \* Definition
- \* Composition
- \* Function
- \* Cell wall Deficient

### I) Definition of cell wall

Outermost layer!!! *not exactly accurate because some bacteria have capsules*

Surrounds the cell membrane

Rigid

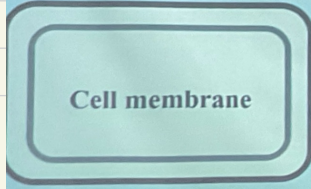


A diagram showing a cell membrane as an inner rounded rectangle and a cell wall as an outer rounded rectangle surrounding it.

Cell membrane

### II) Composition of cell wall

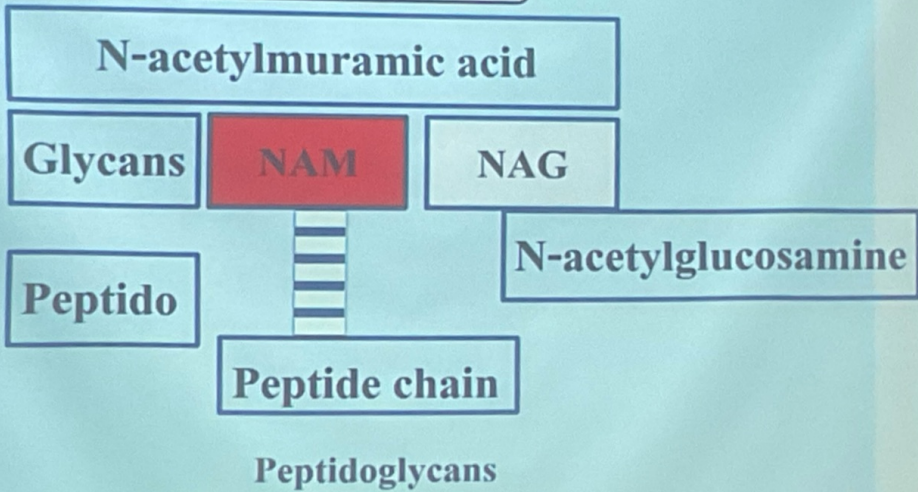
Rigidity  
(Peptidoglycan)



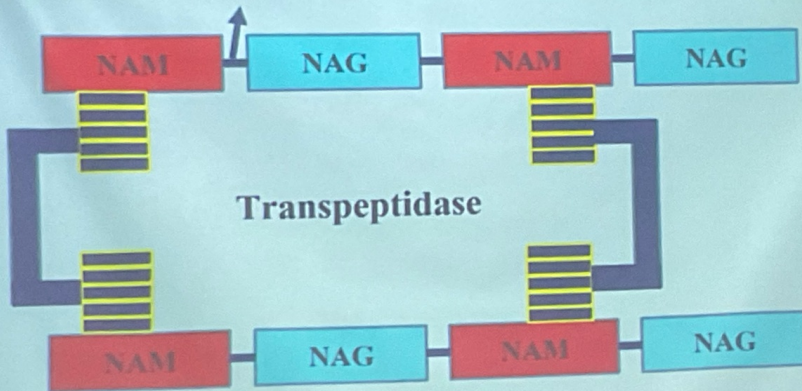
A diagram showing a single rounded rectangle representing the cell membrane.

Cell membrane

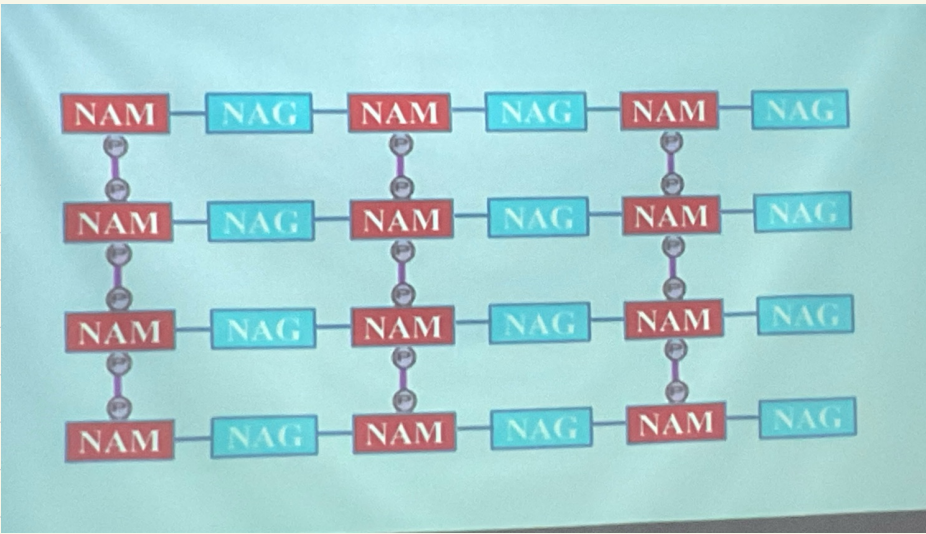
## II) Composition



### Glycosidic bond (Transglycosidase) Alternating repeating unit



antibodies work on cells being replicated

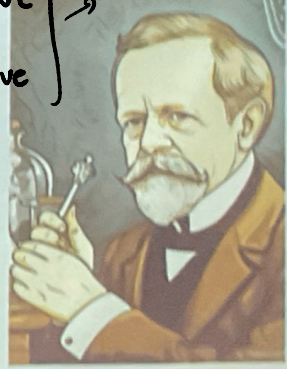


**Gram scientist**

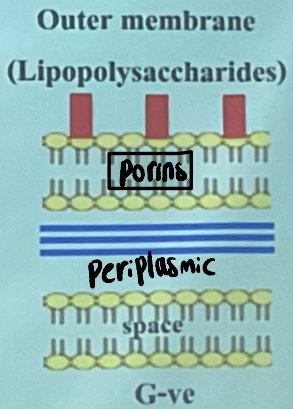
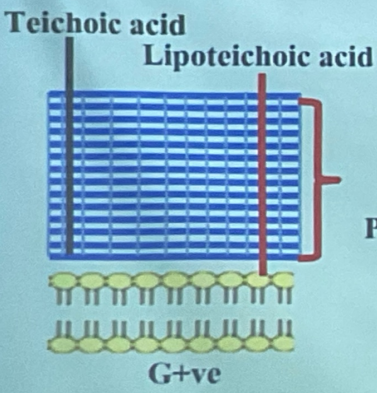
Bacteria are either Type → Gram +ve  
 → Gram -ve

A cartoon illustration of a scientist with a large mustache and glasses, wearing a lab coat. He is looking through a microscope. To his right, there is a cluster of purple, rod-shaped bacteria.

differences in cell wall composition



**Gram positive/negative bacteria**





## Composition of Gram positive

Polymers of glycerol or

Rbitol

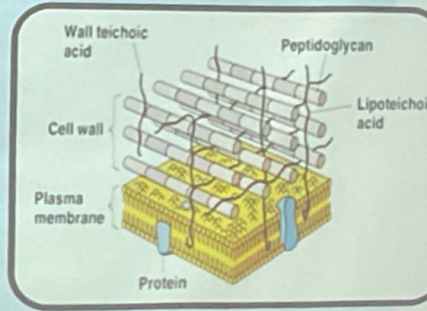
Lipoteichoic acid

(Cell membrane)

Teichoic acid

(Cell wall)

### 2) Teichoic acid



## Composition of Gram positive

Major surface Ag of G+ve

(Highly immunogenic)

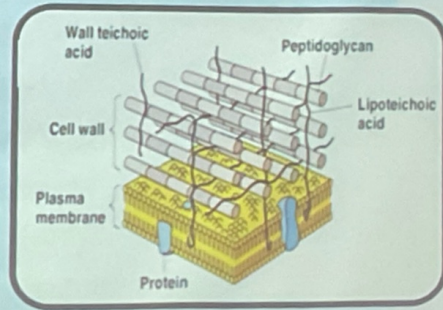
يسبب  
immune response

[TNF- $\alpha$   
IL-1]

cytokines released

\*Toxic Shots\*

### 2) Teichoic acid



## Composition of Gram negative

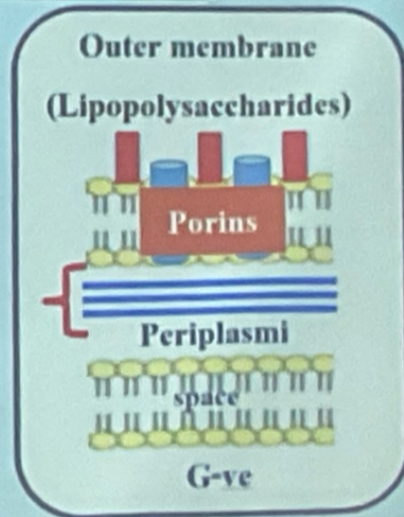
### 1) Peptidoglycan

A thin layer (5%)

2 sheets of

(NMA & NGA)

Peptides



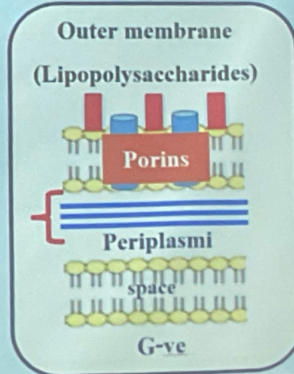
### 2) Outer membrane

A) Bilayer phospholipids

B) Lipopolysaccharides

Lipid A  
(Endotoxin)

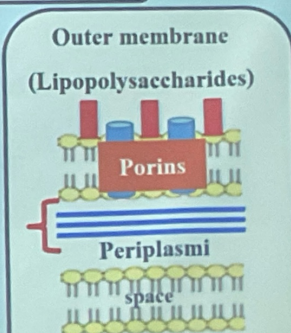
Polysaccharides  
(somatic O Ag)



### 2) Outer membrane

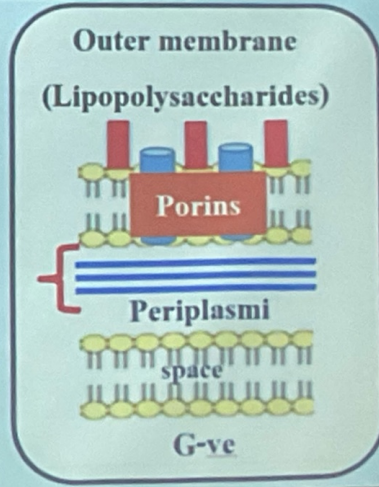
C) Porins

(hydrophilic Protein)  
in the outer membrane  
(Transportation)

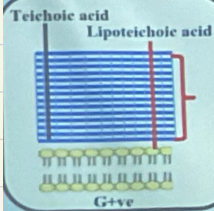


### 3) Periplasmic space

Space between cytoplasmic & outer membrane  
Peptidoglycan layer & gel-like protein



### Gram positive/Negative bacteria



1) Peptidoglycan

Thick

2) Teichoic acid/  
Lipoteichoic acid

Yes

3) Outer membrane

No

1) Peptidoglycan

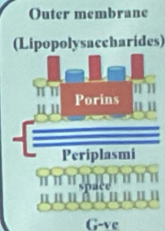
Thin

2) Teichoic acid/  
Lipoteichoic acid

No

3) Outer membrane

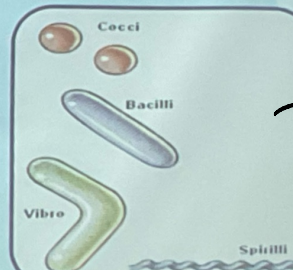
Yes



### Function of cell wall

1

Maintenance of the shape (Rigid)

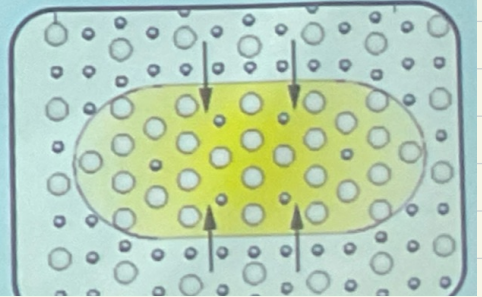


shape → Because of cell wall

## Function of cell wall

2

**Protection**  
(Osmosis insensitive)



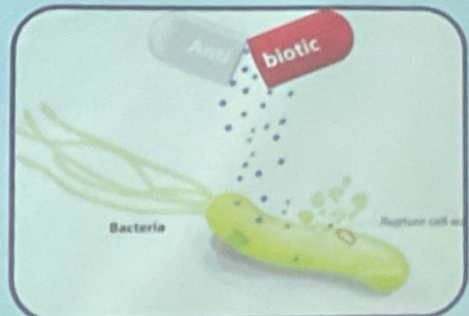
## Function of cell wall

3

**Target site for antibiotics**

**Penicillin**

**Cephalosporines**

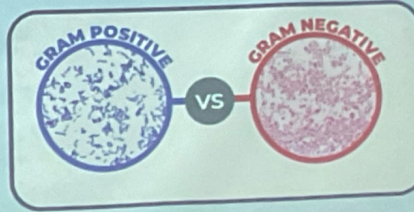


4- division

## Function of cell wall

5

Responsible  
for staining



Primary stain ← \* crystal violet

fixation ← \* iodine

critical step ← \* acetone - 90% alcohol  
decolorization

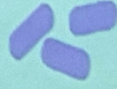
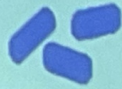
\* safranin

washing  
Between steps

## Function of cell wall

### Responsible for staining

G+ve



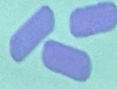
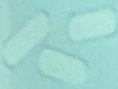
→ Thick layer protection

Fixation

Crystal violet

Iodine

Acetone



G-ve

## Function of cell wall

### Responsible for staining

G+ve



→ already purple did not change

Fixation

Crystal violet

Iodine

Acetone

Counter stain



G-ve

## Function of cell wall

Bacteria without cell wall

Cell membrane

## V) Cell wall Deficient

1) Naturally

2) Induced

**Mycoplasma**  
(Sterol)

**Cell wall inhibitors**  
**Lysozyme**

## 2) Induced

**Completely**

**Partially**

**Cell**  
**membrane**

**Cell**  
**membrane**

**Protoplast (+ve)**

**Spheroplast (-ve)**

**L-form bacteria**

**L-form & Mycoplasma**

**Resist to Penicillin &  
Cephalosporines**

