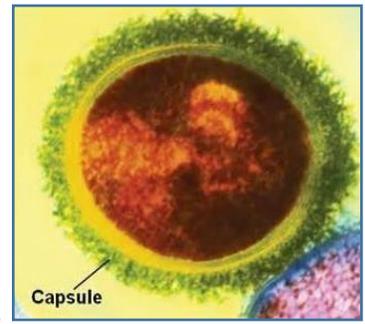


Structures external to the cytoplasmic membrane:

• Capsules

- its mesh or network of fine strands.
- It divided into two groups:



a. Macrocapsule: It is about **0.2µm** thick /can be seen under **LM**.

b. Microcapsule: **can't** be seen under **LM** /can be **demonstrated immunologically**.

- made up of di or polysaccharide or polypeptide.
- The polysaccharide may homo or hetero.
- Functions : protection against temporary drying by binding water molecules /antiphagocytic.

• Lipopolysacch(LPS)

Lipopolysacch h (LPS)

composed of 3
covalently linked
parts :

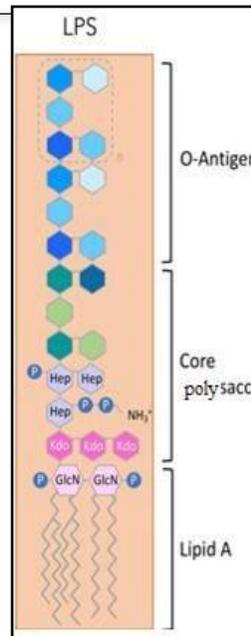
3. **O-antigens** : which extend like whiskers from the membrane surface into the surrounding medium.
fun : Protection from host defenses.

2. **Core polysaccharide**: located at the membrane surface
fun: Contributes to (-) charge on cell surface .

1. **Lipid A** : firmly embedded in the membrane.

fun: stabilize outer membrane structure /endotoxin.

• Lipid A released when cells lyse .



To remember the difference in the cell wall of **Gram positive** and **negative bacteria**

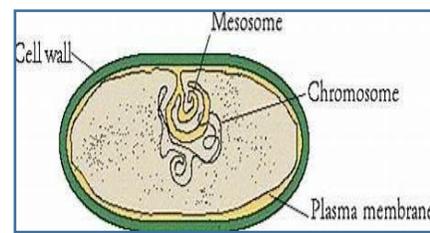
Lipopolysaccharide	P	Positive
Outer membrane	P	Peptidoglycan (thick)
Negative	T	Teichoic acid
Gram?		



Pathogenic effect of LPS:

- **systemic effects** :Fever, coagulation, Weakness, Diarrhea, Inflammation, Intestinal Hemorrhage, Fibrinolysis.
- Activating white cells, especially **macrophages and monocytes**.

structures enternal to the Cell Wall:

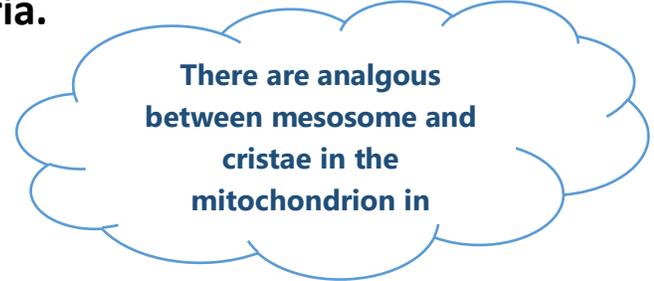


Cytoplasmic Membrane:

- below the cell wall.
- Similar in both gram + ve and -ve bacteria.

Mesosomes:

- increase the surface area of the cell.
- aiding the cell in cellular respiration.



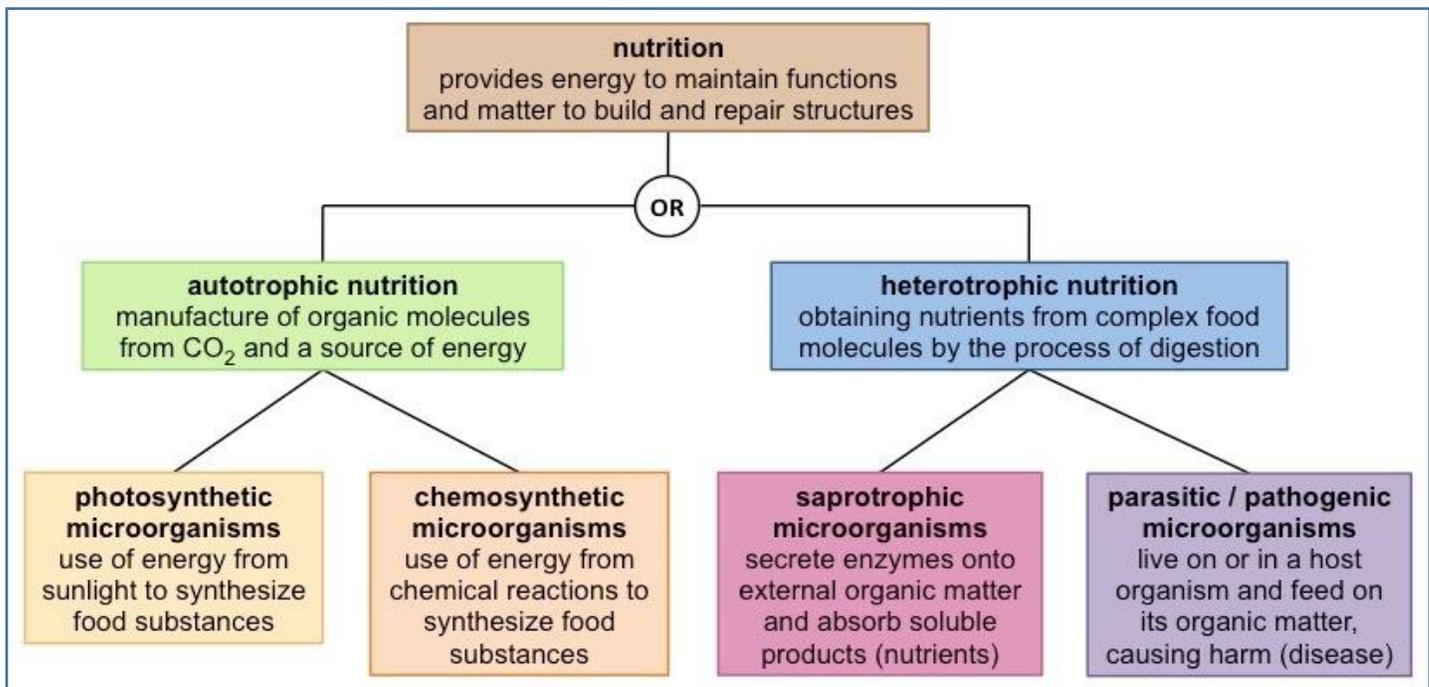
Inclusion Bodies:

- Granules of organic or inorganic that are stocked in cell for future use.

Episome vs. Plasmid:

- two types of DNA elements which exist independently of the genome.
- The main difference between them plasmid does not integrate into the genome, but episome can integrate into the genome.

Microbial nutrition



methods of Reproduction in bacteria

Vegetative reproduction (asexual):

- Budding
- Cyst.
- Gonidia or segmentation.
- Endospore formation.
- Binary fission.**

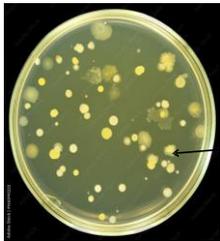
Sexual reproduction:

1. transformation.
2. Bacterial transduction.
3. Bacterial conjugation.

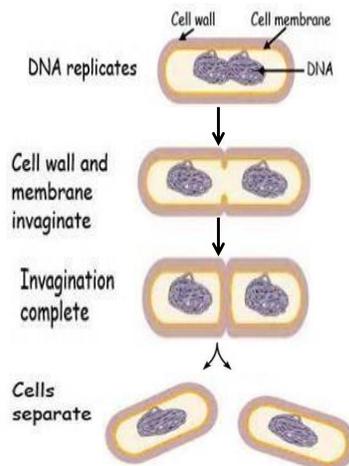
- # its most common.
- # **Bacilli and spiral** divide along the longitudinal axis but **coccus** division can be on any axis.
- # it occurs in following steps:
Division of **nuclear or genetic material** then Division of **cytoplasm and septum formation**.
- # Under favourable conditions it completed within **18-20 minutes**.
- # survival rate of bacteria in nature is only 1 %.

Result of microbial growth is

discrete colony (an aggregation of cells arising from single parent cell).



Bacterial colony



Bacterial growth is inhibited due to reasons :

- ✓ Lack of : space, food, water, oxygen, other salts and accumulation of own harmful waste products.
- ✓ Environmental factors as light, temperature, moisture.

The Four Stages of Bacterial Growth

1. Lag Phase

An adjustment period when the bacteria are switching on or off different machinery necessary to break down the energy source within the immediate environment.

2. Log Phase

Rapid growth of bacteria at an accelerated pace.

3. Stationary Phase

Equal rate of growth and death so that overall bacterial numbers stay the same.

4. Death Phase

Rapid cell death usually due to the cells bursting open, also known as cell lysis.

PHASES of the population growth curve

