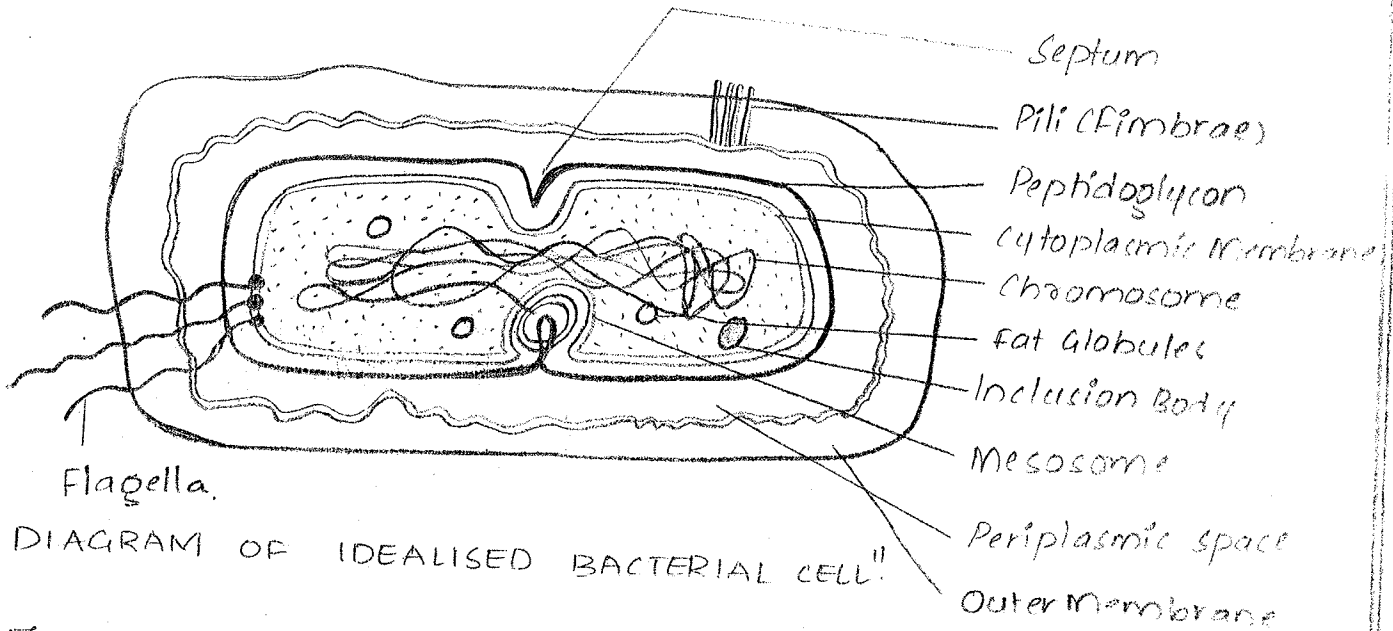


1. Prokaryotes Versus Eukaryotes

Features:	PROKARYOTES	EUKARYOTES
Meaning :	Pro = Before karyo = Nucleus	Eu = True karyo = Nucleus
Size of the cell :	1-4 μm	5 μm
Cell wall is made of :	Peptidoglycon	Chitin (Fungi) cellulose (Plants)
Flagella :	Present	Absent
Ribosomes :	70S with 50S and 30S subunits	80S with 60S and 40S subunits
Histones :	Absent in chromosomes	Present in chromosomes (Mitochondria)
Nucleolus :	Lacks a well developed Nucleolus	A well developed Nucleolus is present with Nuclear membrane
Mitochondria :	Absent	Present
Chloroplast :	Absent	Present in Plant Cells
Endoplasmic Reticulum :	Absent	Present
Golgi complex :	Absent	Present
Lysosomes :	Absent	Present
Centriole :	Present	Present
Mesosomes :	Present	Absent
Pinocytes :	Absent	Present
Gas Vacuoles :	Present	Absent
Nitrogen Fixation :	Present	Absent
DNA :	Single (or) Double standard	Double standard Circular (or) linear

Cytoplasm	Absent	Present
Unicellular (or) Multicellular	Unicellular in Bacteria	Unicellular in Yeast Multicellular in Plant cells
Examples:	Bacteria	Fungi, Plant cells

2 * BACTERIAL CELL STRUCTURE



"DIAGRAM OF IDEALISED BACTERIAL CELL"

⇒ The outer layer or cell envelope of a typical cell consists of 2 compartments . i) Rigid cell wall

ii) Cytoplasmic (or) Plasma membrane

⇒ The envelope (cell) encloses the protoplasm that includes the cytoplasm, vacuoles, granules etc.

⇒ The cells may be enclosed in a viscous layer, which may be a loose slime layer (or) organised as a capsule. Some

⇒ Some carry filamentous appendages protruding through the cell surface like flagella, fimbriae that acts as the organs of locomotion, adhesion etc.

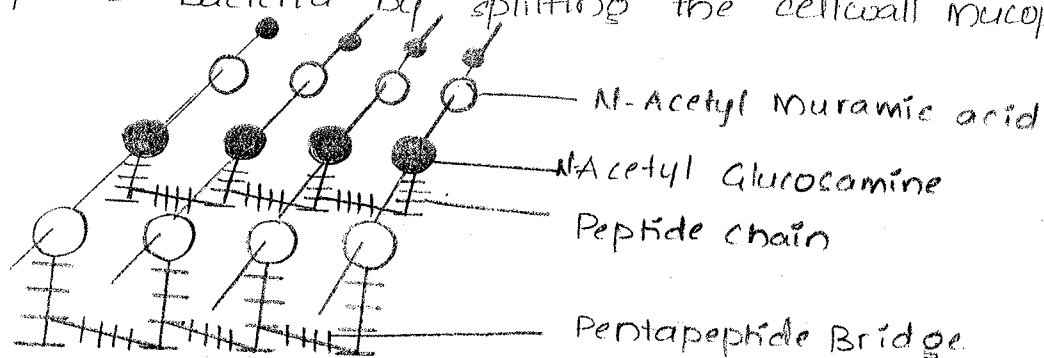
CELL WALLS

Cell wall accounts for shape, rigidity, ductility. It is demonstrated by Plasmolysis i.e., when placed in hypertonic solution, the cytoplasm loses water by osmosis and shrinks, while the cell wall remains. It can be demonstrated by Microdissection, Reaction with specific antibodies, mechanical rupture of cell & differential staining procedure. Bacterial cell walls are about 10-25 μm thick and 20-30% of the dry weight of the cells. Chemically the cell wall is composed of muropeptide scaffolding formed by N-acetyl glucosamine and N-acetyl muramic acid molecules in chains which are cross-linked by peptide chains.

	Gram-Positive	Gram-Negative
(i) thickness	Thicker	Thinner
(ii) variety of Amino acids	Few	Several
(iii) Aromatic & sulphur containing Amino acids.	Absent	Present
(iv) Lipids	Absent / scant	Present
(v) Teichoic acid.	Present	Absent

Gram-Negative has lipopolysaccharides on the cell walls for their endotoxic activity & O antigen specificity on Bovine Antigen.

Cell wall synthesis may be inhibited by many factors. Lysozyme, an enzyme normally present in many tissues fluids, lyses susceptible bacteria by splitting the cell wall muropeptide link.



Stime has little affinity with basic dyes & is not visible in smears of gram stain.

FLAGELLA: Organ of locomotion; 30-20 μm long, 0.1-0.013 μm width

⇒ Motile Bacteria except Spirochetes, possess one (or) more unbranched, long, sinuous filaments called flagella.

⇒ each flagella consists of three distinct parts:

i) Filament: External to the cell & connected to hook at cell surface.

ii) Hook & iii) Basal Body: Are embedded in cell envelope and are antigenically different.

⇒ The presence (or) absence of flagella and their number and arrangement of characteristic of different genera of bacteria.

⇒ Flagella may be arranged all around the cell - Peritrichous

Ex: Typhoid Bacilli

⇒ Flagella may be present at one (or) both ends - Polar

Ex: Monotrichous - Cholera vibrios - moves as fast as 200 $\mu\text{m}/\text{sec}$

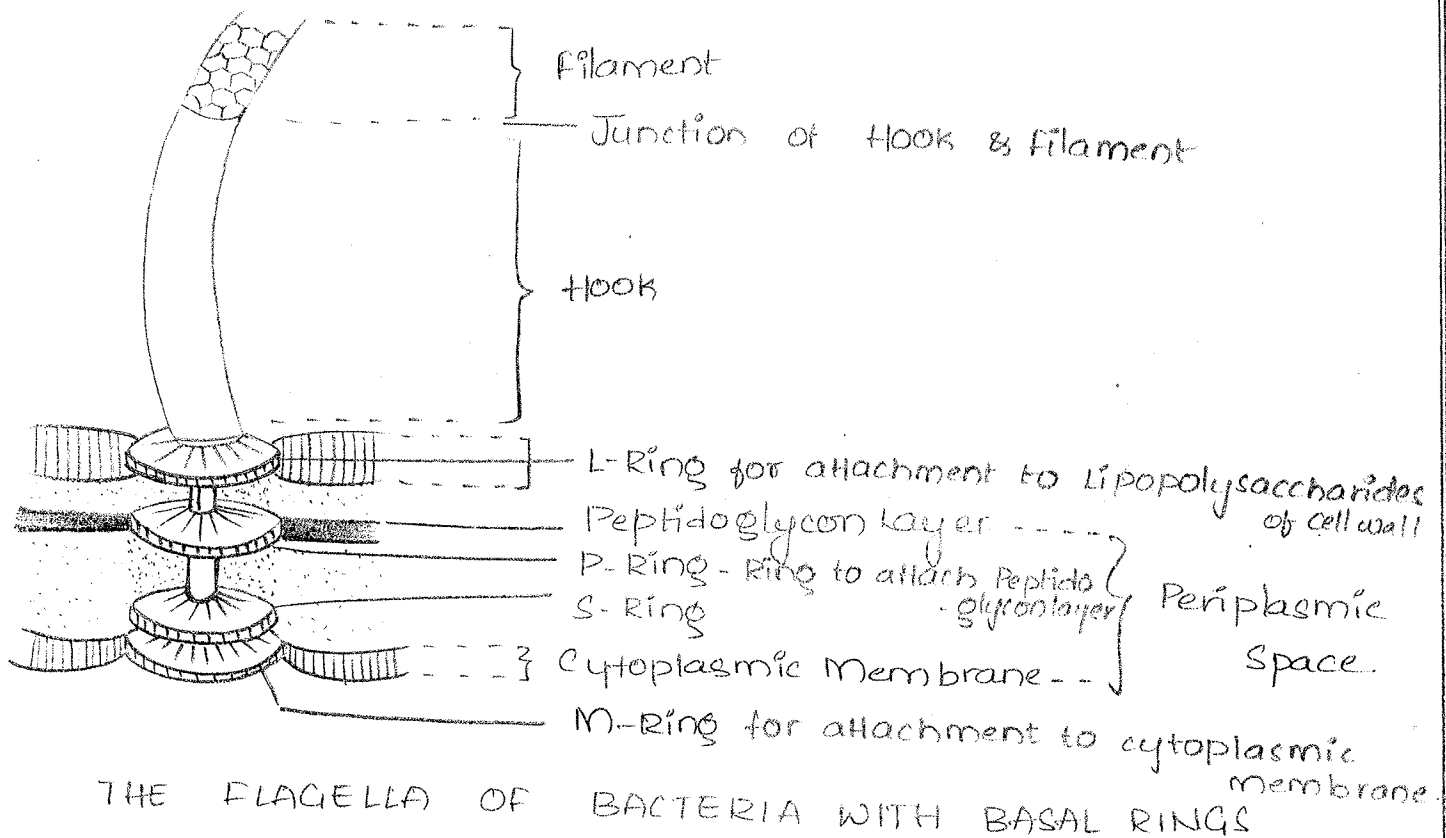
(Tufts) Lophotrichous - spirilla

Amphitrichous (at both ends) and Peritrichous

FIMBRAE: They are very fine, hair-like surface appendages also called Pili, generally seen in gram -ve bacteria. They are shorter & thinner than flagella (0.5 μm long & 10 nm thick). Pili are seen in both mobile and non-mobile cells. They are originated from cell membrane as self-aggregating monomers - Pilin. They are the organs of adhesion i.e., may serve to anchor the bacteria in nutritionally favourable env. Pili are antigenic (employed for serological tests)

* A special type of sex Pili - bound in male bacteria to attach to ♀
Pili are classified (F, I) based on susceptibility to specific Bacteriophage

Fimbriated cells ex: E. coli, Klebsiella - show haemagglutination



THE FLAGELLA OF BACTERIA WITH BASAL RINGS

MONOTRICHOUS: Presence of only one flagella ~~bacteria~~ only at any one end of the Bacterium.

EX: Pseudomonas Aeruginosa, Cholera Vibrios.



LOPHOTRICHOUS: Presence of tufts of flagella at any one end of the Bacterium

EX: Pseudomonas fluorescens, Spirilla.



AMPHITRICHOUS: Presence of tufts of flagella of bacteria at two opposite ends of the Bacterium.

EX: Aquaspirillum serpens,



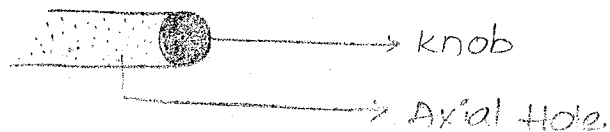
PERITRICHOUS: Presence of flagella ~~bacteria~~ all over the surface of the bacteria.

EX: Salmonella Typhi.



EXTRA INFORMATION ABOUT FIMBRAE:

- * Fimbriae function as organs of Adhesion, helping the cells to adhere firmly. This property may serve to anchor the bacteria in nutritionally favourable micro environment. Fimbriated bacteria form surface pellicles in liquid media.
- * Many fimbriated cells agglutinate Red Blood cells of Guinea pigs, fowls, horses, pigs, Human and Sheep cells, scarcely ox cells.
- * Haemagglutination provides a simple method for detecting the presence of such fimbriae (Mannose sensitive)
- * Pili are classified into various types based on susceptibility to specific Bacteriophages: Like F, I
- * Two types of Pili are
 - i) Common Pili
 - ii) Sex Pili.



" FIMBRAE "