

4. Structure and Function

External Structures

- Learning objectives
 - To give a brief overview of key prokaryotic external structures

4.1. Capsules, slime layers, S-layers

- Layers of material outside of CW
 - Extracellular polymeric substances (EPS)
- Types
- Functions?

Glycocalyx

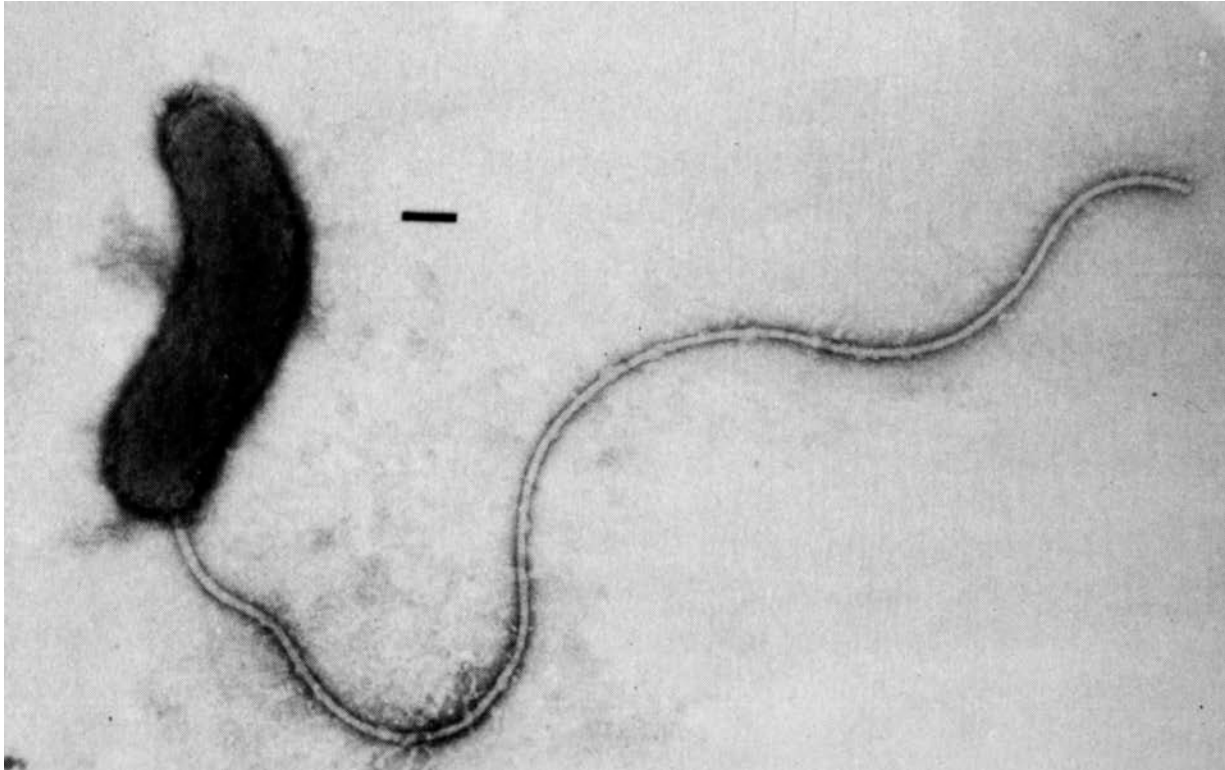
- “Network of polysaccharides extending from surface of bacterial cell”
 - thus, which structures?

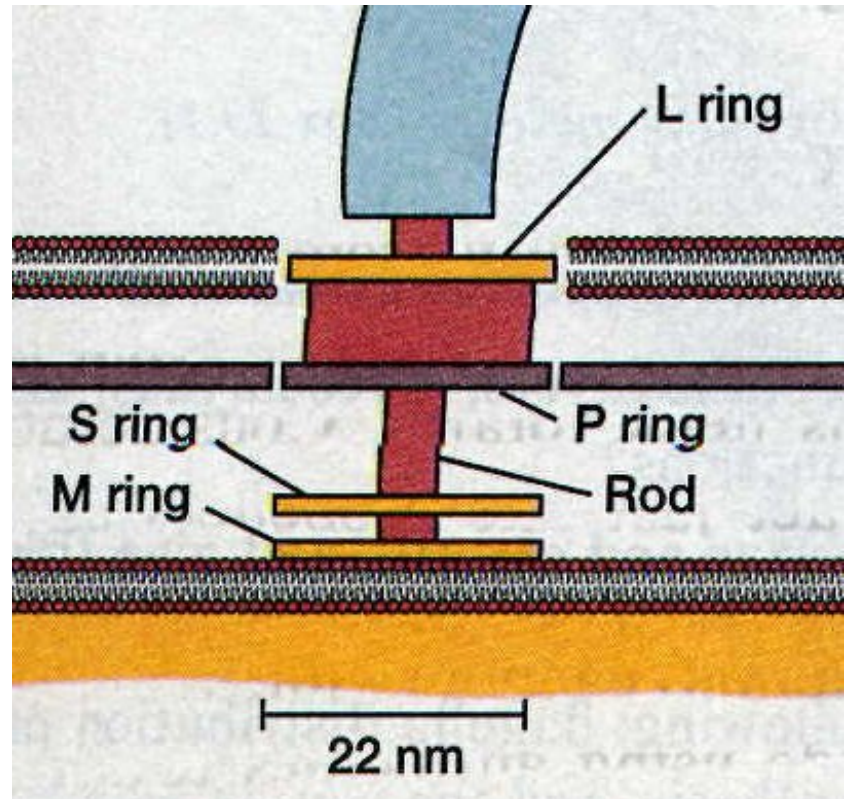
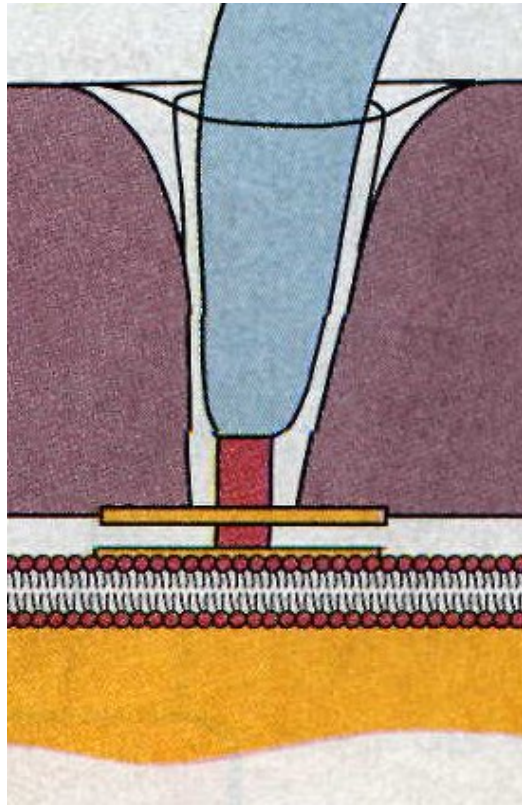
4.2. Pili (and fimbriae)

- Filamentous appendages
 - Def: non-flagellar, proteinaceous, multi-subunit surface appendages that are involved in adhesion to other bacteria, host cells or environmental surfaces
- Pili (fimbriae)
 - Peritrichous or polar
 - Types:
 - Type I and P-pili
 - Curli pili
 - Type IV
- Pilus (sex pilus: pilin protein) → conjugation

4.3. Flagella

- Structure
 - Outside cell?
 - Inside the cell / Attachment?
- Mechanism of movement?
- Efficiency?





Mechanism of Movement

- How determine?
- Speed/Efficiency?

Structure and Function

Internal Structures

- Learning objectives
 - To give a brief overview of key prokaryotic internal structures

4.4. Nucleoid

- Irregular shaped dense region containing the prokaryotic DNA
- Single, circular dsDNA molecule

4.5. Inclusion bodies

- Reserve deposits
- Store

- **Gas Vacuoles**

- Found in

- Why have these?

4.6. Ribosomes

- Smaller than Eukaryotic
 - Subunits:
 - 70S (Svedburg unit)
 - 50S
 - » 5S rRNA and 23S rRNA
 - 30S
 - » 16S rRNA

4.7. Intracytoplasmic membranes

- What are they?
- Origin?
- Why have ICMs?

- **e.g. nitrifying bacteria**
 - Why have ICMs?

Table 3.1 **Functions of Prokaryotic Structures**

Plasma membrane	Selectively permeable barrier, mechanical boundary of cell, nutrient and waste transport, location of many metabolic processes (respiration, photosynthesis), detection of environmental cues for chemotaxis
Gas vacuole	Buoyancy for floating in aquatic environments
Ribosomes	Protein synthesis
Inclusion bodies	Storage of carbon, phosphate, and other substances
Nucleoid	Localization of genetic material (DNA)
Periplasmic space	Contains hydrolytic enzymes and binding proteins for nutrient processing and uptake
Cell wall	Gives prokaryotes shape and protection from osmotic stress
Capsules and slime layers	Resistance to phagocytosis, adherence to surfaces
Fimbriae and pili	Attachment to surfaces, bacterial mating
Flagella	Movement
Endospore	Survival under harsh environmental conditions