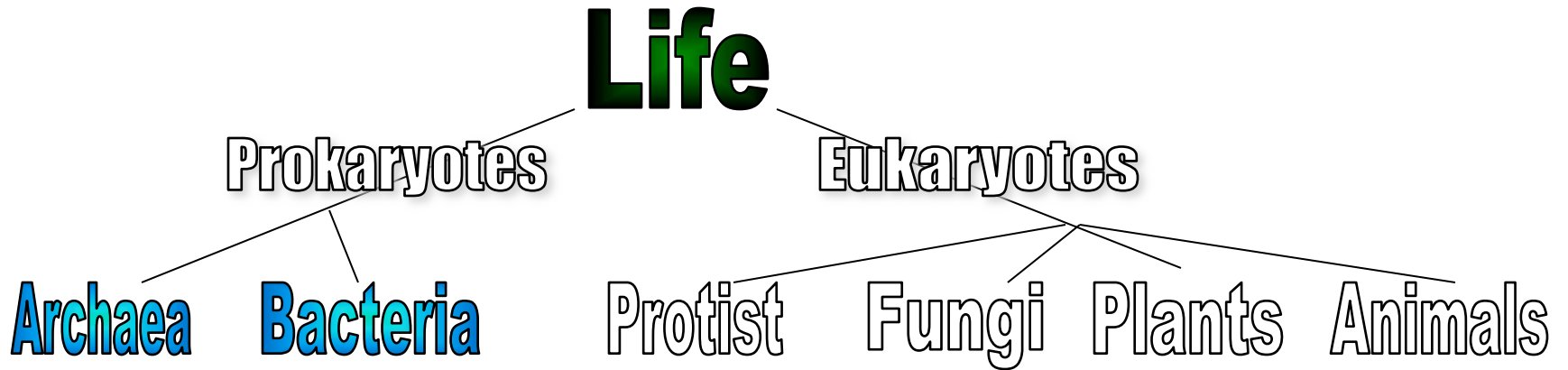


Bacteria vs. Archaea

Bacteria vs. Archaea



I) Classification of Bacteria and Archaea

A) Classification based on shape

1) 3 shapes:

a) Cocci = spherical

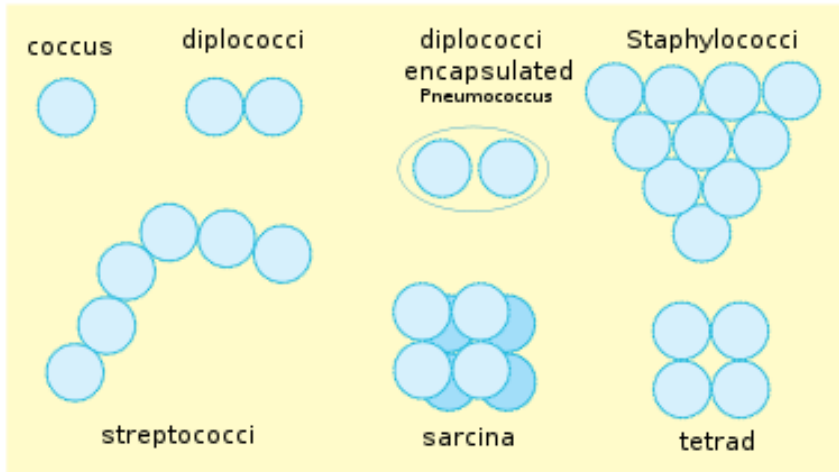
b) Bacilli = rods

c) Spirilli = spirals

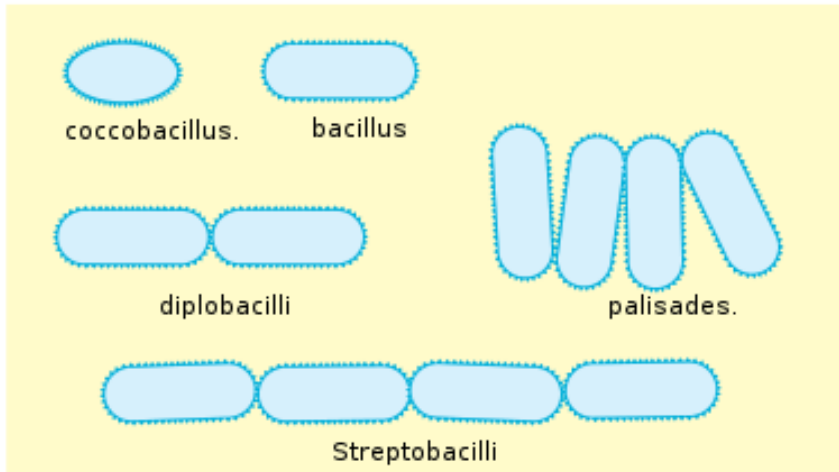
2) Aggregation:

a) tendency to group together

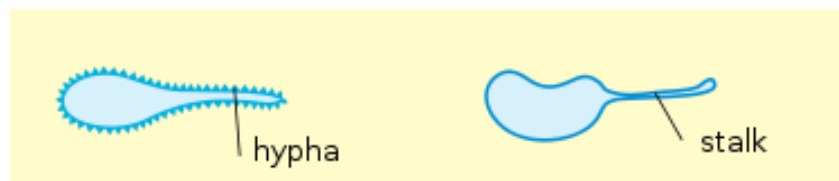
Cocci



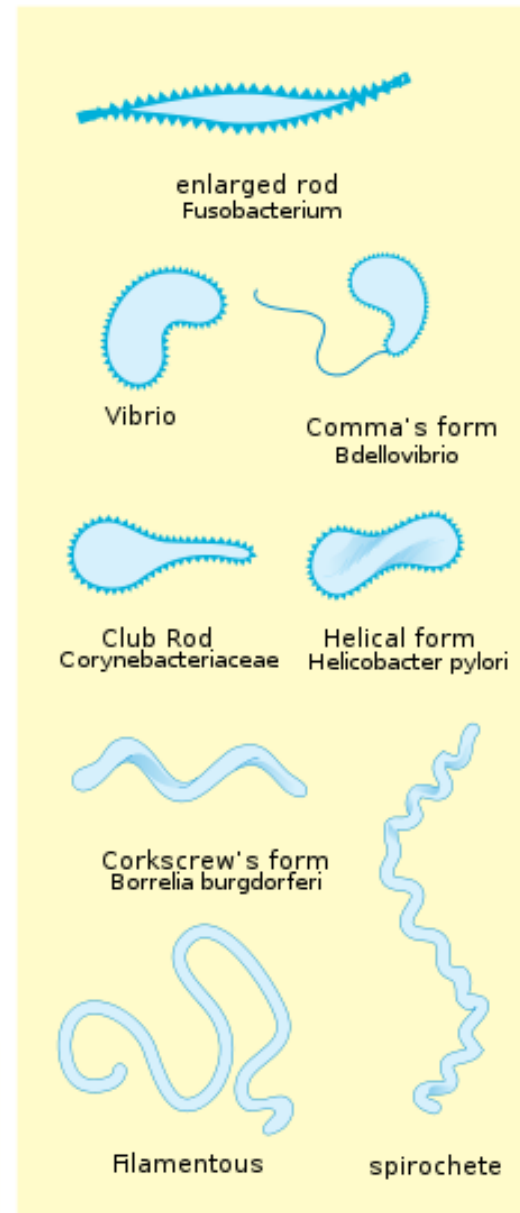
Bacilli

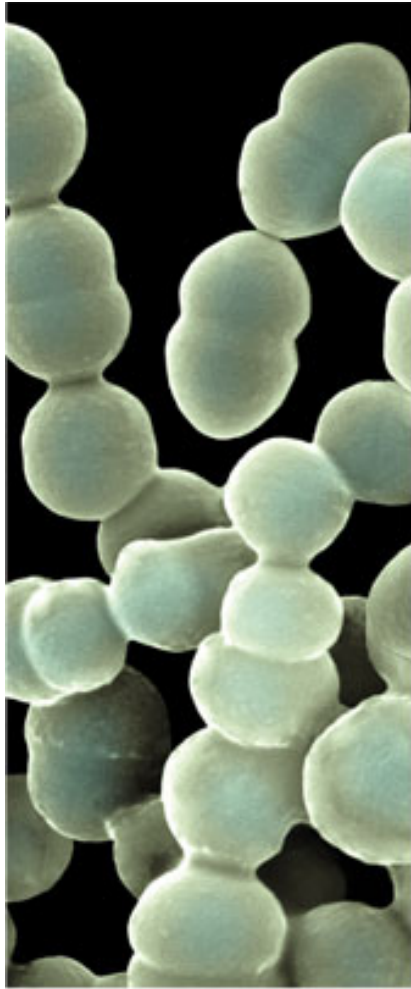


Budding and appendaged bacteria



Others





1 μm

(a) Spherical (cocci)



2 μm

(b) Rod-shaped (bacilli)



5 μm

(c) Spiral

B) Classification based on the cell wall

1) Peptidoglycan

- a) Chain-link combination of alternating amino acids and sugars
- b) Gives rigidity to the cell wall

2) Link to Penicillin

- a) Penicillin affects the final formation of peptidoglycan
 - i) binds to the molecule and stops the cell wall construction (destroying the bacteria)

3) The importance of the Gram Stain

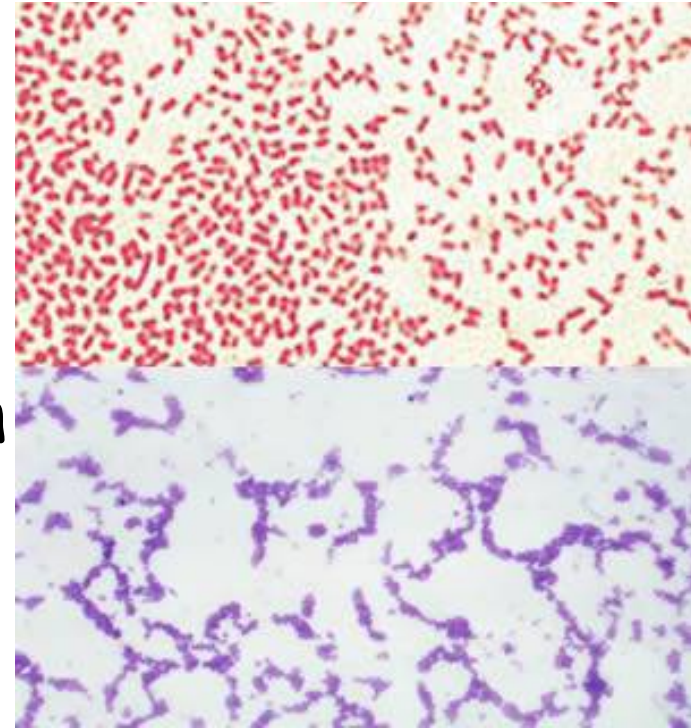
a) Bacteria only

i) Pink stain

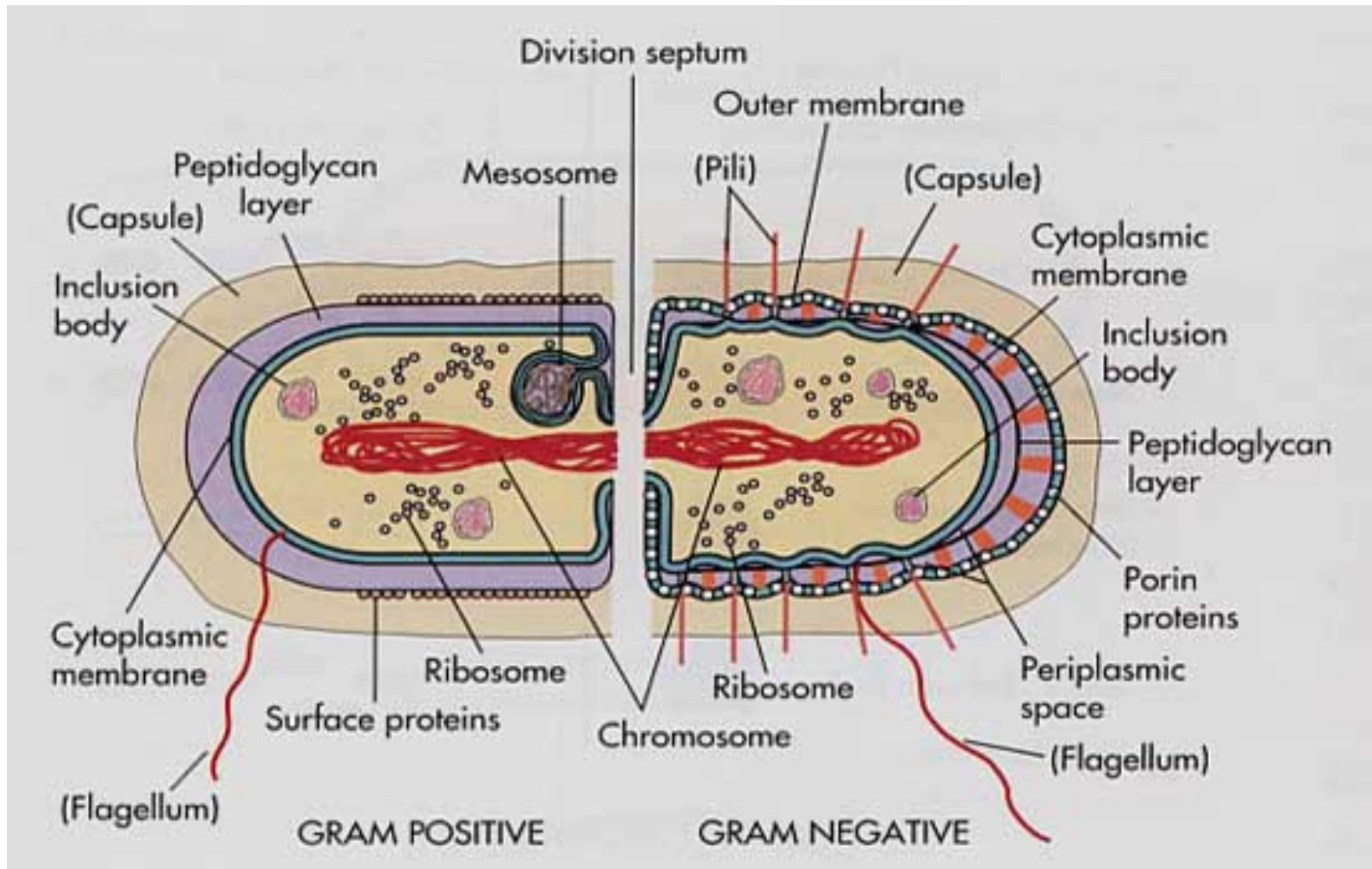
- Gram -
 - Majority of bacteria
 - Thin protein layer on their cell wall

ii) Purple stain

- Gram +
 - Thick protein layer on their cell wall



b) Information used in determining which antibiotics to use.



C) Classification based on nutrition

1) some bacteria use photosynthesis

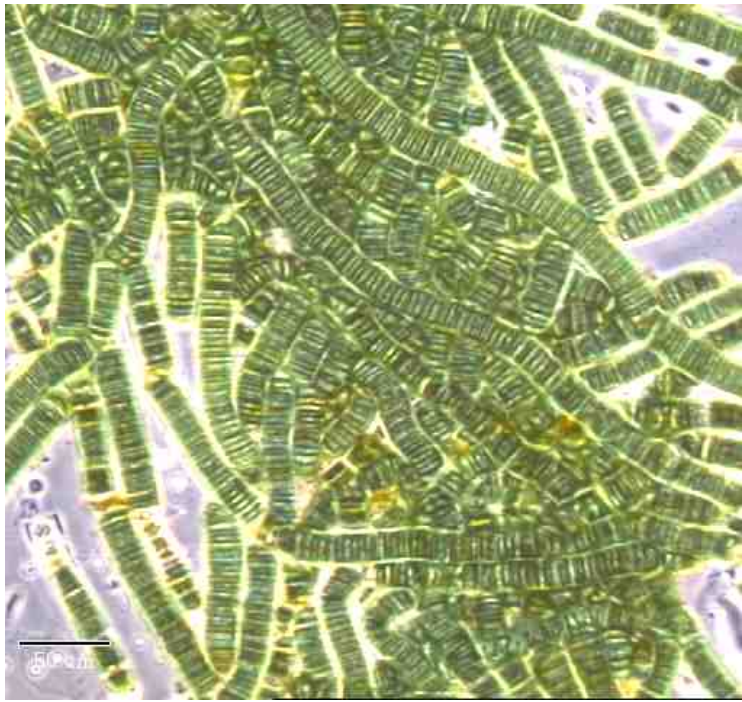
a) ex. Cyanobacteria (blue-green algae)

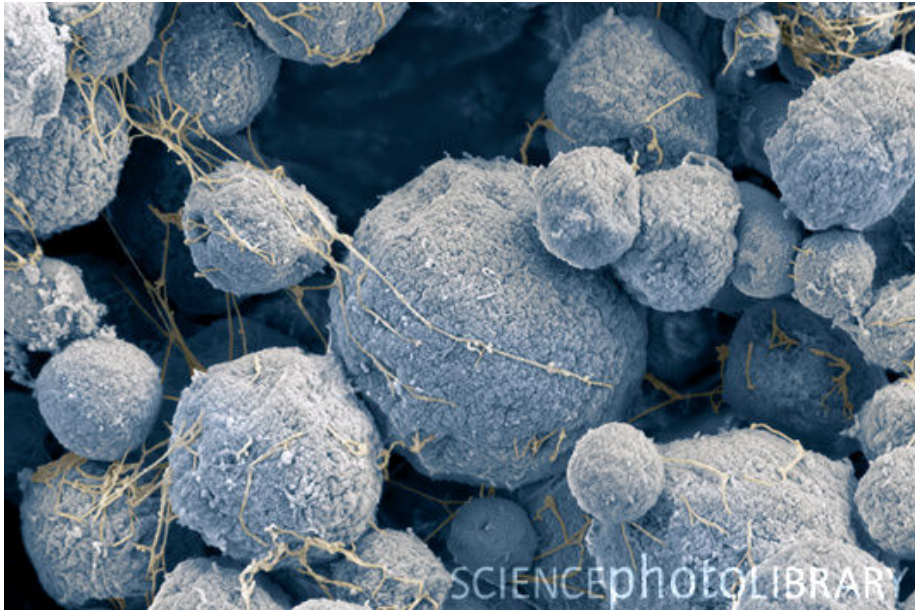
2) archaea produce methane (methanogenesis)

a) ex. digestive tract of cows

3) both heterotrophs

a) decomposers





D) Classification based on habitat

1) both live in aerobic and anaerobic conditions

2) bacteria mostly mesophiles

a) environments are moderate, not extreme

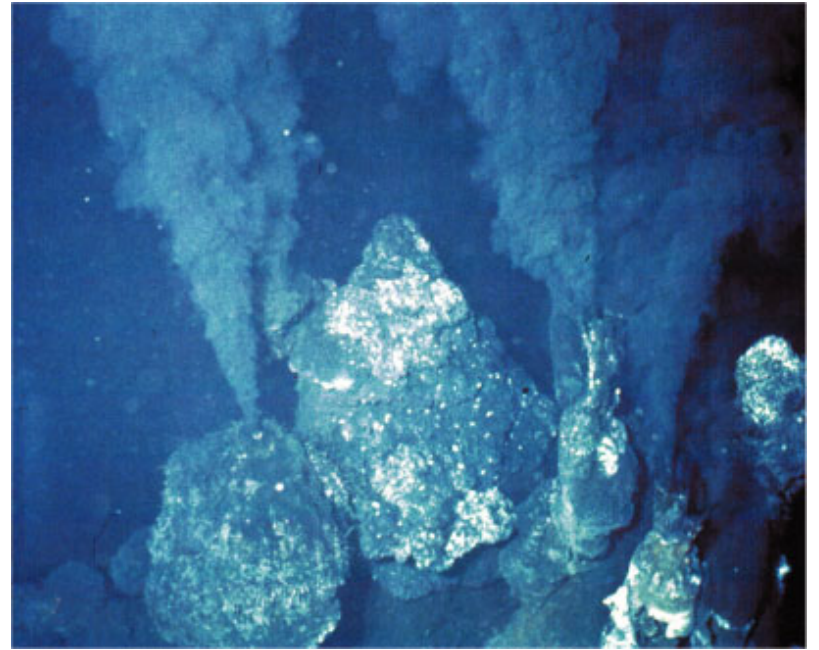
3) archaea can be extremophiles

a) live in extreme habitats

i) deep sea vents, hot springs

ii) volcanic crater & mine drainage lakes

iii) salt lakes



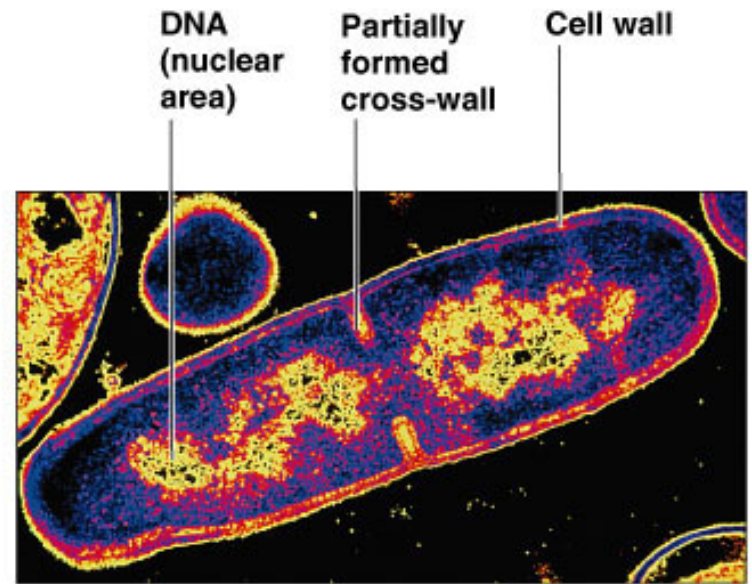
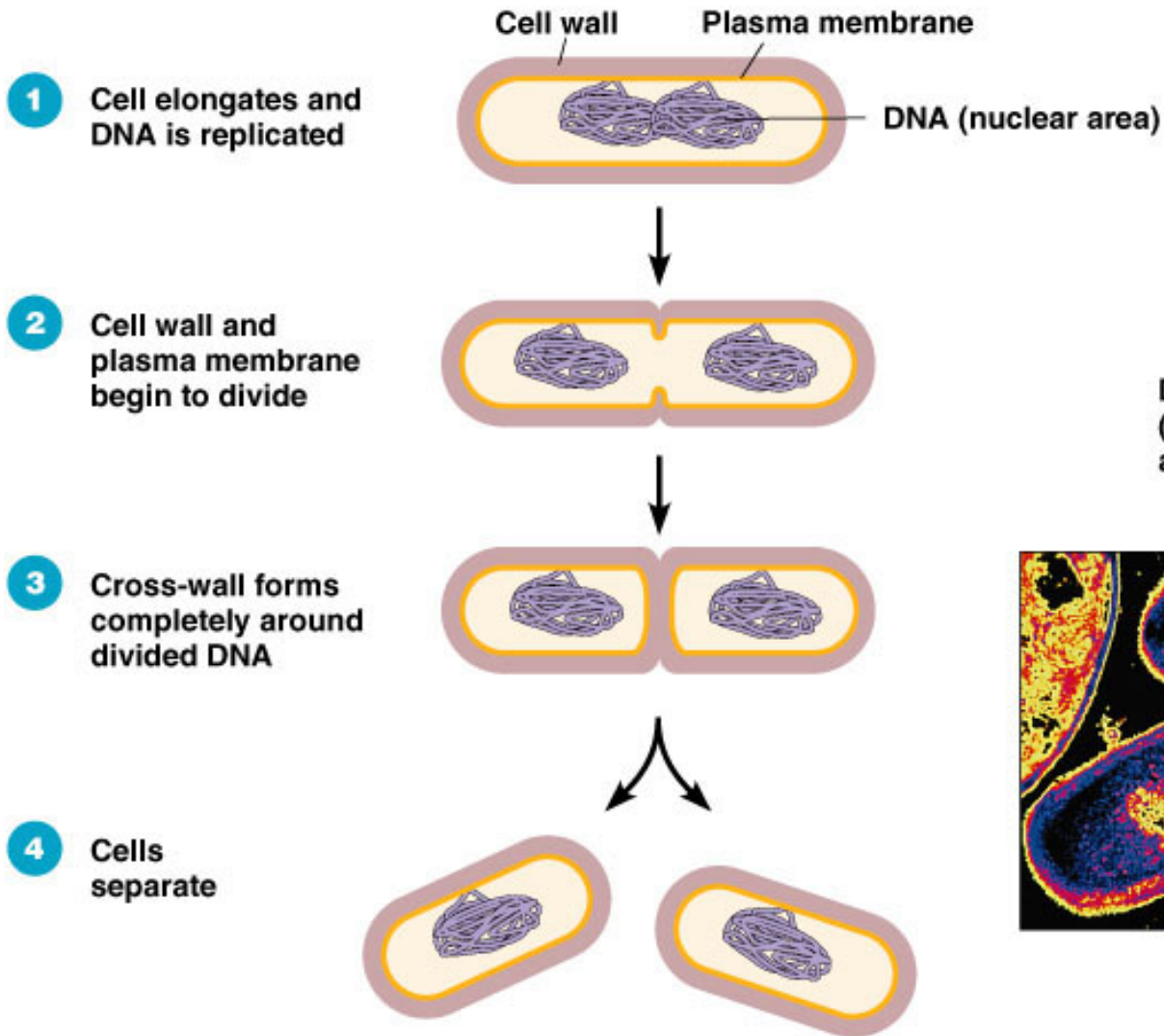
E) Reproduction of Archaea and Bacteria

1) Binary fission:

a) Result: cells with the same genetic material

b) Process:

- Makes copies of its single chromosome
- Cell elongates
- Builds a partition (septum)

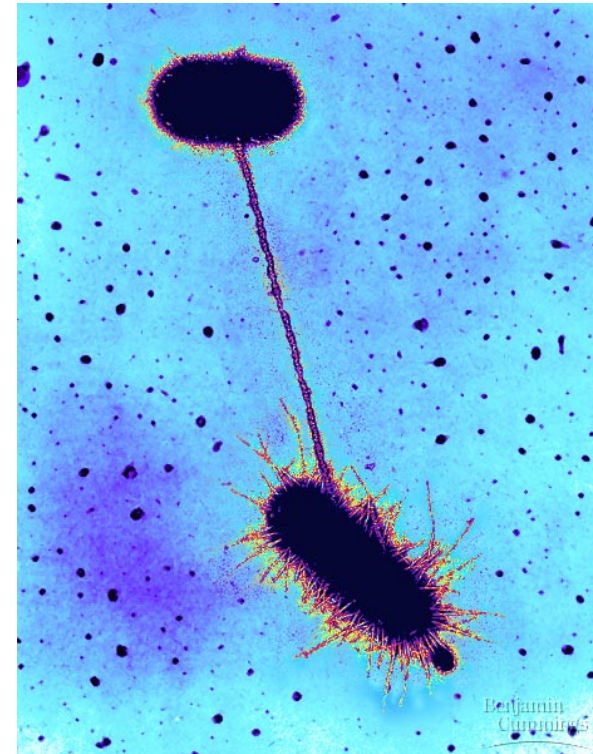


(a) A diagram of the sequence of cell division.

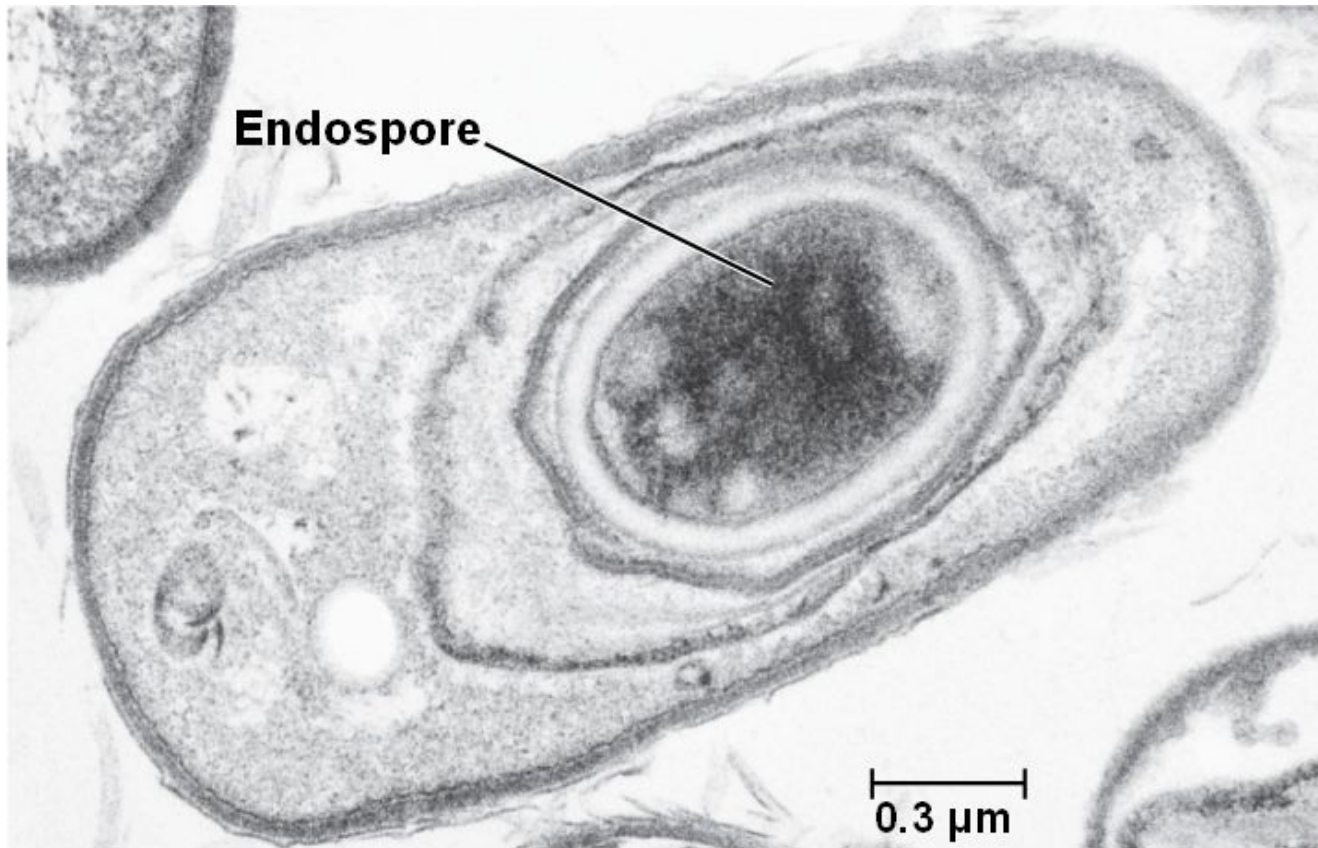
(b) A thin section of a cell of *Bacillus licheniformis* starting to divide.

2) Conjugation

- a) in less optimal conditions
- b) ability to exchange DNA
 - i) results in cells with new genetic material



3) Endospores (bacteria only)



- a) Creation of a hard walled structure that protect the genetic material
 - i) Resistant to high temperatures, freezing, drying, toxic chemicals and radiation
- b) Results in bacteria being able to remain dormant for very long periods of time

F) Bacteria vs. Archaea Summary

	Shape	Cell wall	Nutrition	Habitat	Reproduction	Survival Tactics
Bacteria	Cocci- spherical Bacilli – rod Spirilli- spiral shape	With Peptidoglycan	Autotrophs (photosynthesis) Heterotrophs (predation)	Mostly mesophiles	Binary fission	Conjugation Endospores
Archaea	Cocci- spherical Bacilli – rod Spirilli - spiral shape	Without peptidoglycan	Autotrophs (methanogenesis) Heterotrophs (predation)	Some extremophiles	Binary fission	Conjugation

G) Archaea and biotechnology

1) Archaea are currently used for:

a) Sewage treatment

b) Archaeaocin (new antibiotics)

c) Enzyme production

- Due to the extreme conditions they inhabit
- Low lactose milk
- Cloning DNA

H) Bacteria in Biotechnology

1) Bacteria are currently used for

a) Food Production

i) Cheese, yogurt

b) Production of antibiotics

c) Natural pesticides

