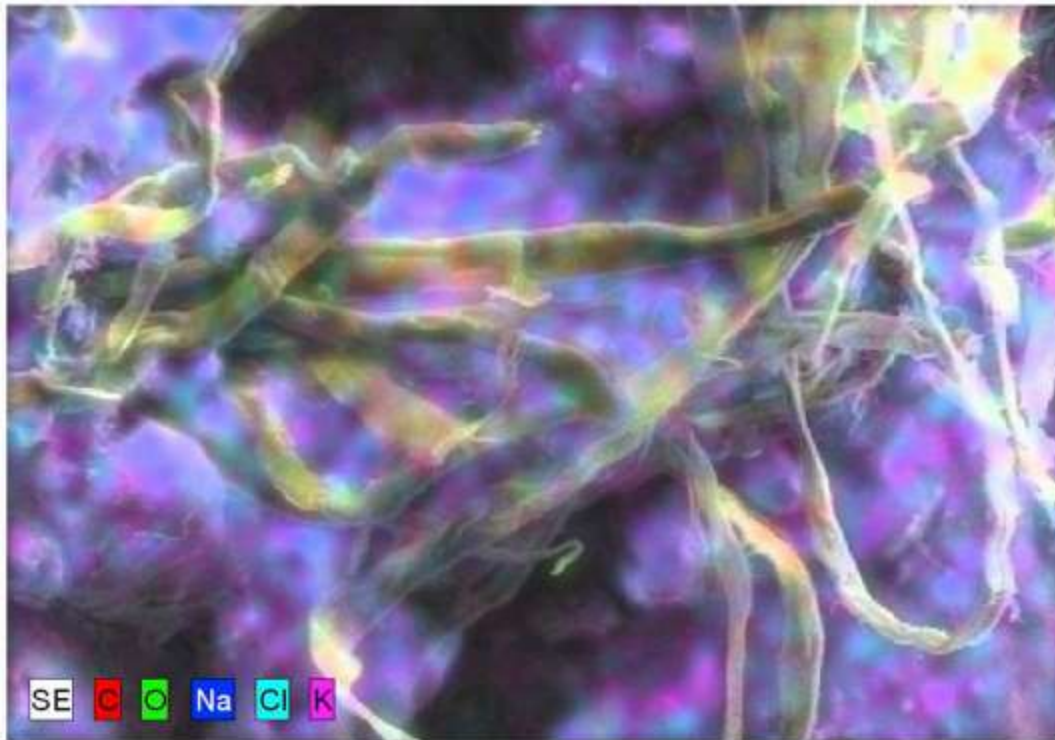
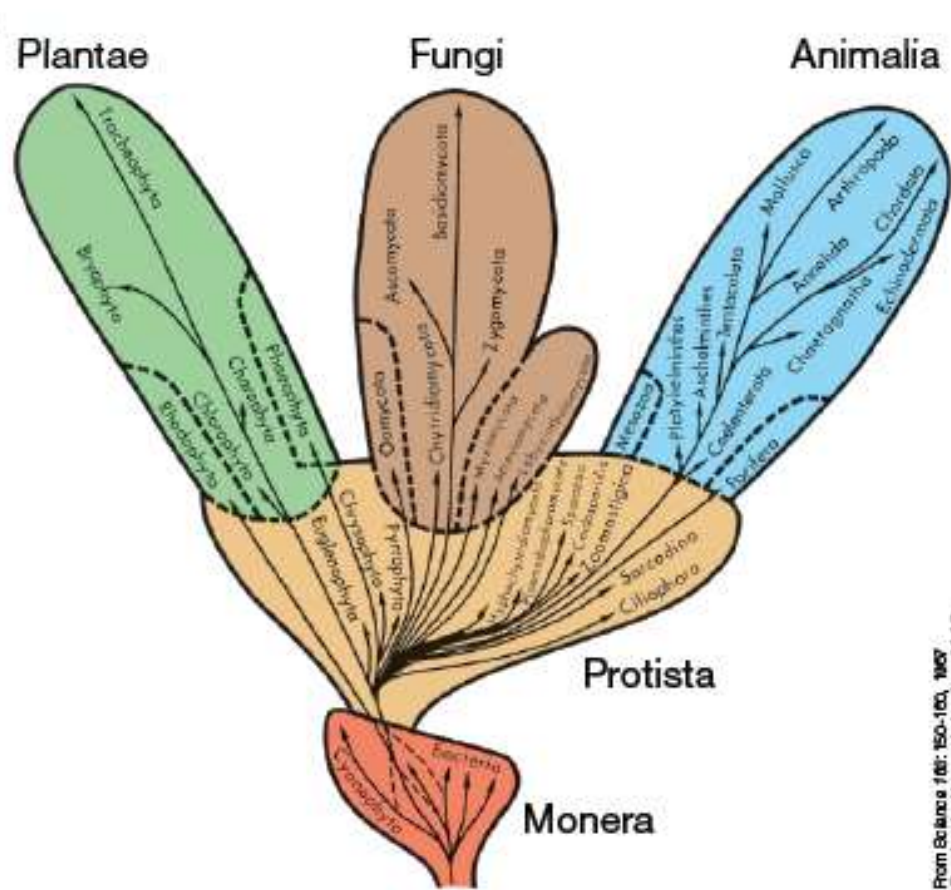
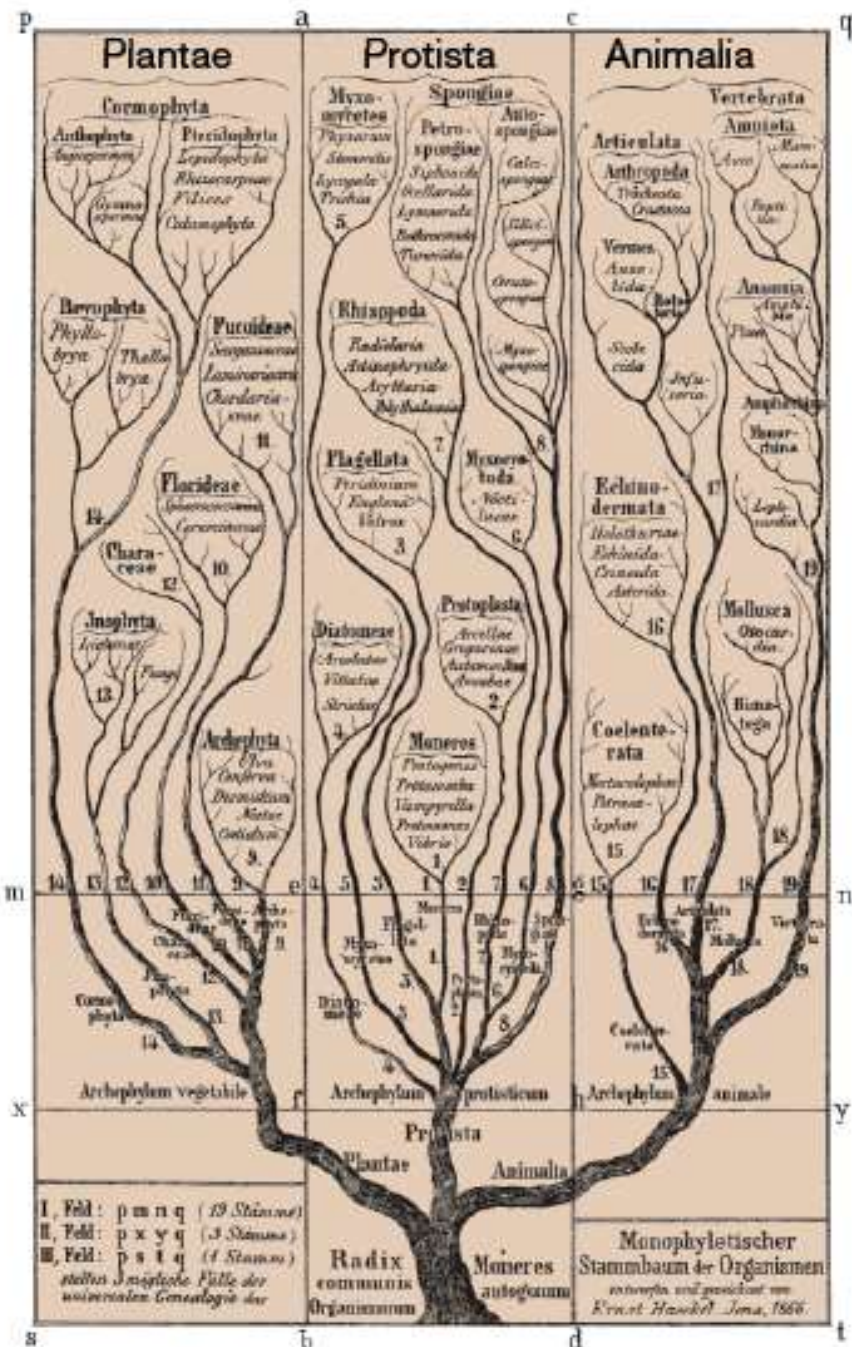


Bacteria

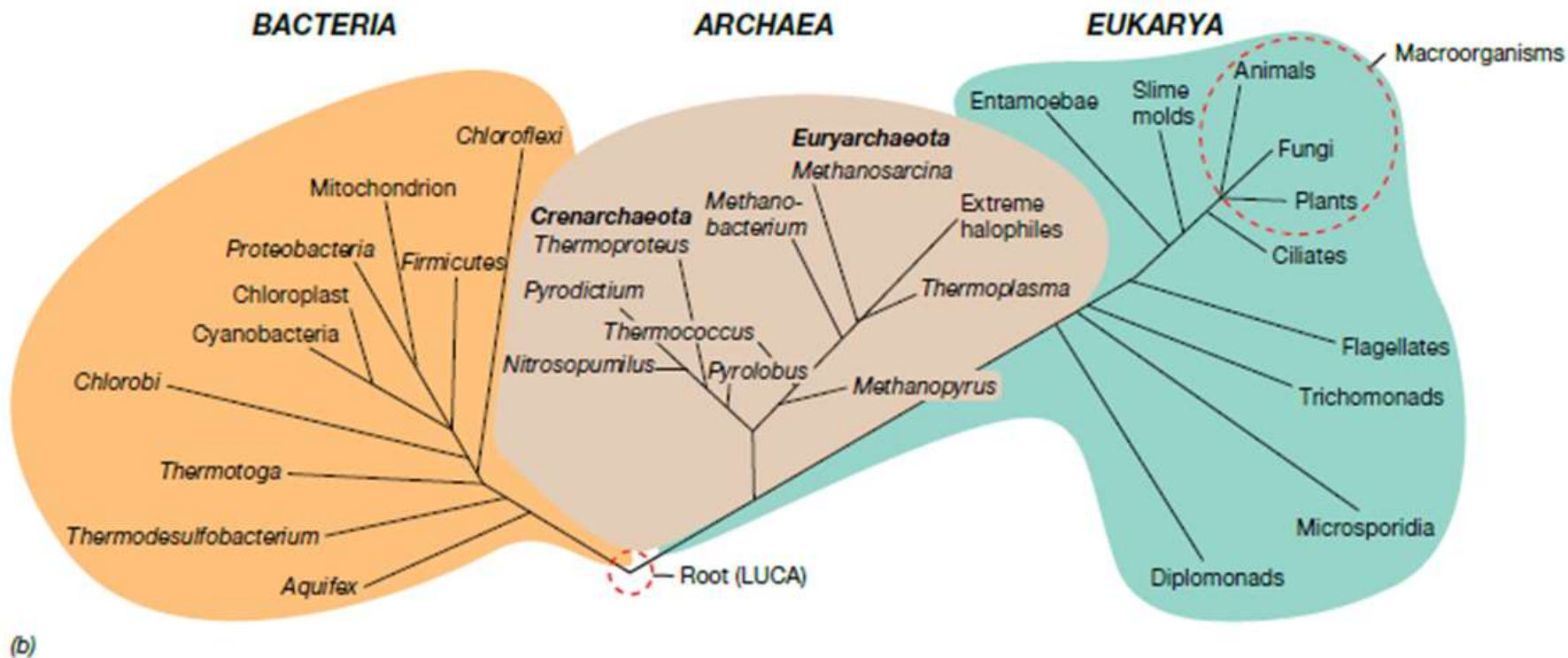
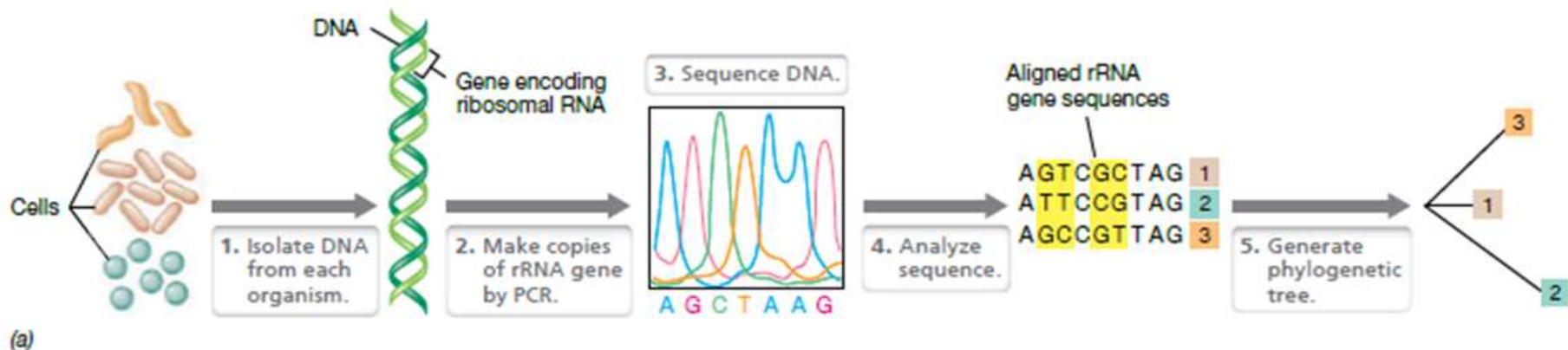




(b) The Whittaker Tree


Figure 1.35 Early efforts to depict the universal tree of life. (a) Tree of life published in 1866 by Ernst Haeckel in *Generelle Morphologie der Organismen*. (b) Tree of life published by Robert H. Whittaker in 1969. The terms "Monera" and "Moneres" are antiquated terms used to refer to prokaryotic cells. Compare these conceptual trees

From Science 161: 150-160, 1967
 Reprinted with permission from AAAS



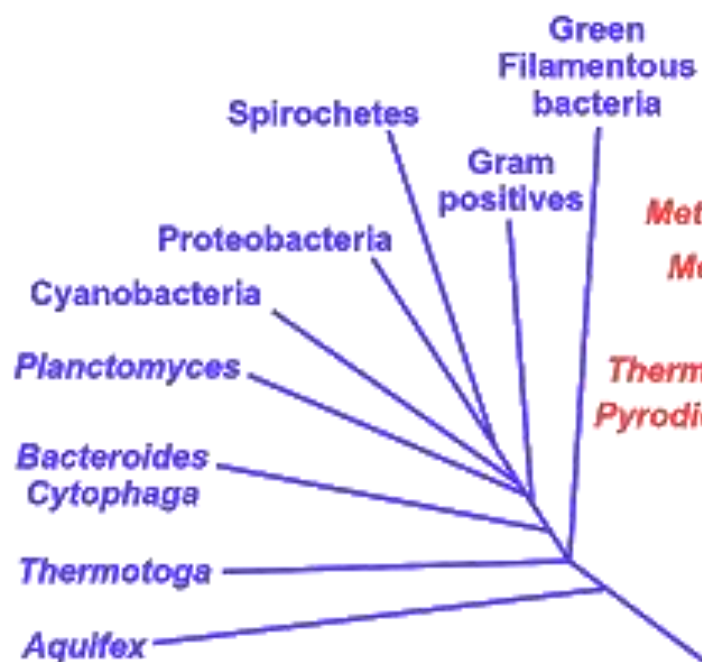
They are.....



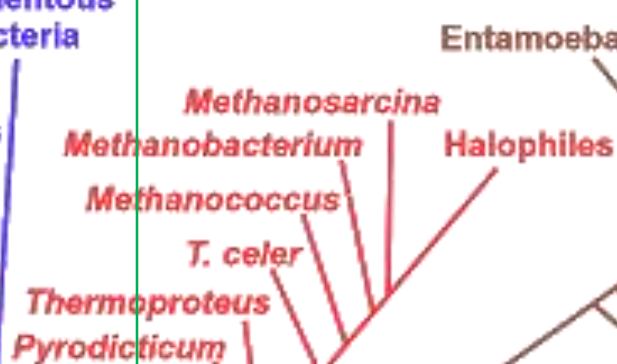
Trait	 Bacteria	Archaea	Eukarya
Carbon linkage of lipids	Ester	<i>Ether</i>	Ester
Phosphate backbone of lipids	Glycerol-3-phosphate	<i>Glycerol-1-phosphate</i>	Glycerol-3-phosphate
Metabolism	Bacterial	Bacterial-like	Eukaryotic
Nucleus	No	No	Yes
Organelles	No	No	Yes
Spliceosomal introns	No	No	Yes
Telomeres	No	No	Yes
Chromosome shape	Mostly circular	Circular	Linear
DNA replication	Bacterial	Eukaryotic-like	Eukaryotic
Transcription	Bacterial	Eukaryotic-like	Eukaryotic
Translation	Bacterial	Eukaryotic-like	Eukaryotic



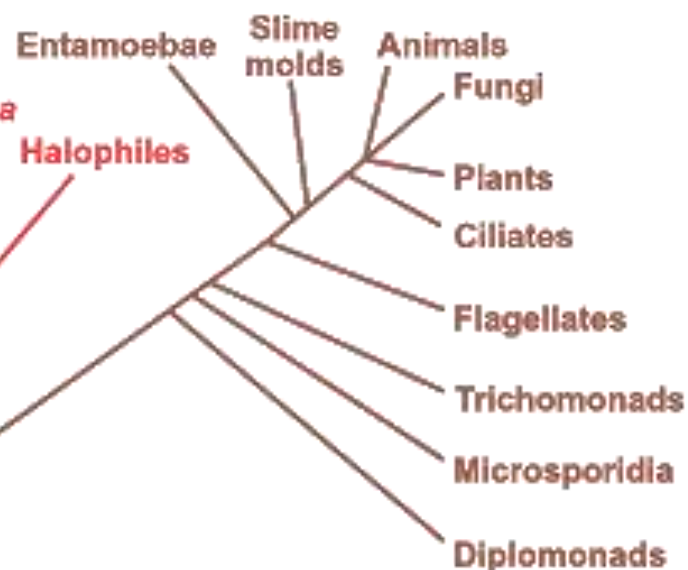
Bacteria



Archaea



Eukaryota



Aquifex

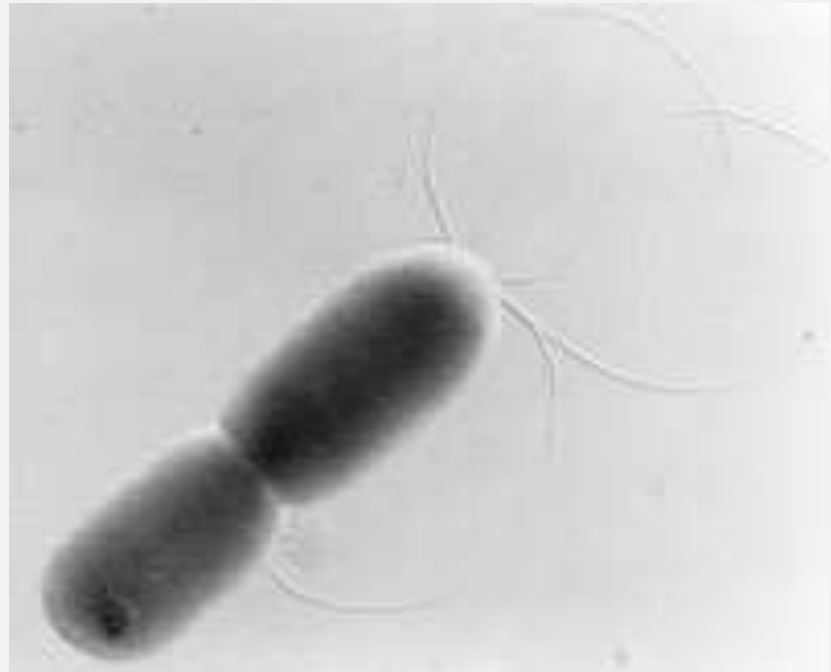
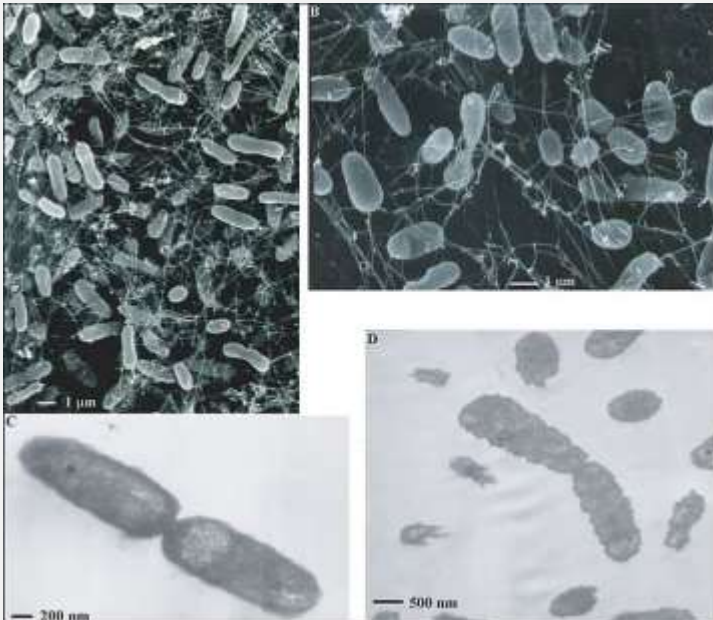
Scientific Classification

- Domain: Bacteria
- Phylum: Aquificae
- Class: Aquificae
- Order: Aquificales
- Family: Aquificaceae
- Genus: *Aquifex*
- Species: *A. Aeolicus*
A. pyrophilus



Aquificae habitat

White flocculent mats in and around the extremely gassy, high-temperature (>100°C, 212°F) white smokers at Champagne Vent.



BERDASARKAN JUMLAH DAN KEDUDUKAN FLAGELLA

MONOTRIK



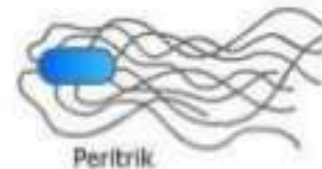
AMFITRIK



LOFOTRIK



PERITRIK



ATRIK



Thermotoga

Scientific Classification

Domain: Bacteria

Phylum: Thermotogae

Order: Thermotogales

Family: Thermotogaceae

Genus: *Thermotoga*

Species: *T.elfii*

T.hypognae

T.lettingae

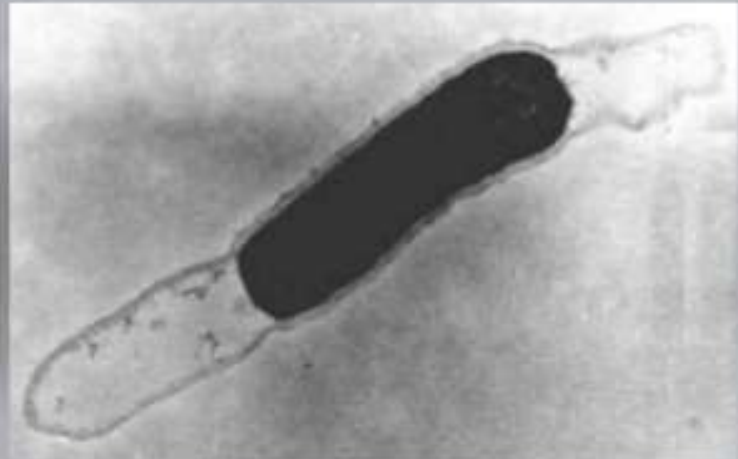
T.maritima

T.naphophila

T.neapolitana

T.petrophila

T.subterranea



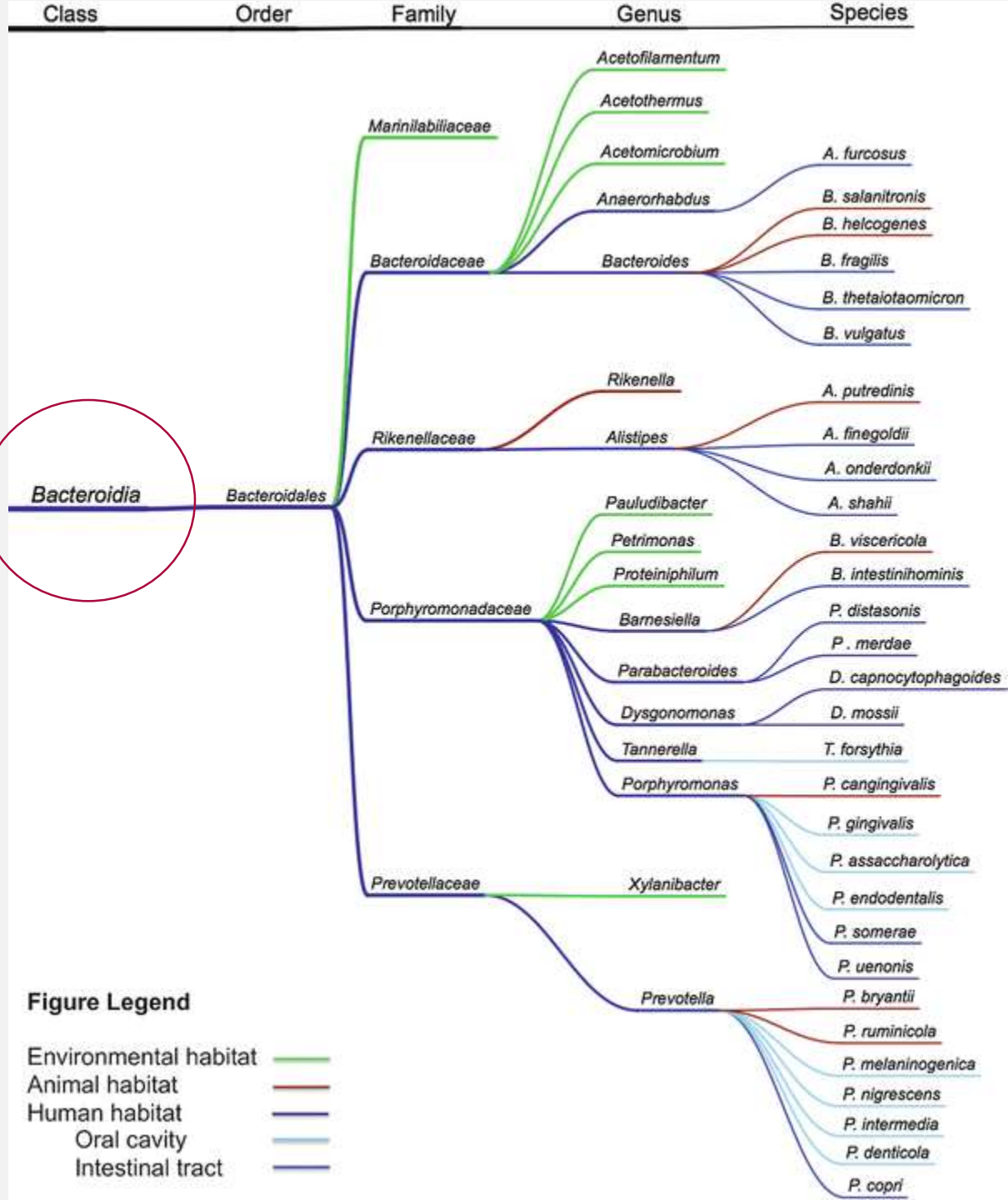
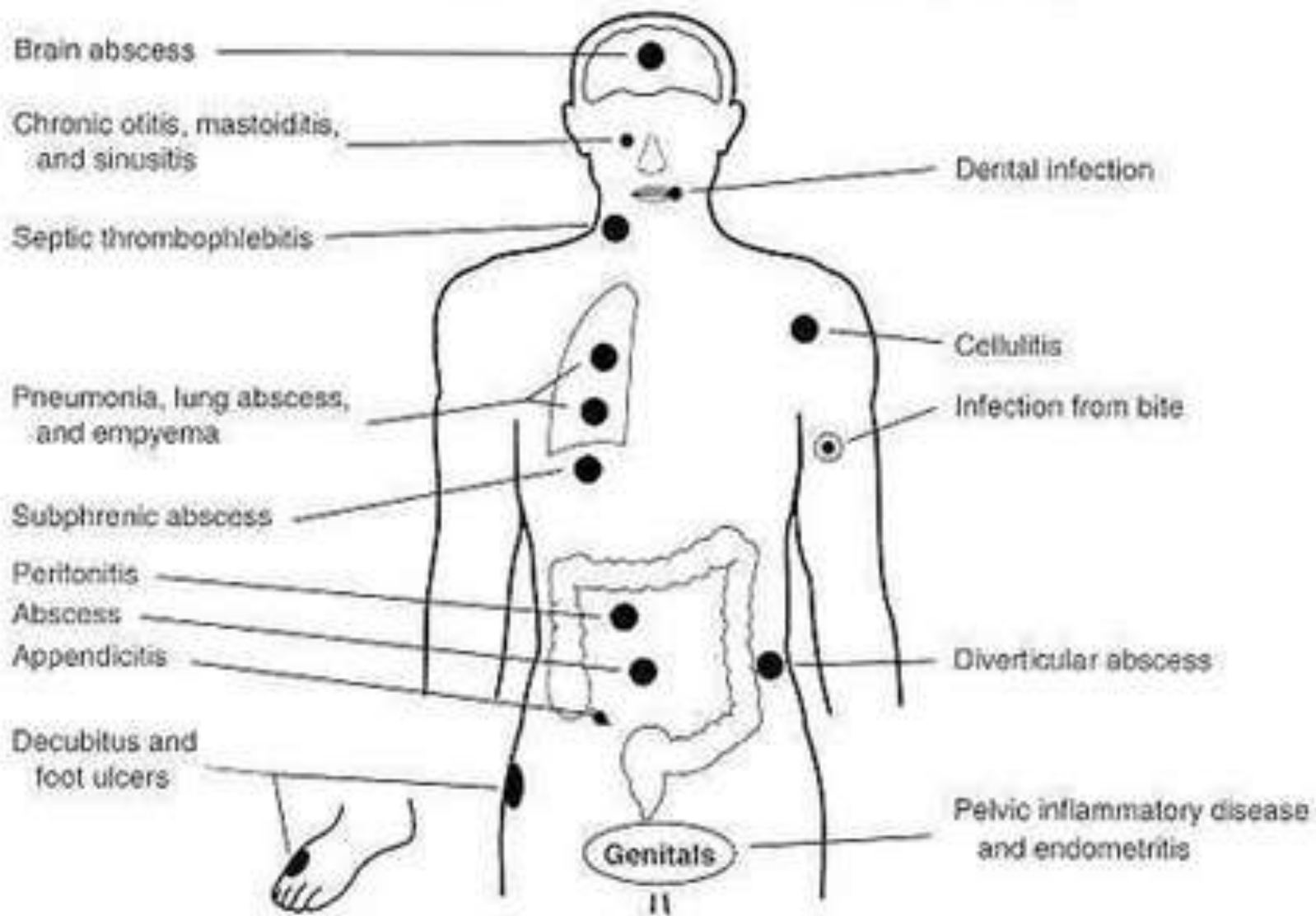
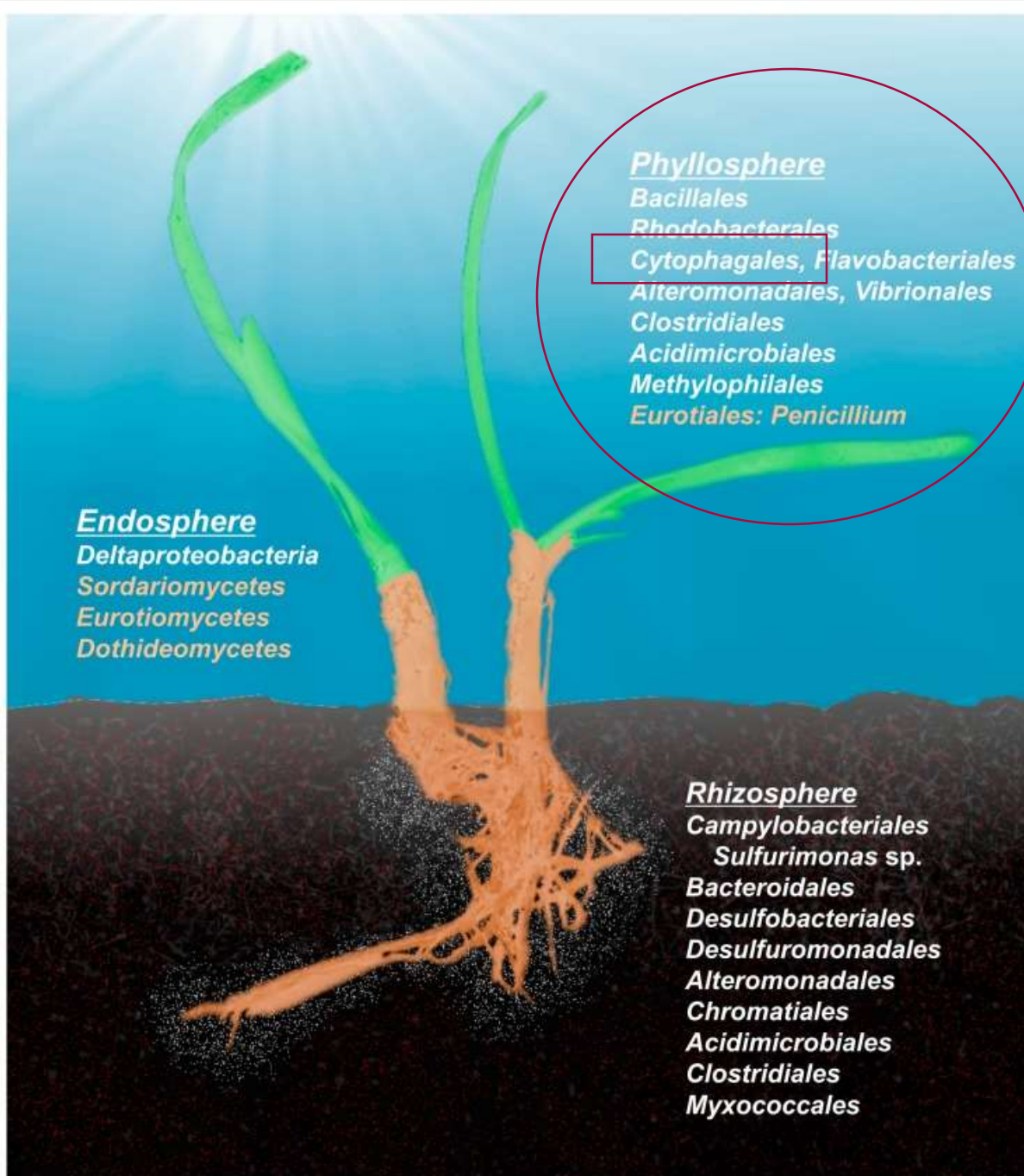
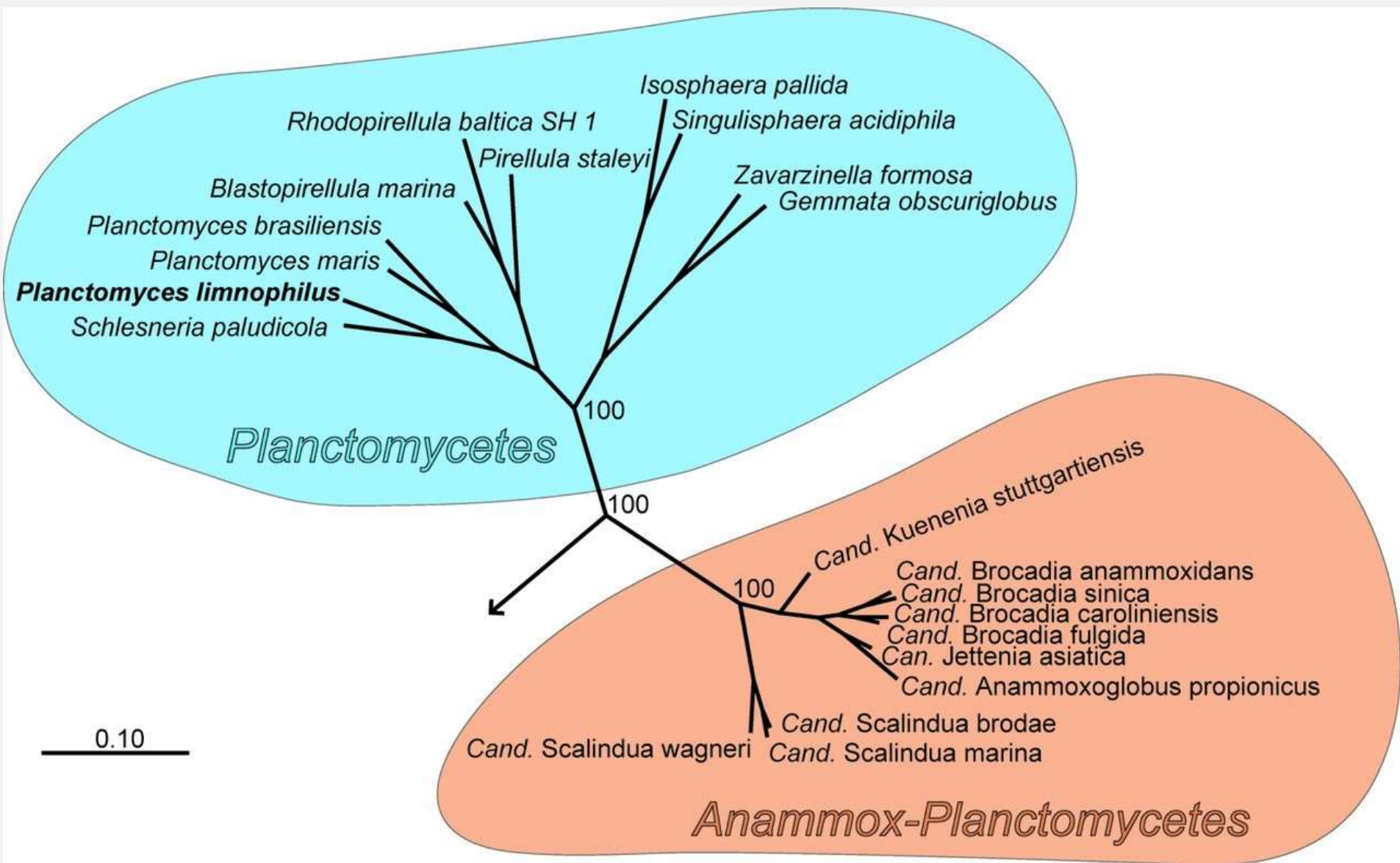


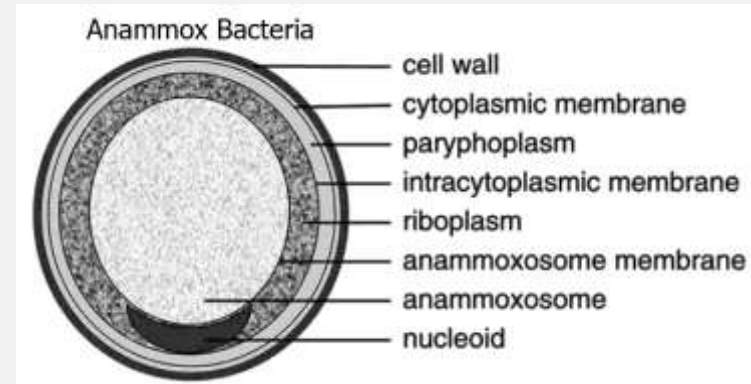
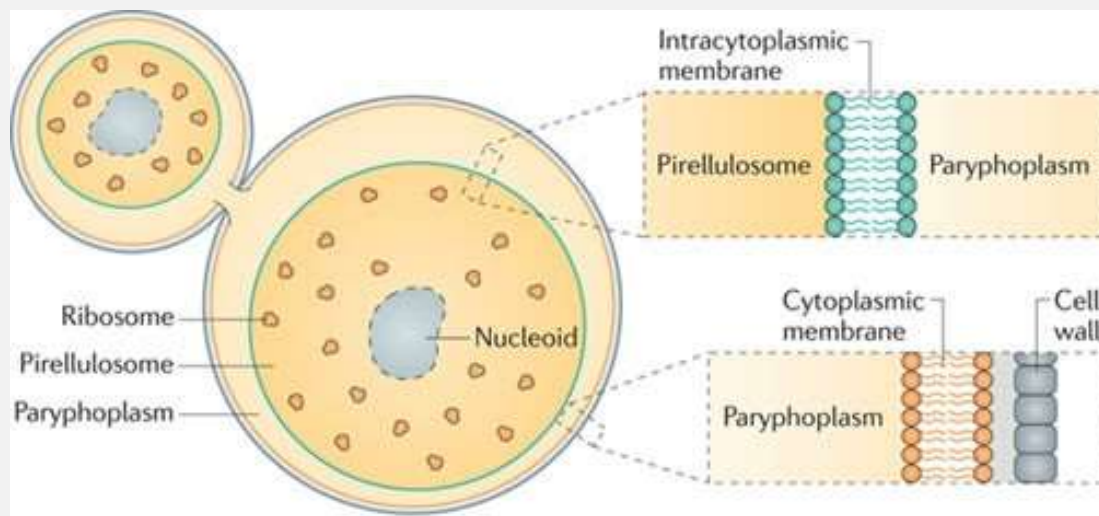
Figure Legend

- Environmental habitat —
- Animal habitat —
- Human habitat —
- Oral cavity —
- Intestinal tract —

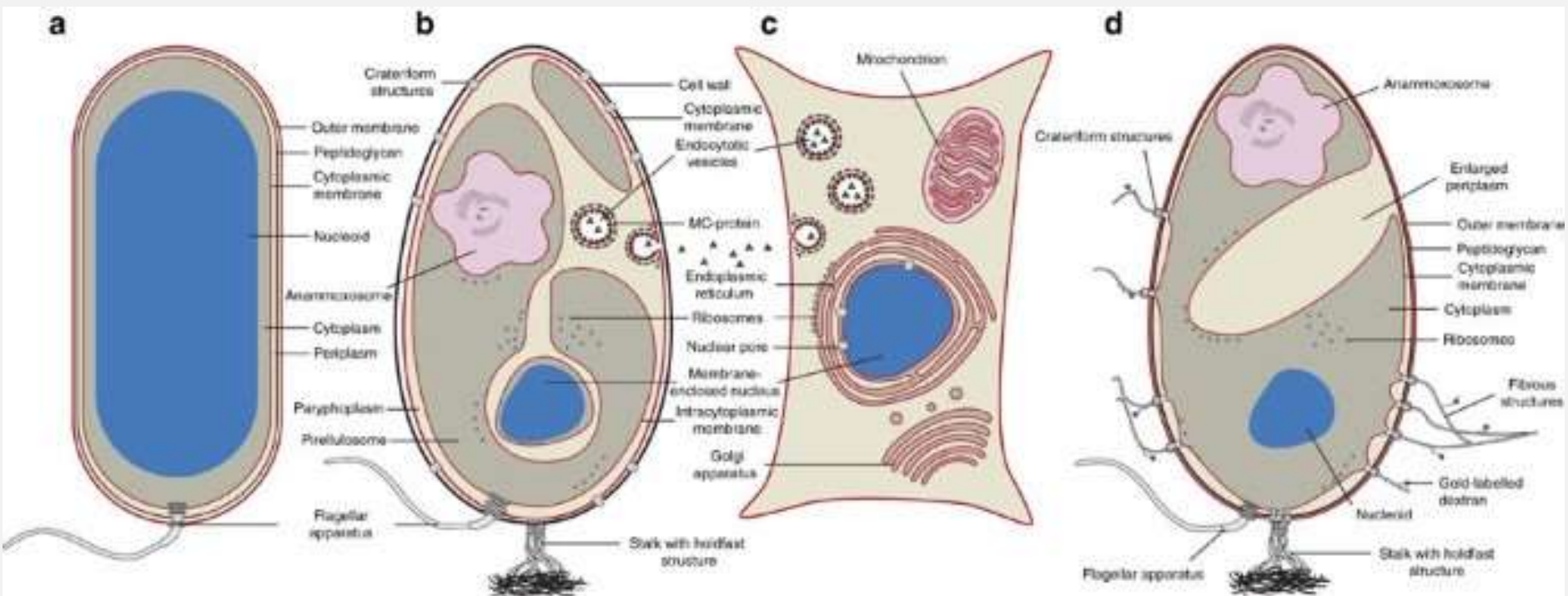


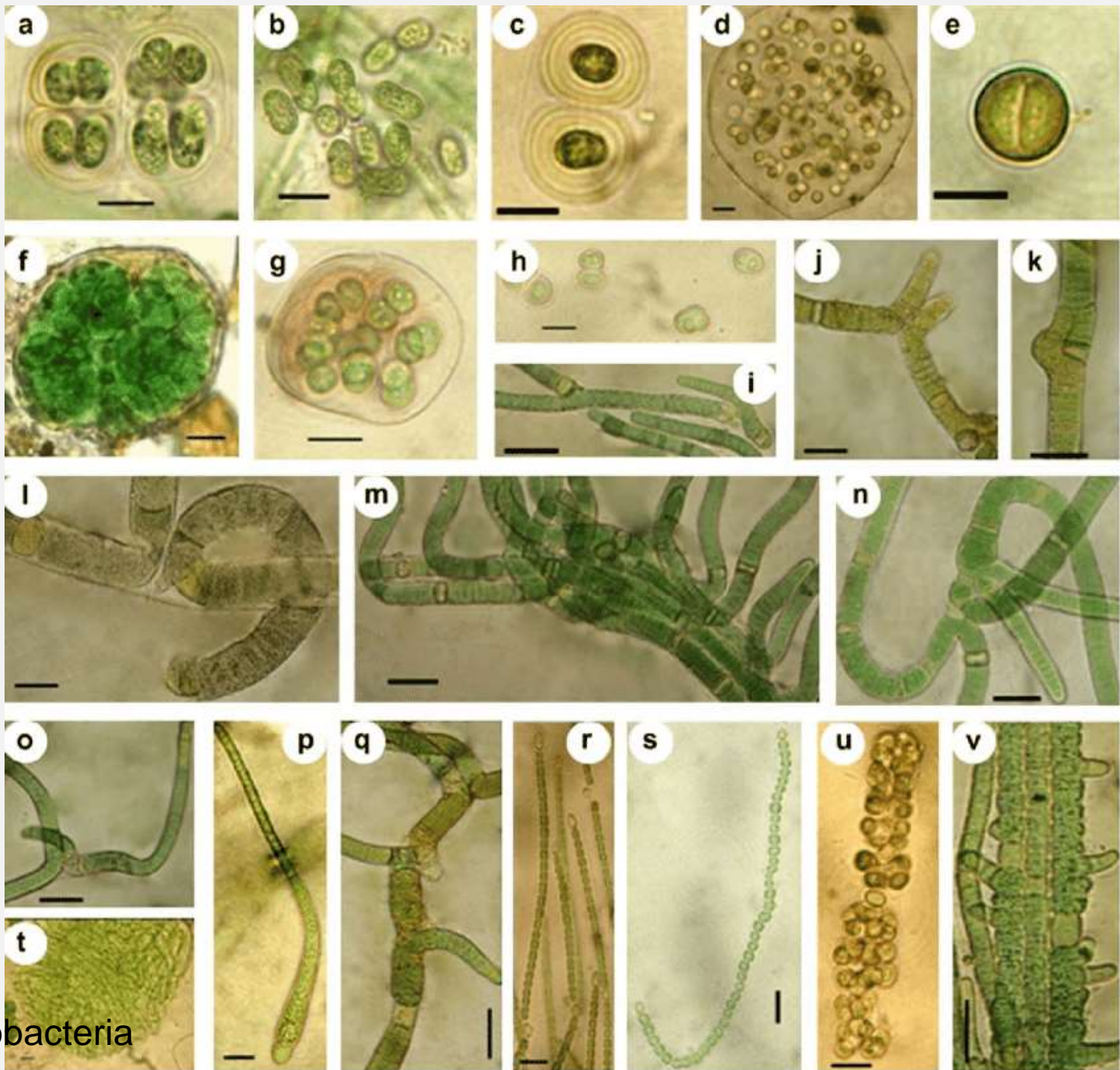






Nature Reviews | Microbiology





Cyanobacteria

Spirochaetales Associated Human Diseases

<u>Genus</u>	<u>Species</u>	<u>Disease</u>
<i>Treponema</i>	<i>pallidum</i> ssp. <i>pallidum</i> <i>pallidum</i> ssp. <i>endemicum</i> <i>pallidum</i> ssp. <i>pertenue</i> <i>carateum</i>	Syphilis Bejel Yaws Pinta
<i>Borrelia</i>	<i>burgdorferi</i> <i>recurrentis</i> Many species	Lyme disease (borreliosis) Epidemic relapsing fever Endemic relapsing fever
<i>Leptospira</i>	<i>interrogans</i>	Leptospirosis (Weil's Disease)

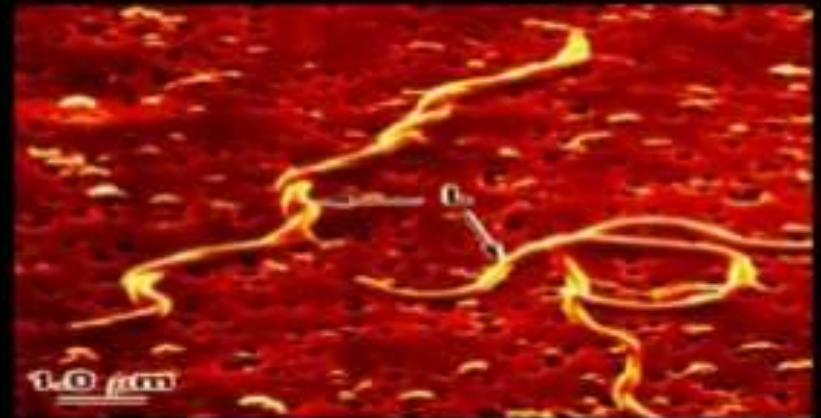
Gram Negative Spirochetes

- pathogenic
- very flexible
- tightly coiled, helically coiled
- Example
 - syphilis
 - Treponema pallidum*



Gram Negative Spirochetetes

- Most of pathogenic
- Very flexible
- Tightly coiled, helically coiled
- Example
 - Lyme disease
Borrelia burgdorferi
(organism gets lodged in tissues)



Proteobacteria

Alphaproteobacteria

Nitrogen-fixing (Rhizobium),
Agrobacterium, marine

Betaproteobacteria

Burkholderiales, ammonia
oxidizing, arsenic resistant soil
bacteria

Gammaproteobacteria

Pseudomonas, Xanthomonas,
Acidithiobacillus

Deltaproteobacteria

Ferric iron-reducing, sulfur
reducing

**Epsilon
proteobacteria**

Inhabit the digestive tract of
animals and serve as symbionts
or pathogens

Zetaproteobacteria

It has a sole member,
Mariprofundus ferrooxydans

According to Bergey's manual of
bacteriology

- **Proteobacteria (gram-negatives)**

- Alpha - *Rhodospirillum*, *Rhizobium*, *Agrobacterium*, *Rickettsia*
- Beta - *Nitrosomonas*, *Neisseria meningitidis* and *gonorrhoeae*
- Gamma - *Escherichia coli*, *Salmonella*, *Proteus*, *Pseudomonas*, *Legionella*
- Delta - *Myxococcus*, *Bdellovibrio*
- Epsilon - *Helicobacter pylori*

Gram +ve

Gram -ve

Bacteria

↓
Stained with
crystal violet

All bacteria will be stained
bluish or bluish purple

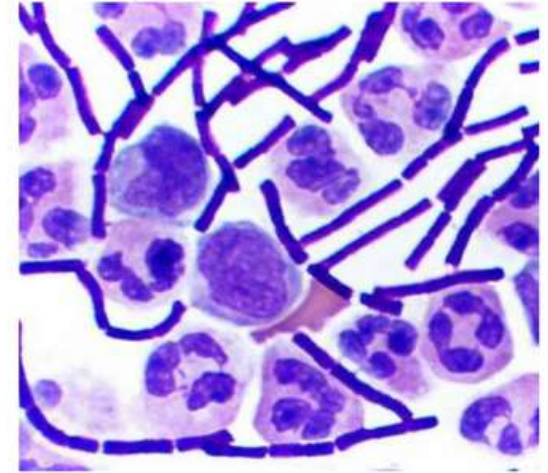


↓
KI solution

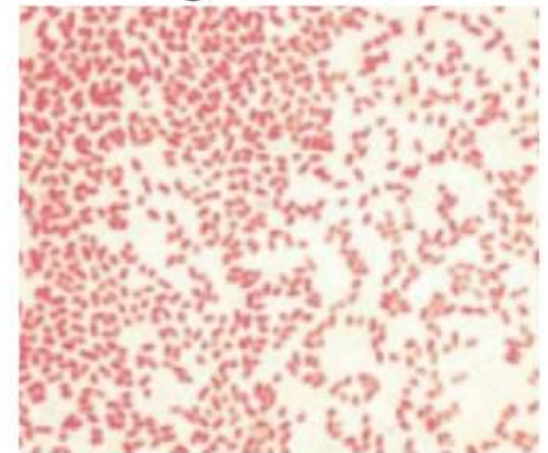
Stain will be fixed due to formation
of a complex of **crystal violet** and KI (Mordant)

↓
Destaining is done
with water and alcohol

Gram positive bacteria



Gram negative bacteria

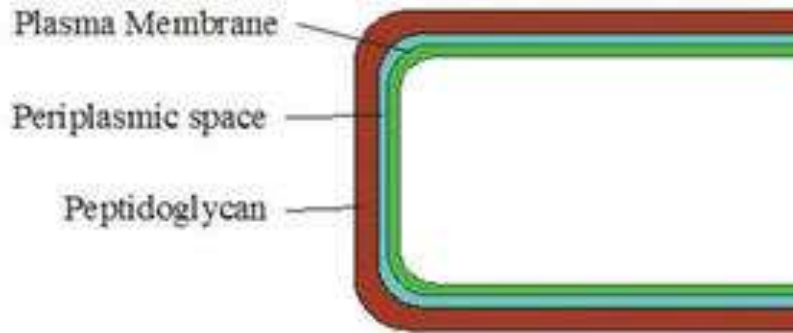


Stain does not come out
Gram +ve Bacteria

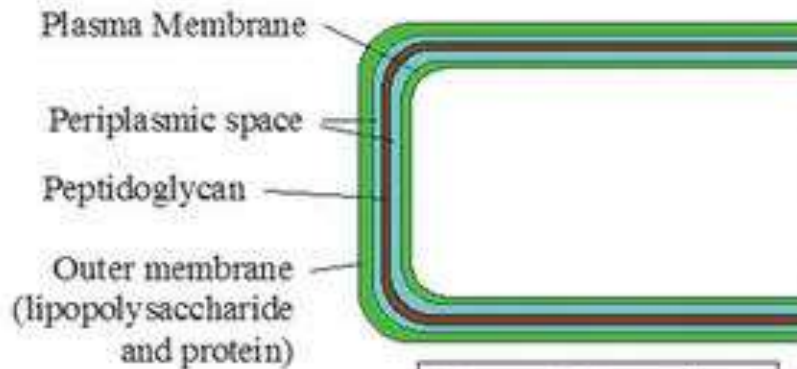
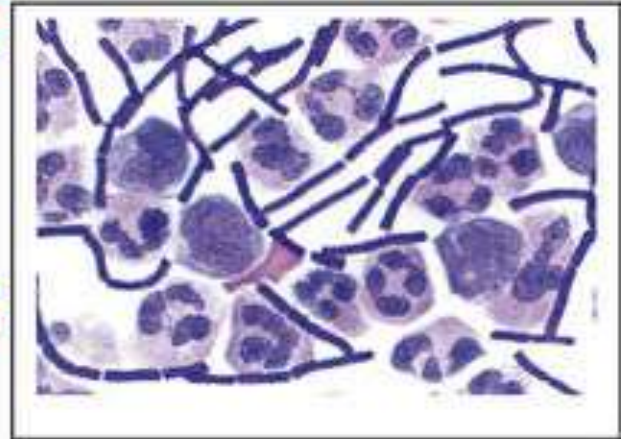
Stain come out
Gram -ve Bacteria

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Gram Positive



Gram-positive bacteria stain purple with Gram stain. This is because they have a thick cell wall without an outer membrane. Example: cyanobacteria



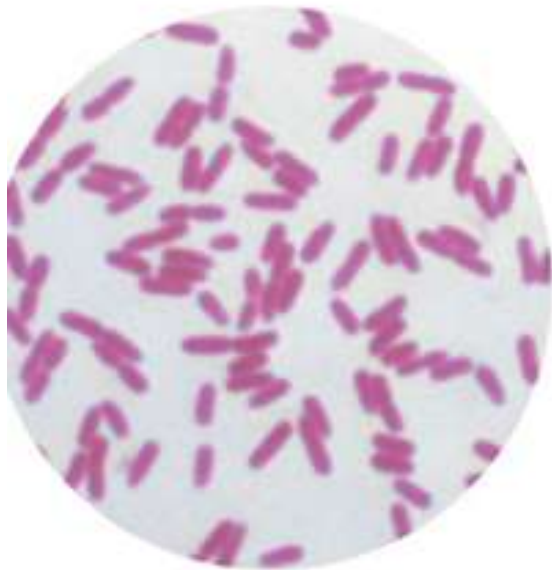
Gram Negative



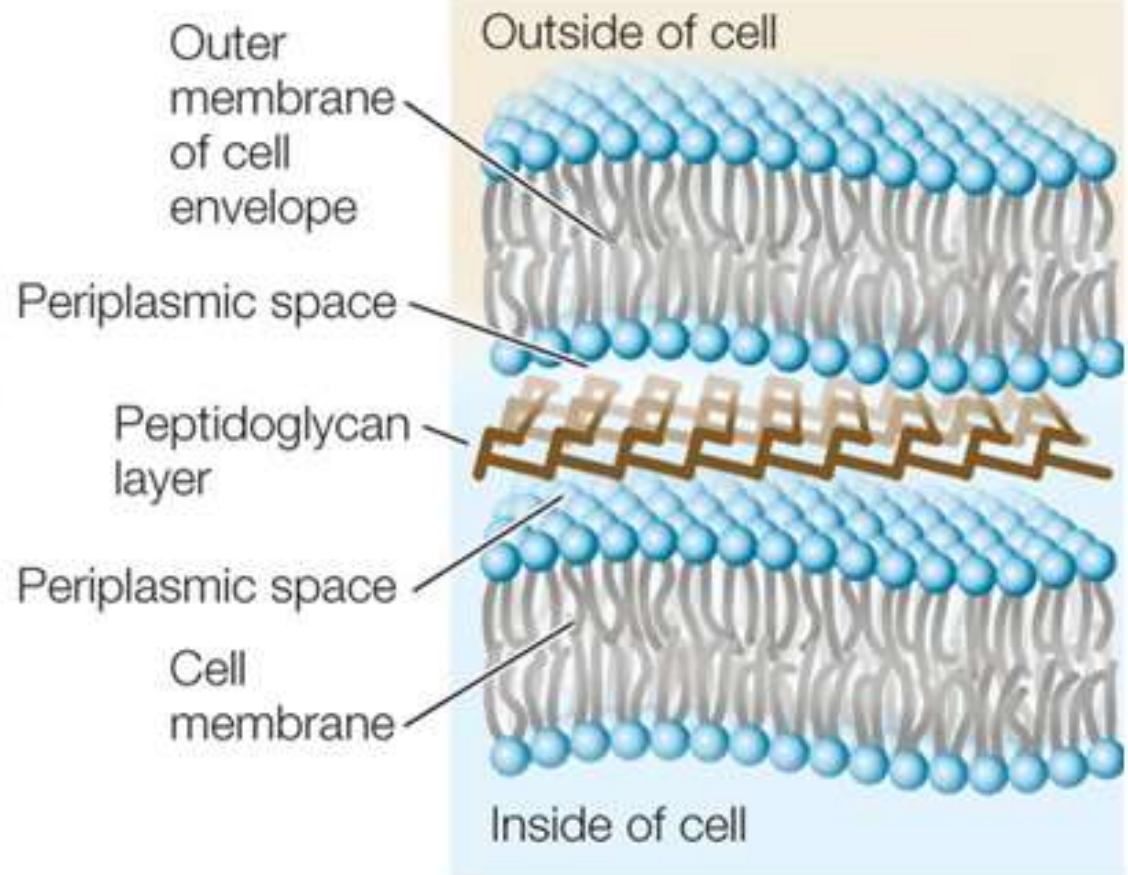
Gram-negative bacteria stain red with Gram stain. This is because they have a thin cell wall with an outer membrane. Example: Salmonella.

(B)

Gram-negative bacteria have a very thin peptidoglycan layer and an outer membrane.

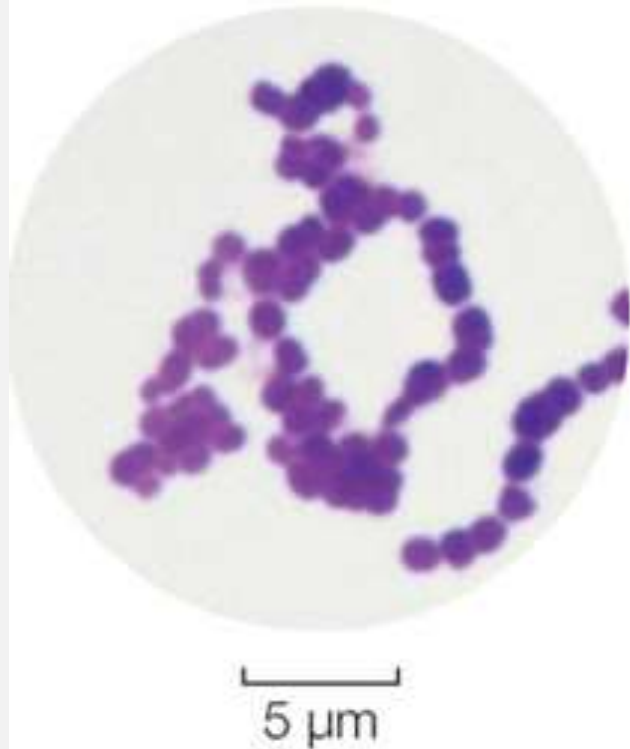


5 μm



(A)

Gram-positive bacteria have a uniformly dense cell wall consisting primarily of peptidoglycan.



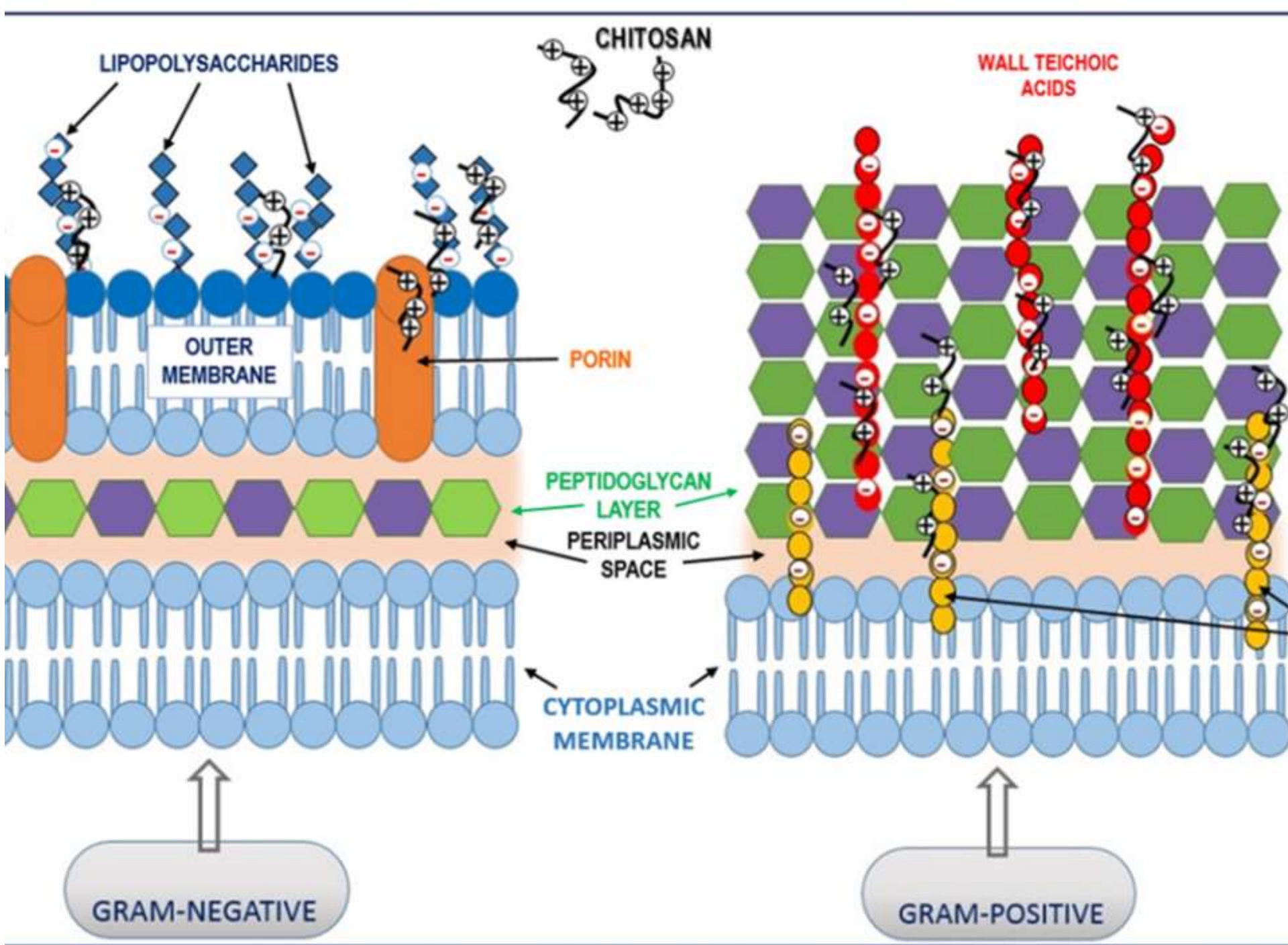
Cell wall
(peptidoglycan)

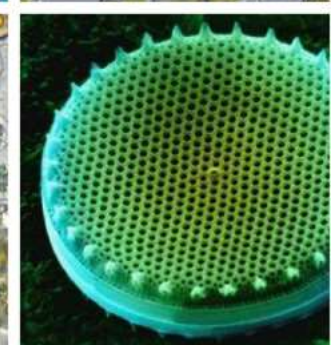
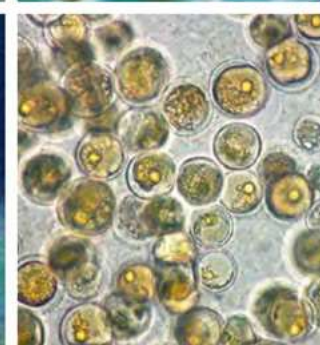
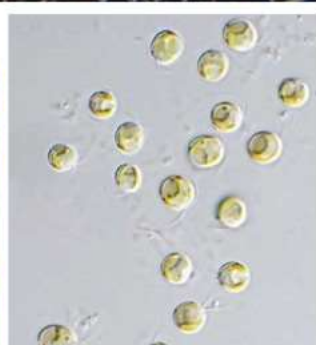
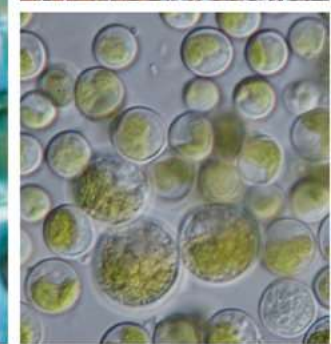
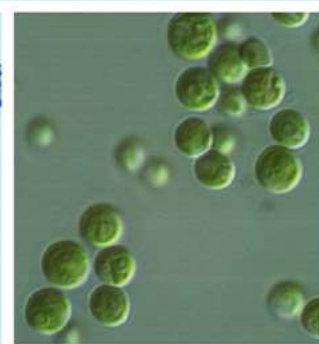
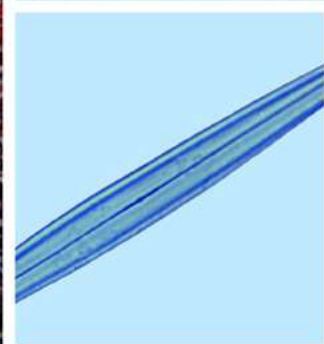
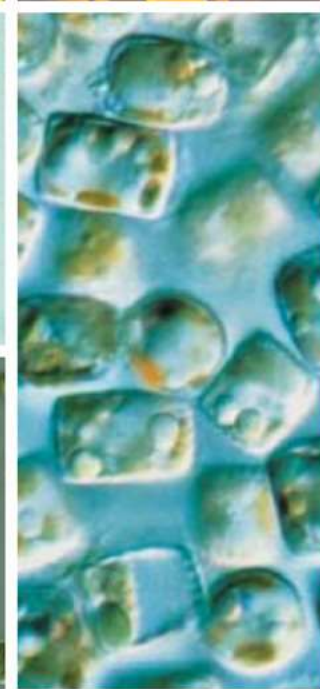
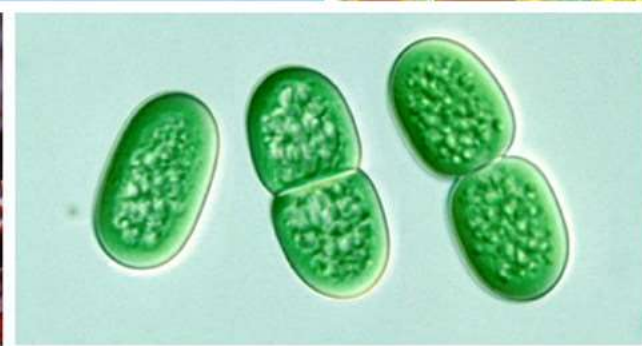
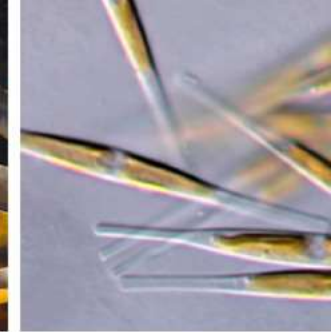
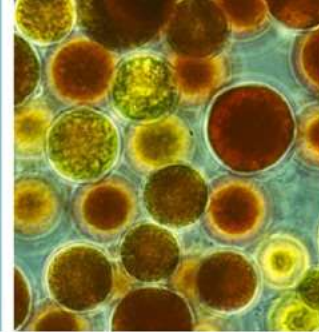
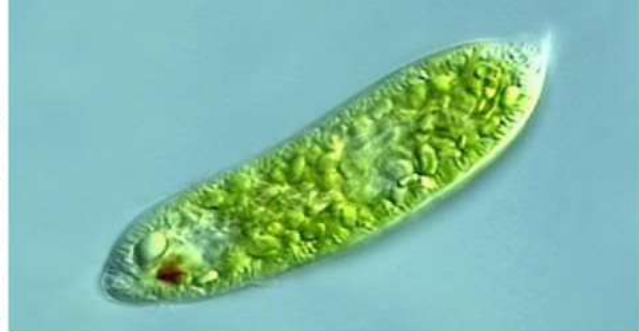
Cell
membrane

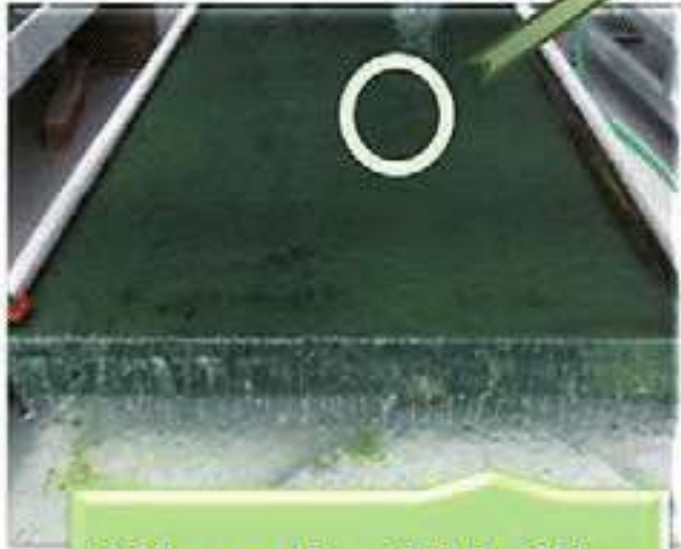
Outside of cell



Inside of cell







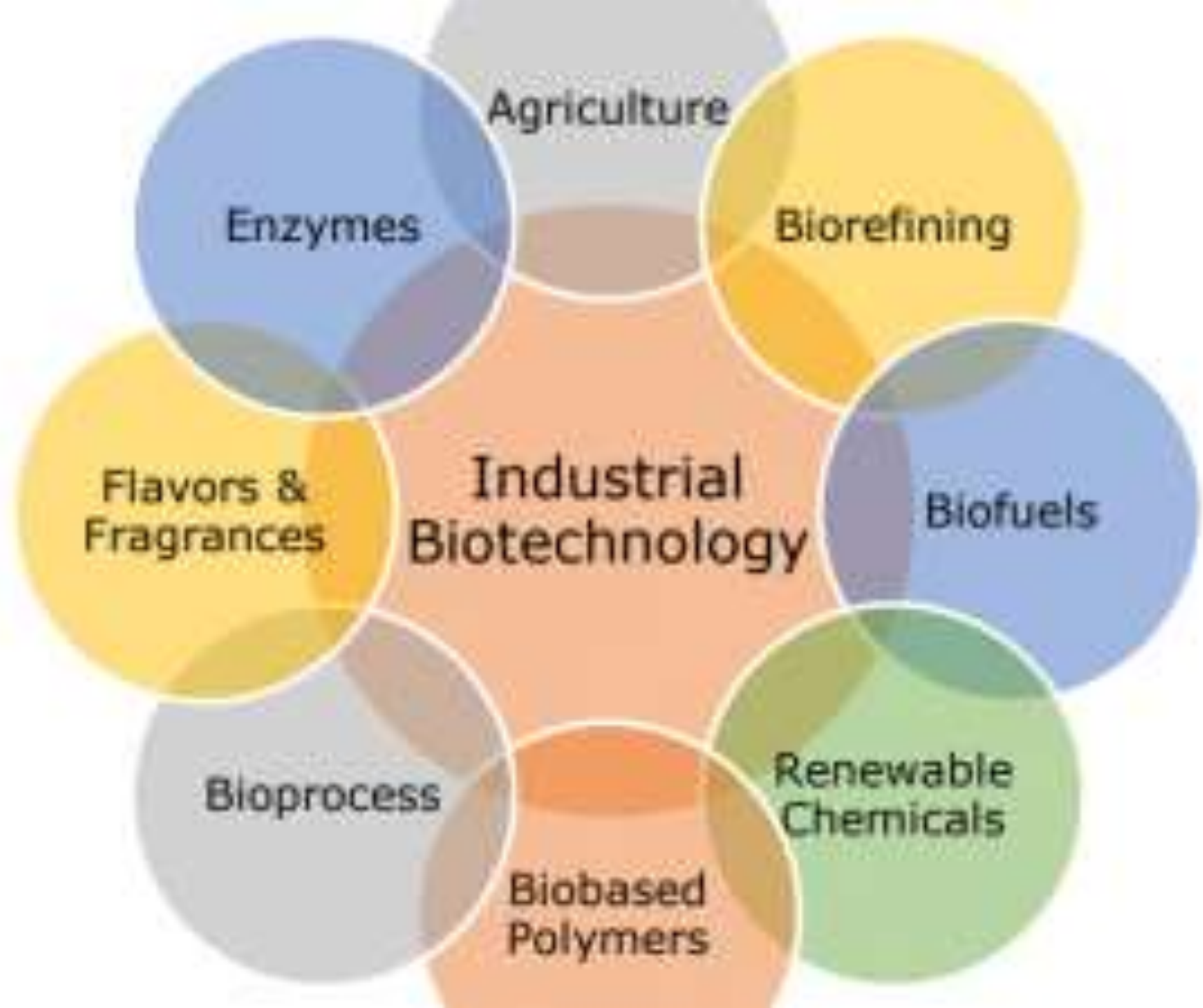
Microalgal biofilm

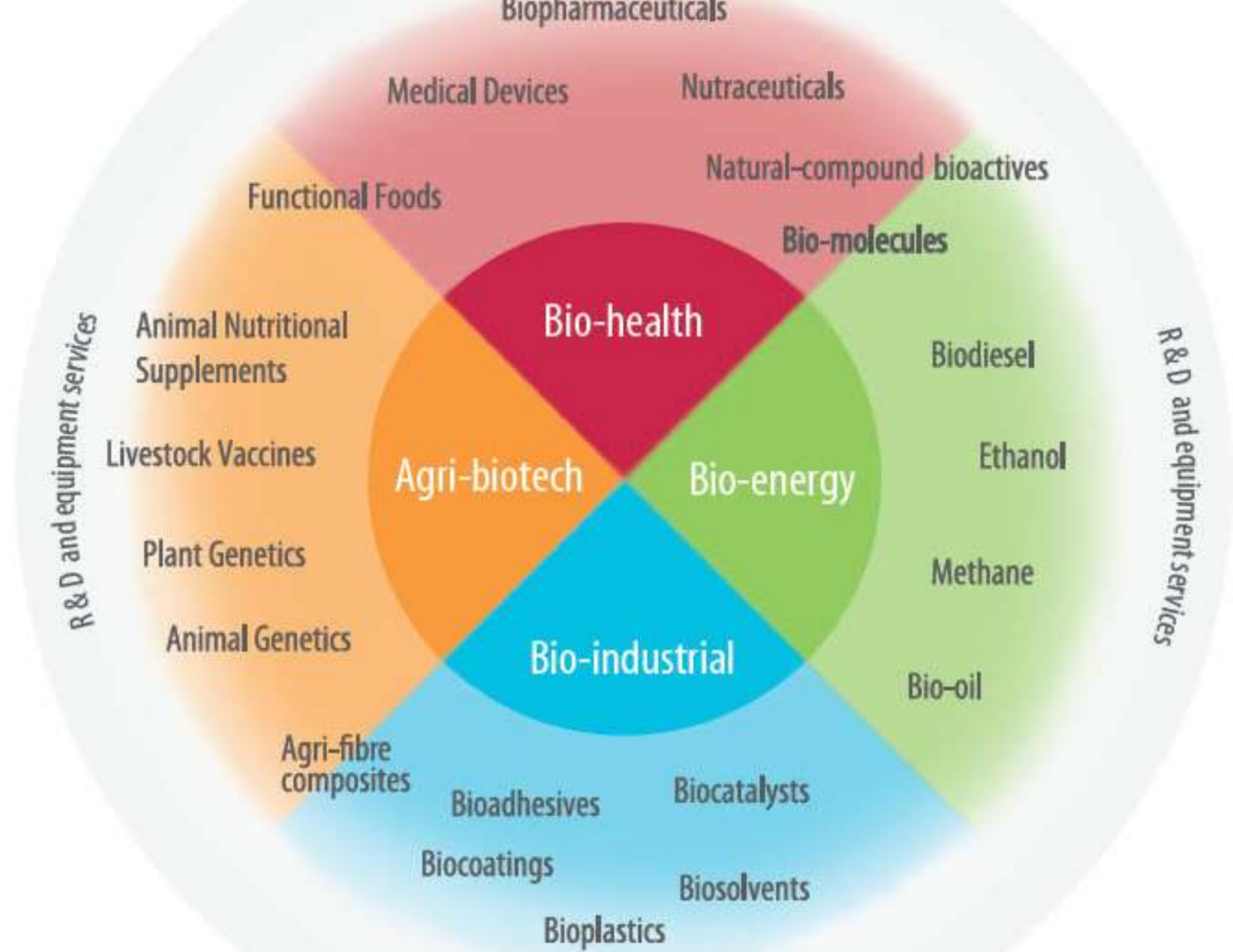


Macroscopic structure



Microscopic structure





The Production of edible vaccines by using bacteria

Gene from a human pathogen is inserted into a bacterium that infects plants



Bacteria infect potato leaf segments

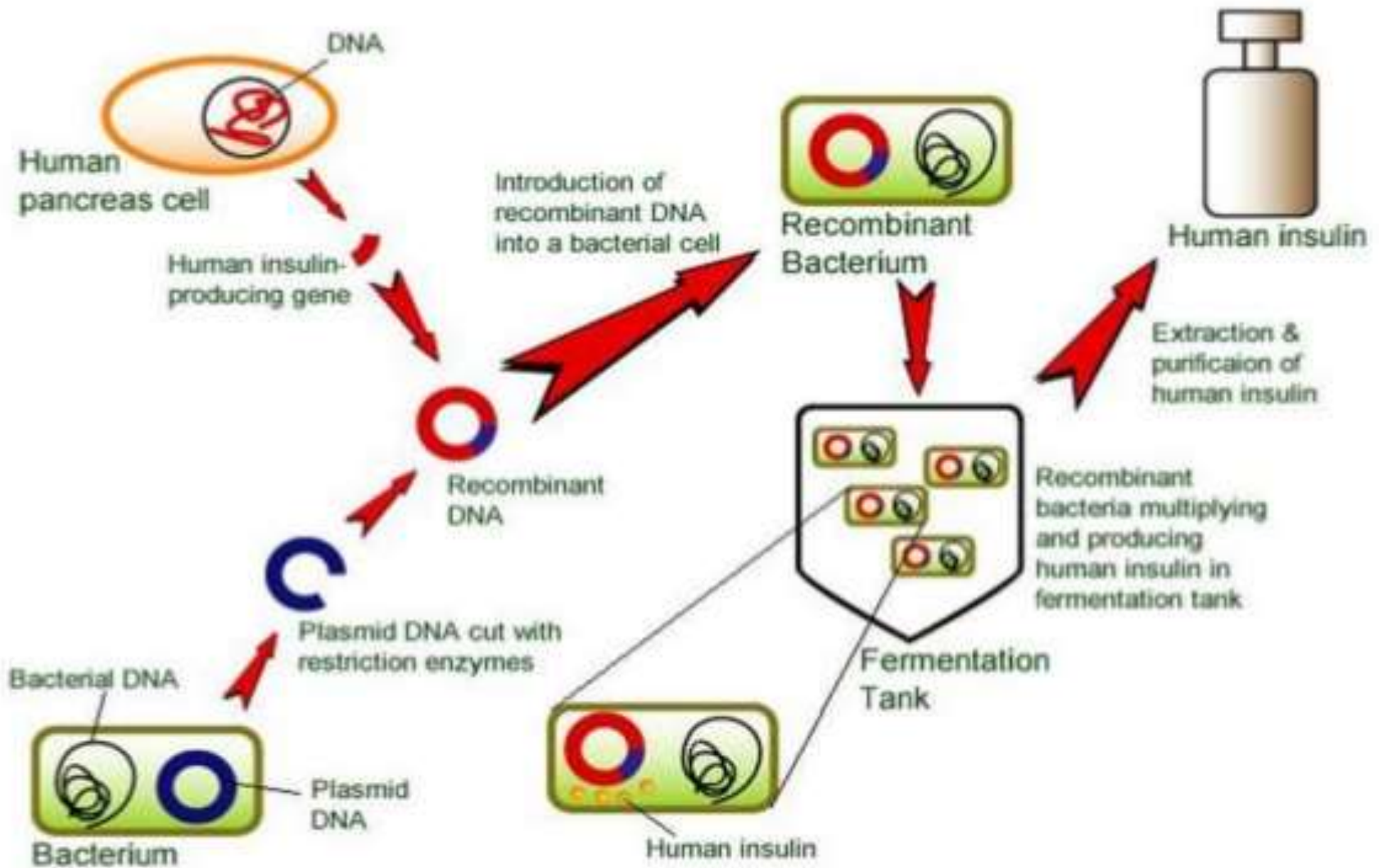


Leaf segments sprout into whole plants carrying gene from human pathogen

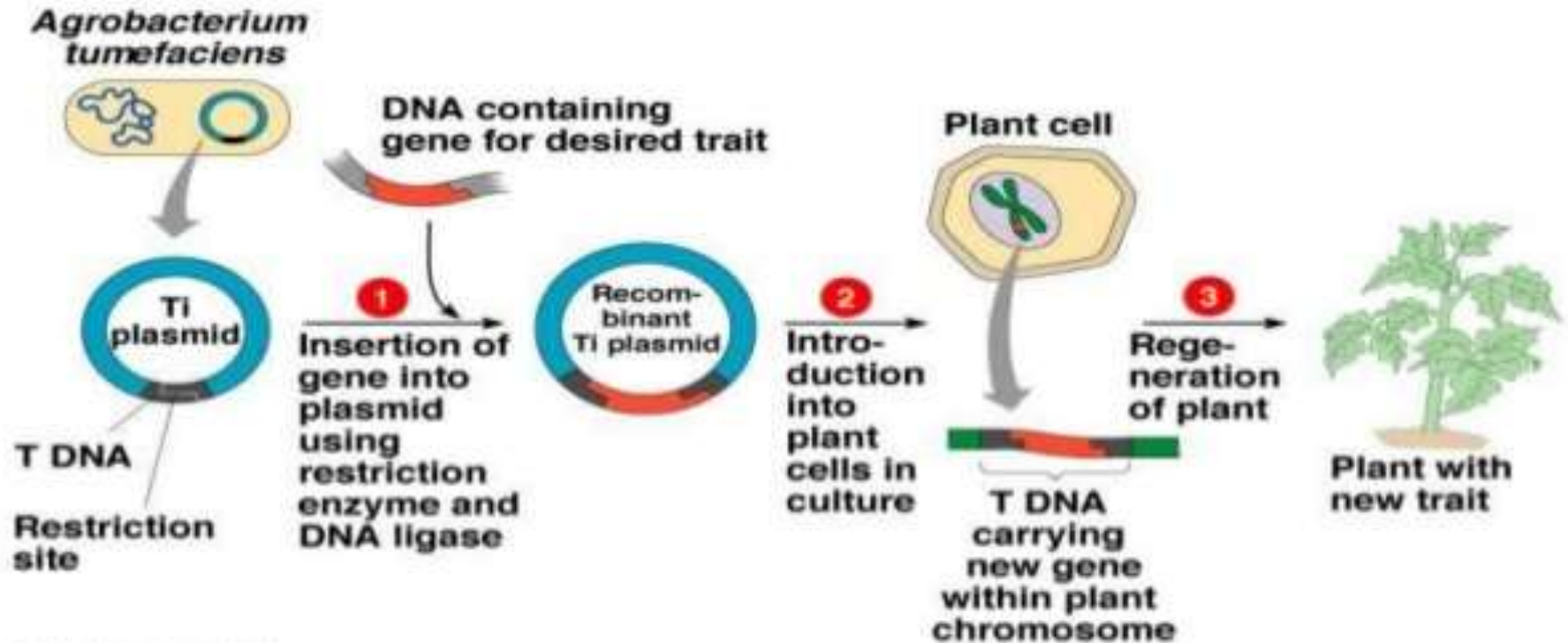


Eating raw potato triggers immune response to pathogen

Human Insulin Production



The role of bacteria in the genetically modifying of plants





**Thank You
So Much!**