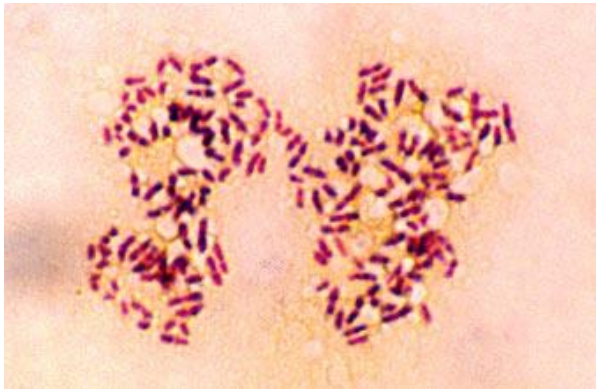
MICROORGANISMS

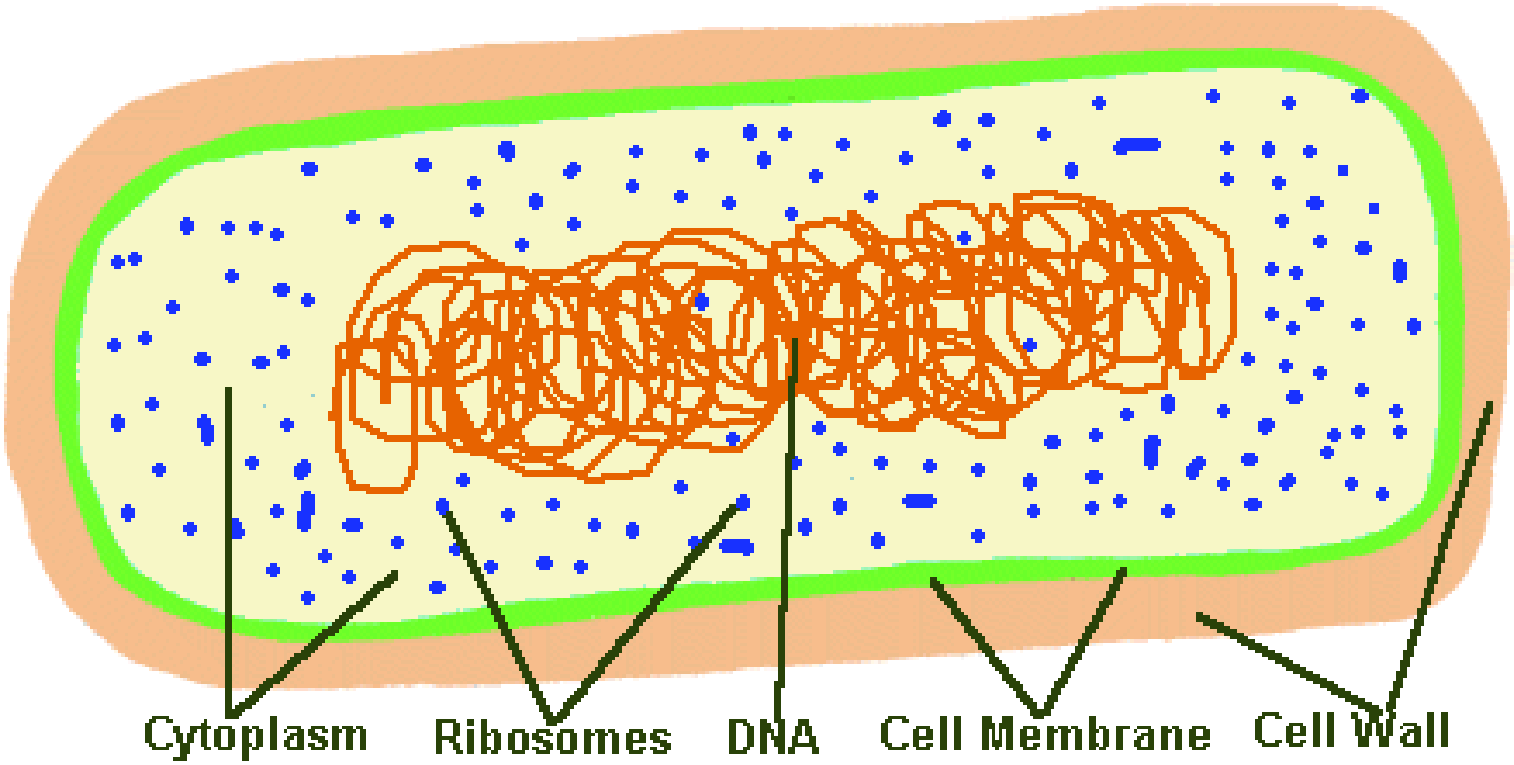
Charcteristics of Bacteria

I. Characteristics of Bacteria

A. Bacteria are Prokaryotes - they have no true nucleus or membrane bound organelles. Instead, DNA is concentrated into a nucleiod region.



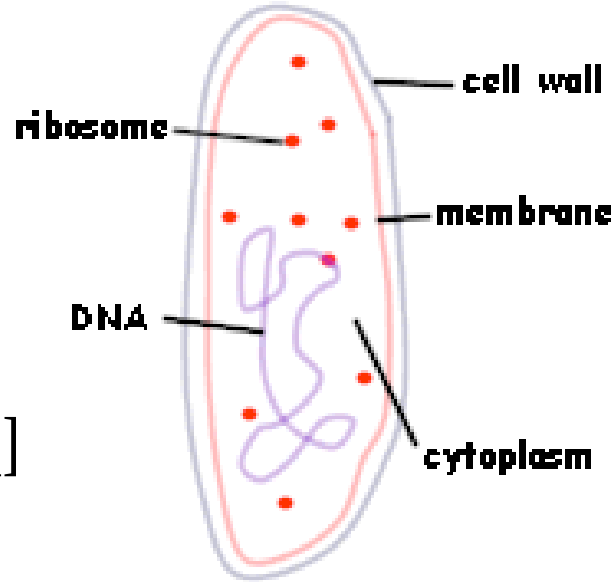
A Typical Prokaryote Cell



Charcteristics of Bacteria

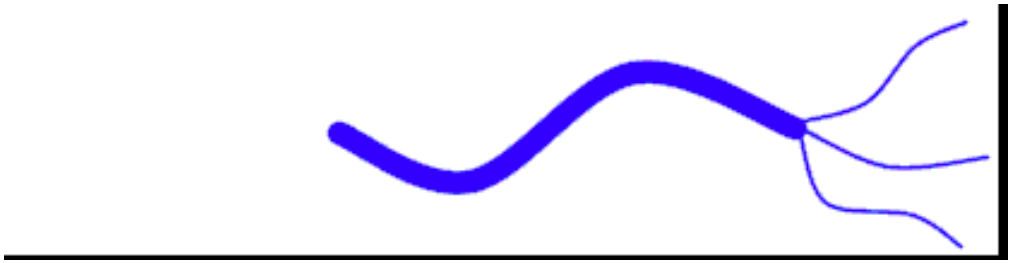
B. There are unicellular, colonial, and multi-cellular forms

C. Most bacteria have a cell wall that helps maintain the cell shape. The cell wall also protects the bacterial cell and prevents it from bursting.

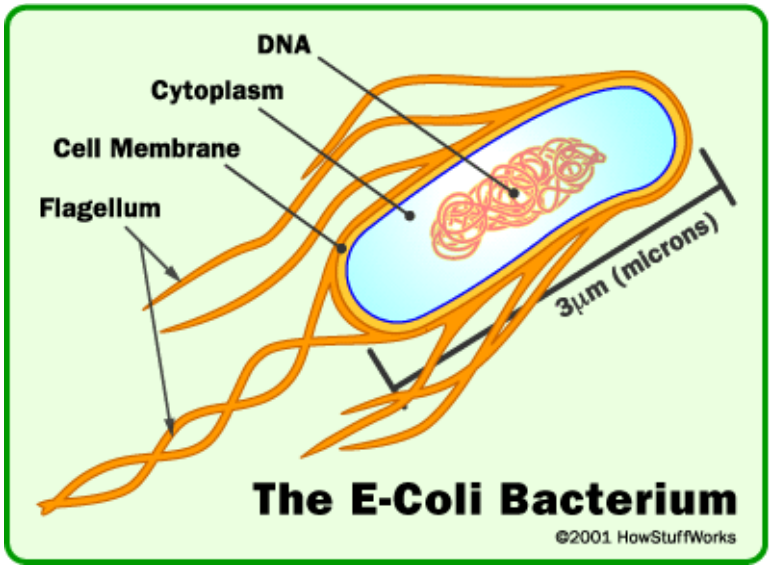


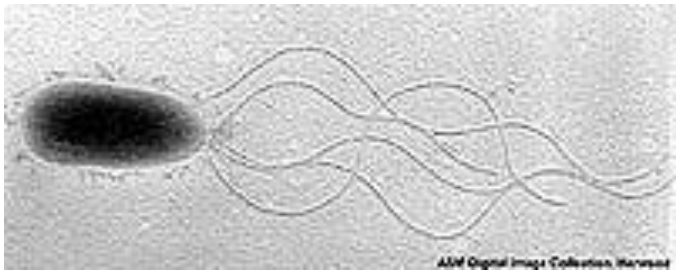
Charcteristics of Bacteria

D. Some bacteria contain a capsule. This is a gelatinous secretion which provides the cell with additional protection and helps the bacteria adhere to their host.



E. Some bacteria contain a flagellum which is like a tail anchored to the cell wall. The flagellum works like a propeller and moves the bacteria through a fluid environment.

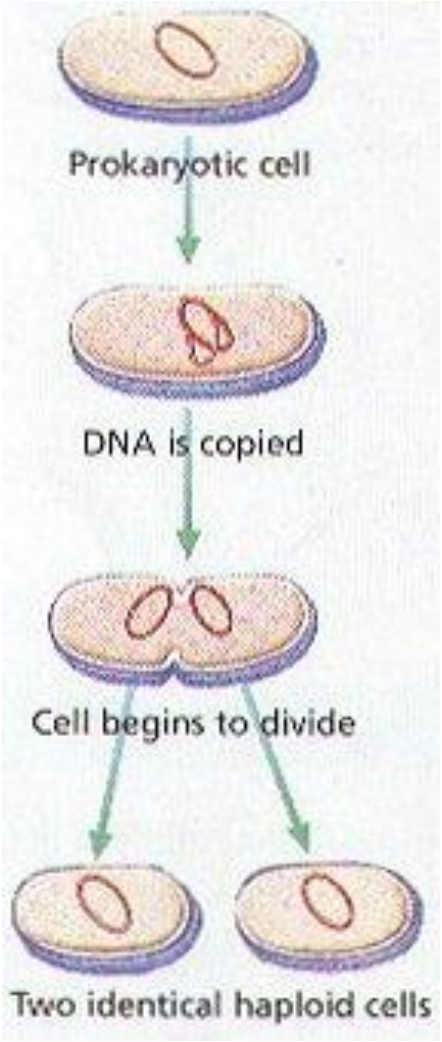




Reproduction

F. bacteria may reproduce in 1 of 2 ways:

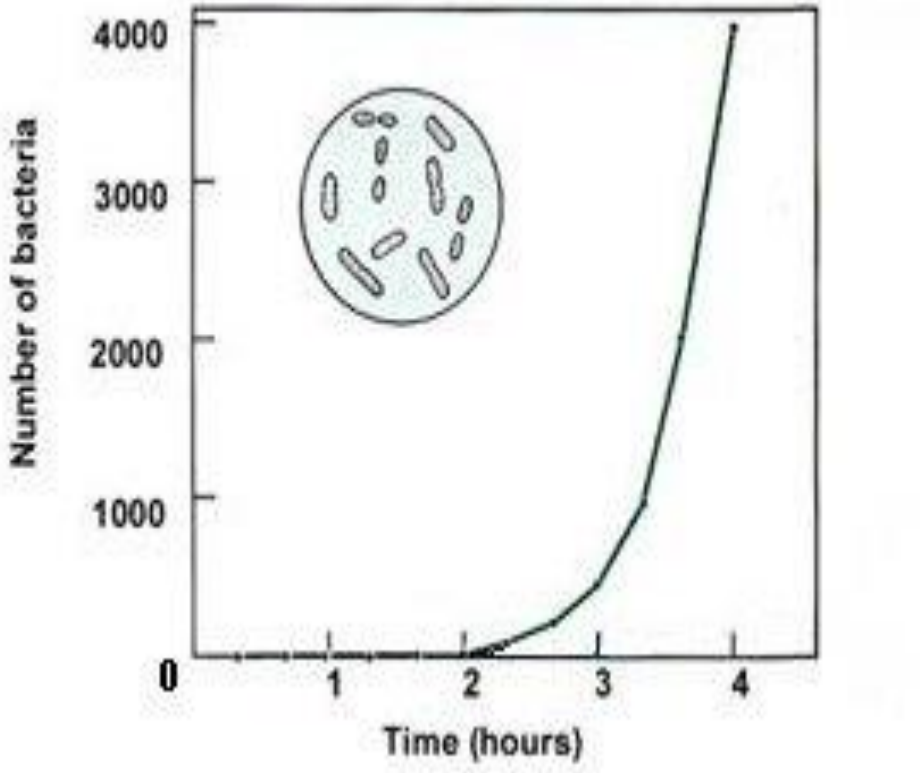
1. Binary Fission - asexual reproduction (no exchange of genetic material) in which the cell simply divides into two equal parts.



Reproduction

2. Conjugation - Simple type of sexual reproduction in which genetic material is transferred from one bacteria to another through a tube.

Reproduction



*bacterial growth is geometric

2 to 4 to 8 to 16 to _____ to _____ to _____

Response to Oxygen

II. Response to Oxygen

A. Some bacteria need oxygen: Aerobes

B. Some bacteria don't: Anaerobes

C. In fact, some anaerobes cannot survive in the presence of O_2

Classification

III. Bacteria Fall Into One of Two Kingdoms

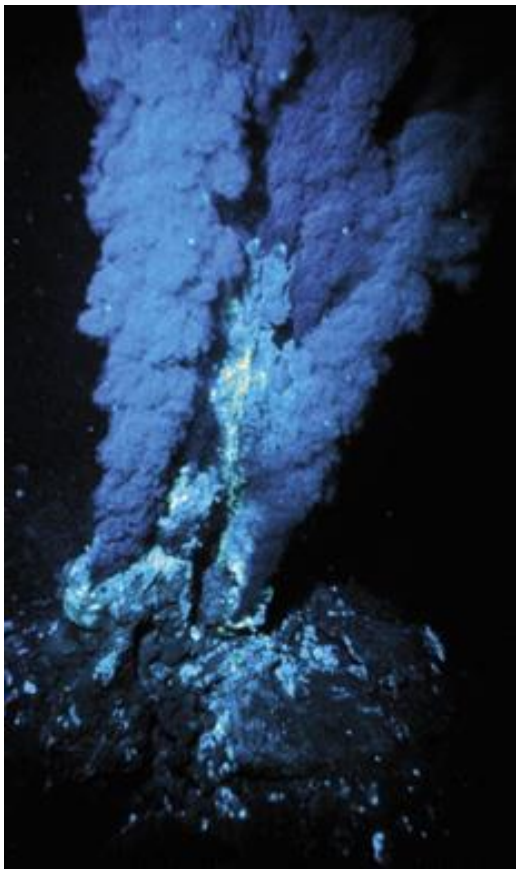
A. Archaebacteria - Members of this small kingdom live only in extreme places such as high salt environments and hot acidic water of sulfur springs

Classification

1. Methanogens - Live in oxygen free environments and produce methane

2. Halophiles - live in waters of extreme salinity

3. Thermoacidiphiles - live in hot acidic waters of sulfur springs



A sulfide-rich "black smoker" vents hot water into the cold ocean. Microbial extremophiles live on the vented minerals, anchoring a food chain of worms and other organism.

Classification

B. Eubacteria - This is the larger group of "normal bacteria" , there are thousands of bacteria types in this group. They are placed into groups based on:

1. shape

a. bacilli: rod-shaped

b. cocci: spherical

c. **spirilla**: curved walls

Classification

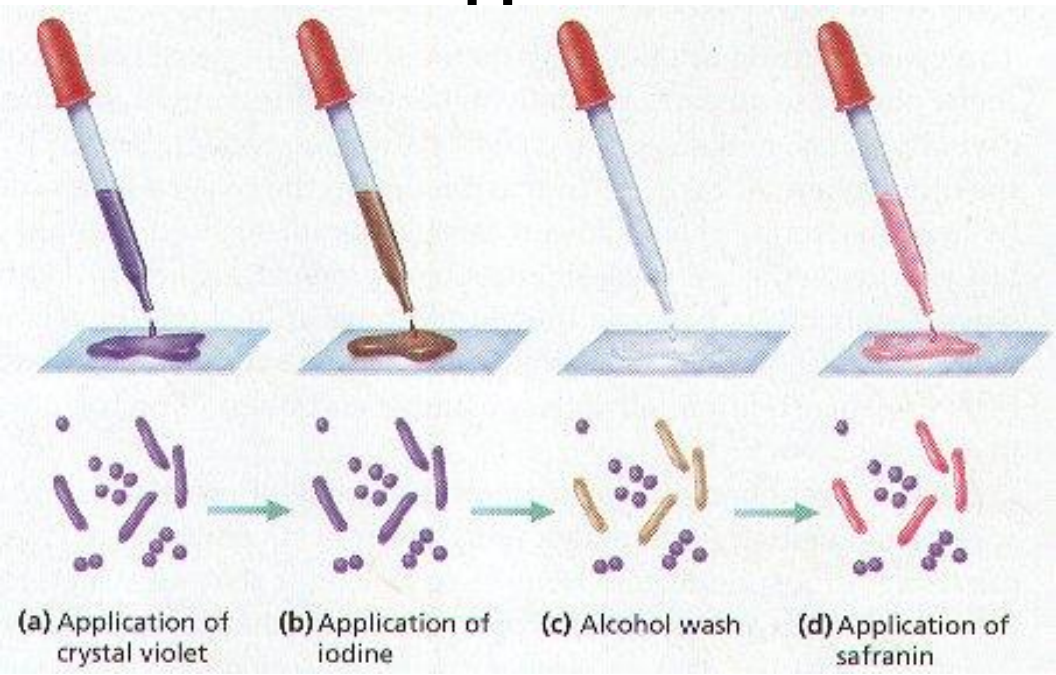
2. ability to form spores
3. method of energy production
4. nutritional requirements

Classification

5. Reaction to the Gram stain.

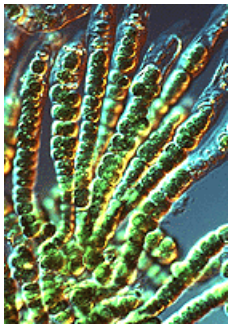
a. Gram-Positive Bacteria will retain the PURPLE DYE and appear Purple.

b. Gram-Negative Bacteria will appear PINK from the PINK DYE.



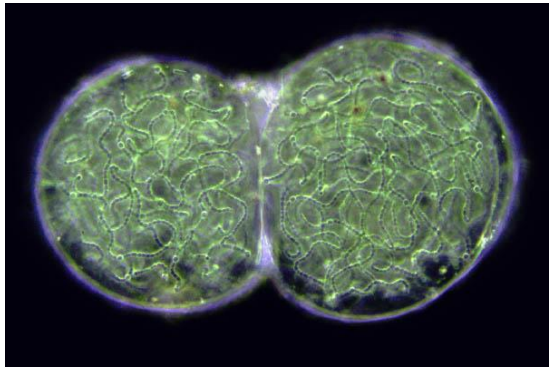
Eubacteria

C. <u>Eubacteria may be:</u>



1. photosynthetic ex. cyanobacteria
2. chemosynthetic- make their own food using chemicals … or
3. heterotrophic – can't make their own food

Ex. Parasitic bacteria



Adaptation

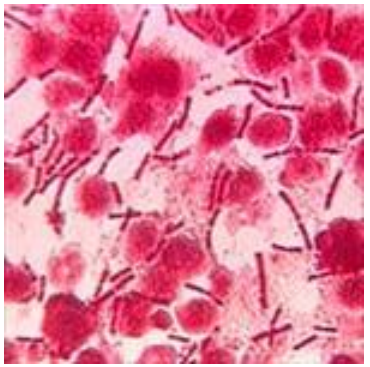
IV. Adaptations For Survival

A. Endospores -

1. resistant, dehydrated, cell with a thick cell wall.

2. formed when environment is unfavorable.

3. They germinate and give rise to new bacterial cells when conditions are good.



Anthrax Spores

Importance

V. Economic Importance

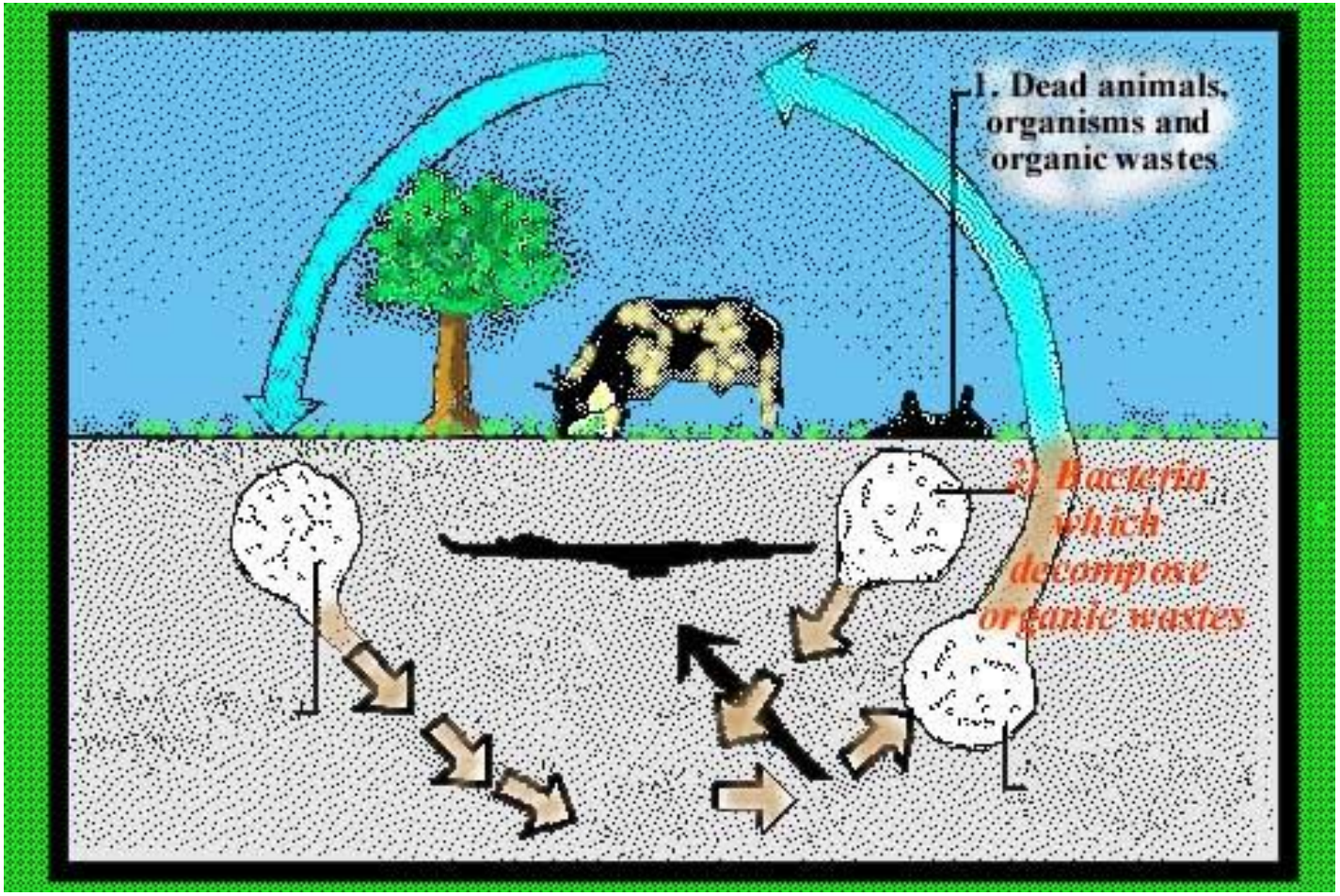
A. Nitrogen Fixation - convert N_2 gas into Ammonia

B. Recycling of Nutrients (decomposition) - breakdown dead organic matter and return nutrients to the soil

Nitrogen Fixation

- The nodules on soybean roots contain *Rhizobium* bacteria that convert nitrogen gas into ammonia.
- Symbiosis: plant gains useable source of nitrogen/ bacteria use sugars supplied by the plant

THE NITROGEN CYCLE



Importance

C. Food and Medicines

1. vinegar, yogurt, cheese, pickles
2. antibiotics

ex. streptomycin

Diseases

VI. Disease Causing Agents

A. It is estimated that half of all human disease is caused by bacteria

B. Examples of bacterial disease:

1. tuberculosis
2. strep throat
3. syphilis
4. tetanus

VII. Virus vs. Bacteria

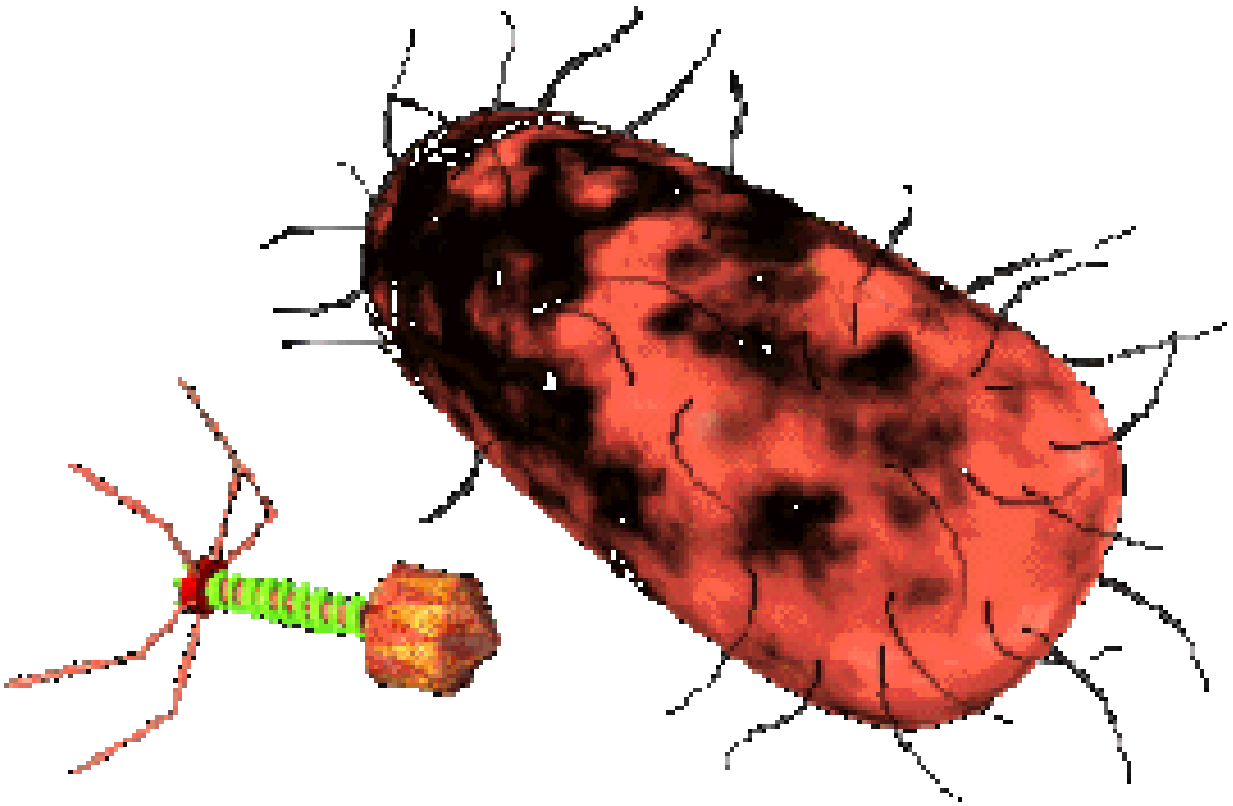
A. It's easy to mix these up since compared to us, both are

VERY SMALL.

But...

Bacteria, given the proper nutrients, can grow and reproduce on their own

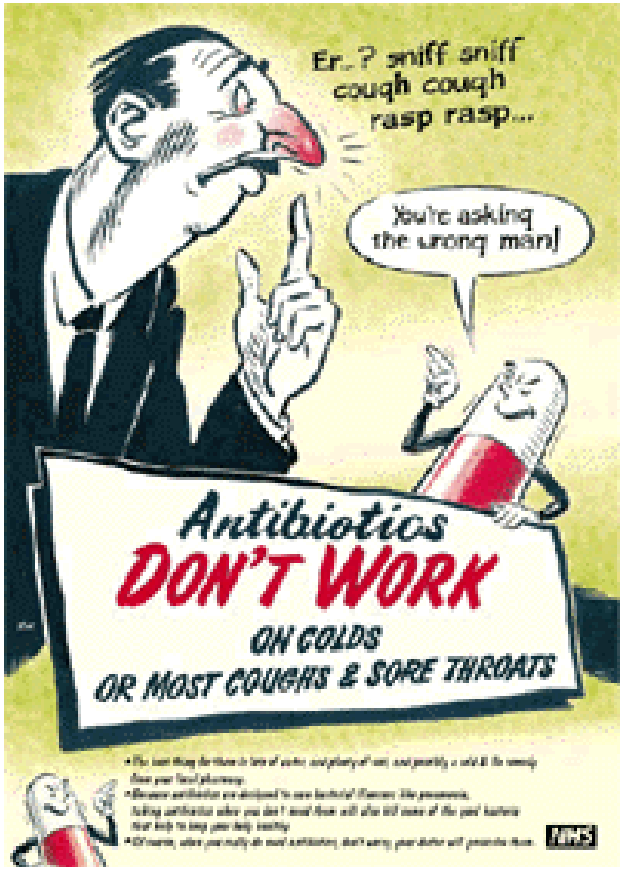
B. Viruses cannot "live" or reproduce without getting inside some living cell, whether it's a plant, animal, or bacteria.



C. compared to viruses, bacteria are

HUGE

VIII. Treatment of Disease



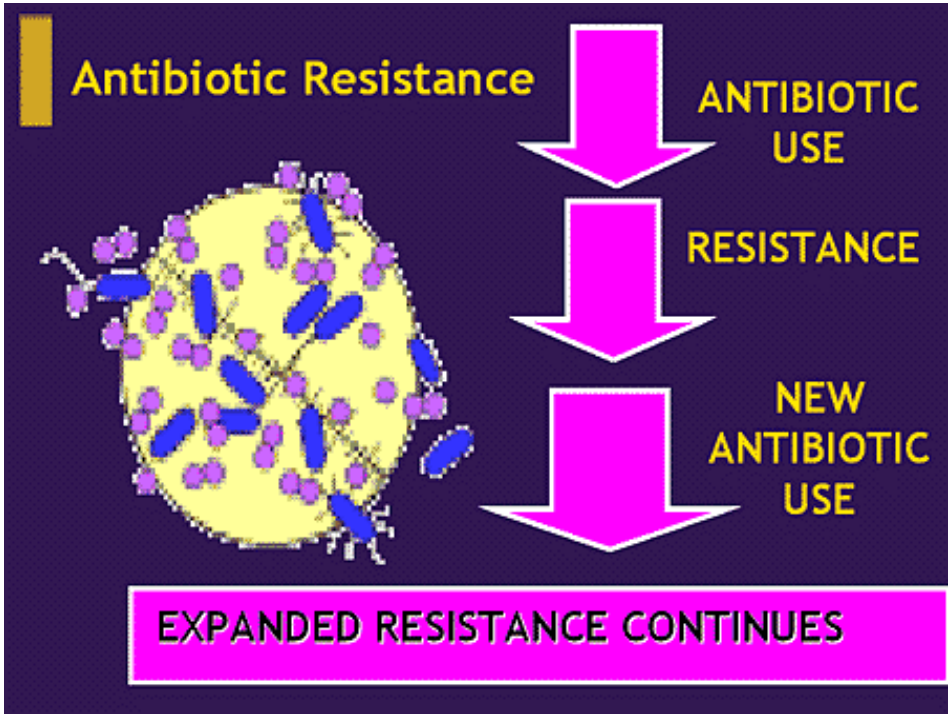
A. Antibiotics are often used to fight off bacterial infections

B. Since a virus is not a living cell, antibiotics used to fight living bacteria will not be effective on viral illnesses

C. Should you still take an antibiotic "just in case" or to help relieve your symptoms?

NO!!!

1. **This will only lead to antibiotic resistance of your immune system, causing you to get sicker in the future**

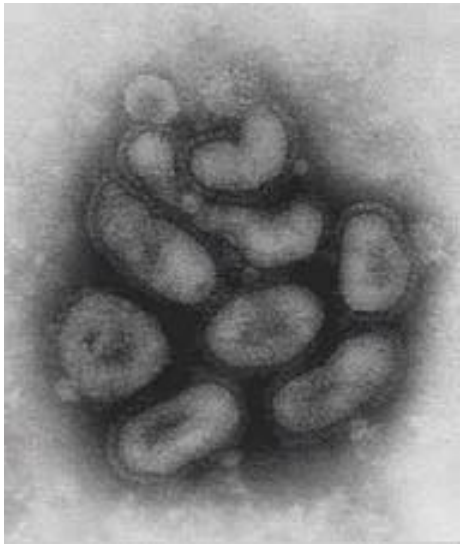


What is a Virus

I. What is a virus?

A. a virus is a tiny particle made of protein and genetic information

electron micrograph of a cluster of influenza viruses



What is a Virus

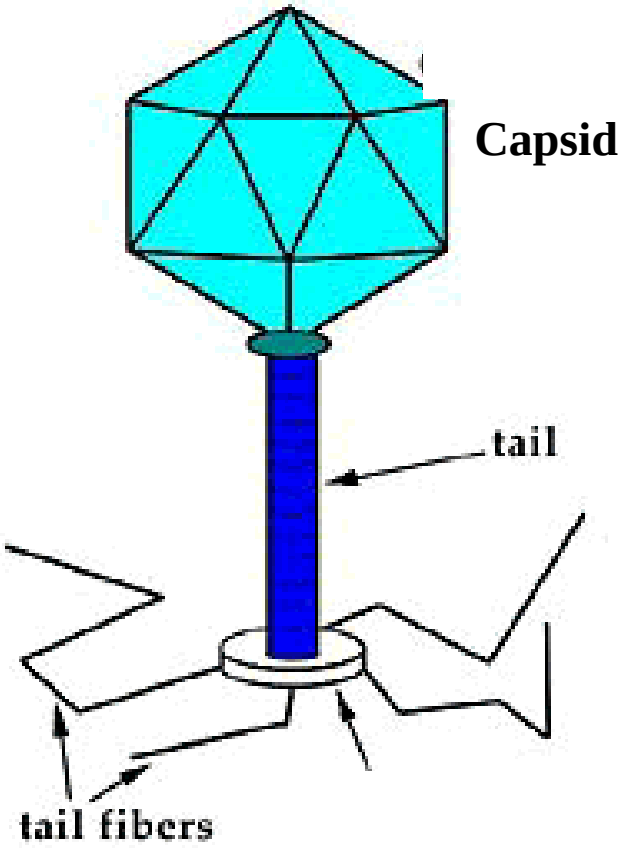
B. A virus has 2 parts

1. genetic material -

   a. the genetic information in viruses may be either RNA or DNA.

   b. viruses contain only a very small amount of genetic material

What is a Virus



2. Capsid

a. the Capsid is a shield made of protein that protects the genetic material.

Bacteriophage – a virus that attacks bacteria

What Viruses Do

II. What Do Viruses Do?

A. viruses inject other cells with their genetic material in order to reproduce

B. each type of virus infects a particular kind of cell in a specific organism

C. the specific organism that a virus attacks is called its host

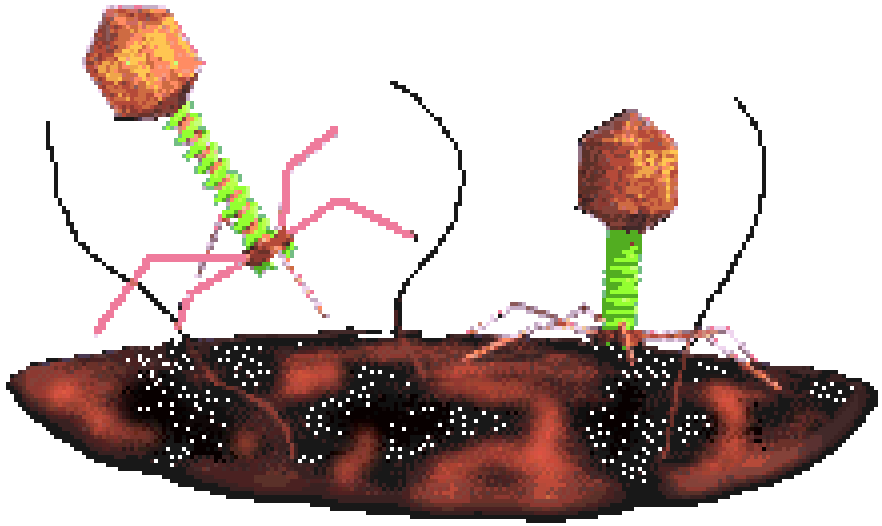
Viral Replication

III. How Do Viruses reproduce?

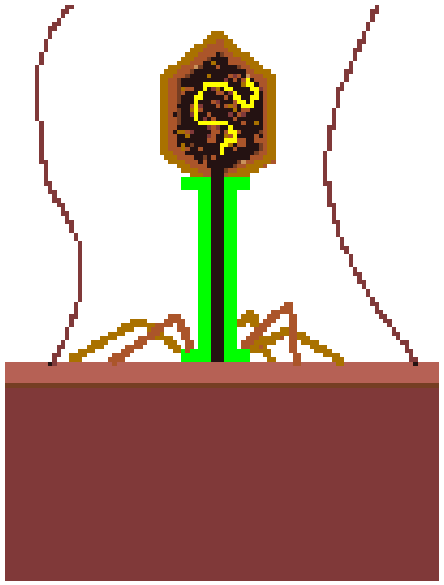
REPLICATION

A. Steps of Viral Replication

1. The virus attaches to a host cell



Viral Replication

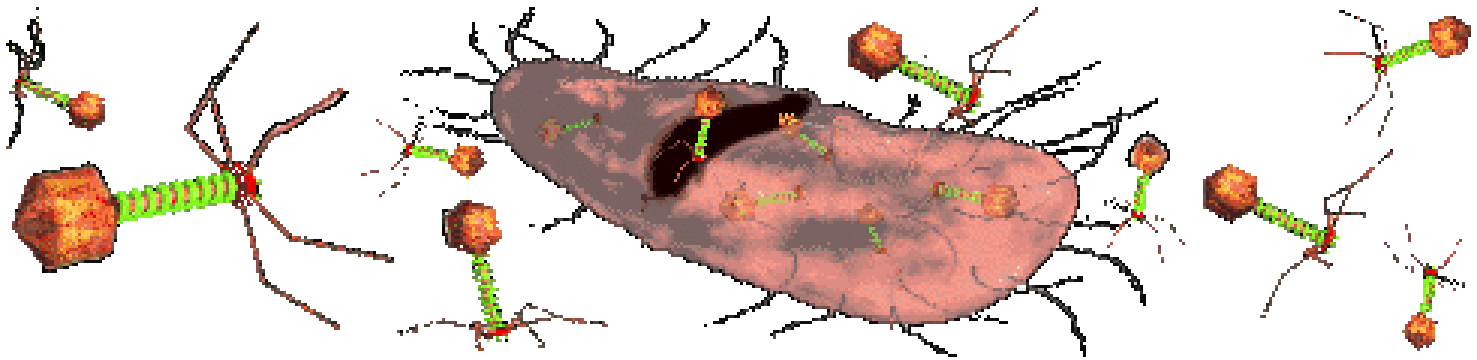


2. The virus injects its information into the host cell

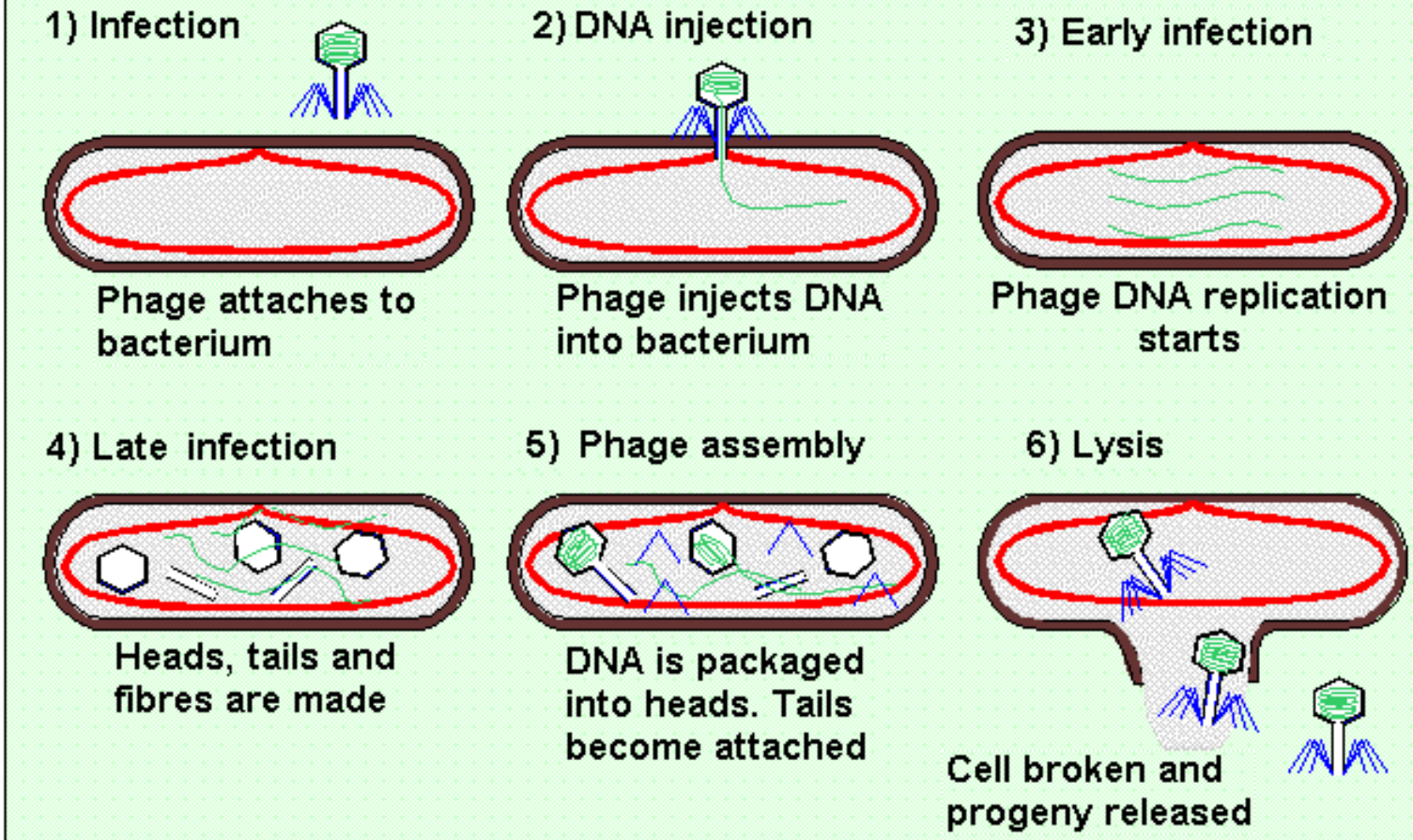
3. The genetic information of the virus takes control of the host cell and orders the production of new viruses

Viral Replication

4. New viruses are assembled in the host cell
5. So many viruses are made inside the host cell that the cell bursts (lysis)
6. The new viruses leave the host cell and go on to infect new cells.



Lytic development



Basic Virus Structure