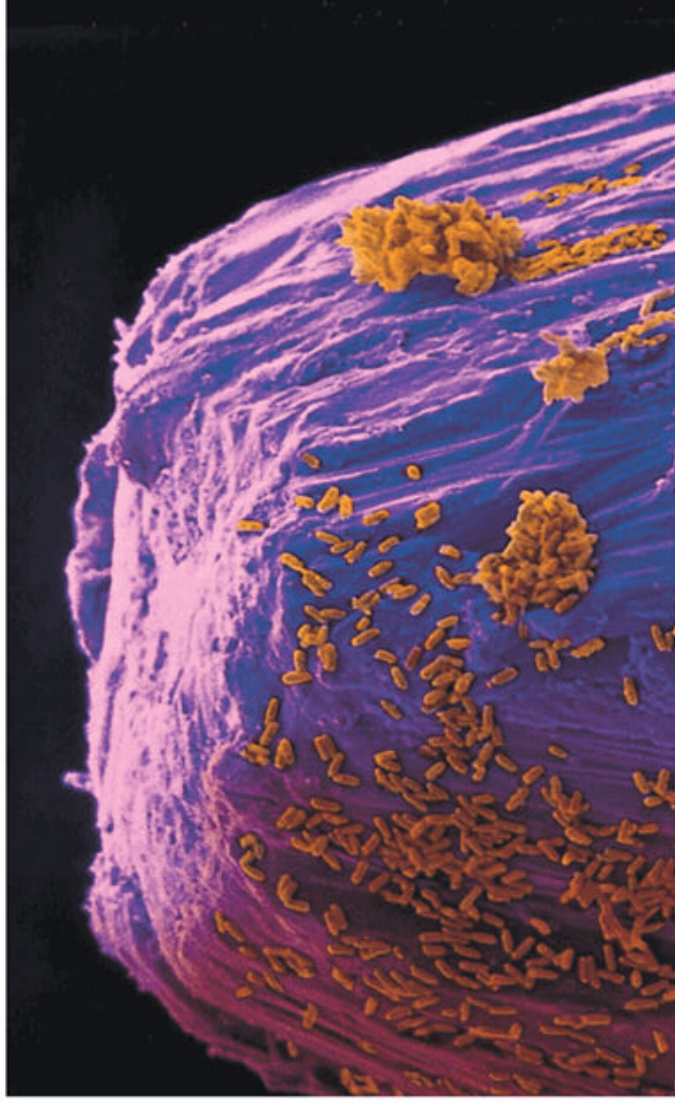


Prokaryotes are (and have always been) the dominant life form on planet Earth...in terms of sheer numbers

Prokaryotes outnumber eukaryotes by many powers of 10!
It is estimated that the world's population of bacteria is about 10^{30}

If you touched the door knob on the way in...you hit the "jackpot"!



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1 milliliter of saliva contains approximately 40 million bacteria!

A gram of soil...about 100, 000, 000 of them!

They are found in every environment on Earth...from ice caps to hot springs!

What makes these organisms so plentiful and successful?

...in short, their extremely varied array of forms and metabolic abilities!

Bacteria fight a PR Battle!



But...most bacteria are harmless!



Classification of Prokaryotes

DIFFERENCES AMONG THE DOMAINS BACTERIA, ARCHAEA, AND EUKARYA			
Characteristic	Bacteria	Archaea	Eukarya
rRNA sequences	Some unique to bacteria	Some unique to archaea; some match eukaryotic sequences	Some unique to eukarya; some match archaea sequences
RNA polymerase	One kind; relatively small and simple	Several kinds; complex	Several kinds; complex
Introns	Rare	In some genes	Present
Response to antibiotics streptomycin and chloramphenicol	Growth inhibited	Growth not inhibited	Growth not inhibited
Peptidoglycan in cell wall	Present	Absent	Absent
Histones associated with DNA	Absent	Present in some species	Present

Some Archea:



Thermophiles

Halophiles



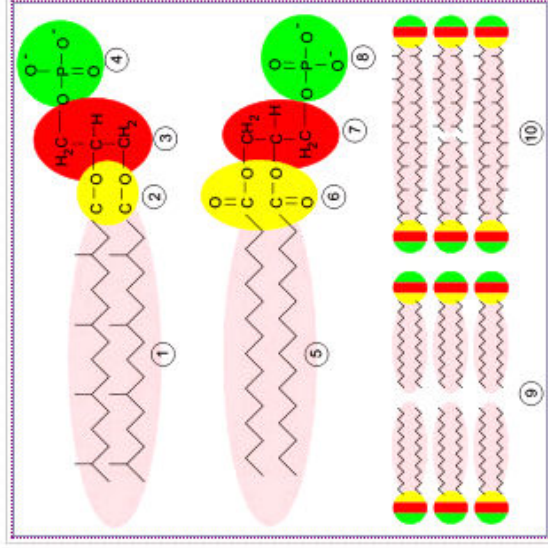
Methanogens (in gut)

Prokaryotic Variety:

External shape/membrane composition:

1. Archea vs.

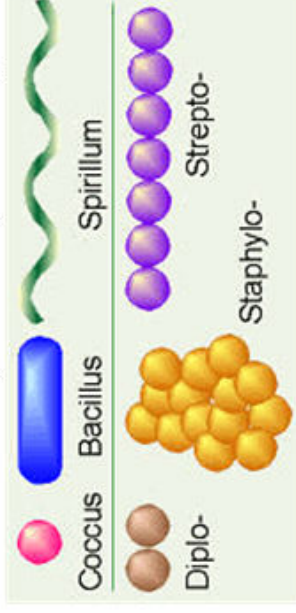
Bacteria...differences in lipids found in membrane



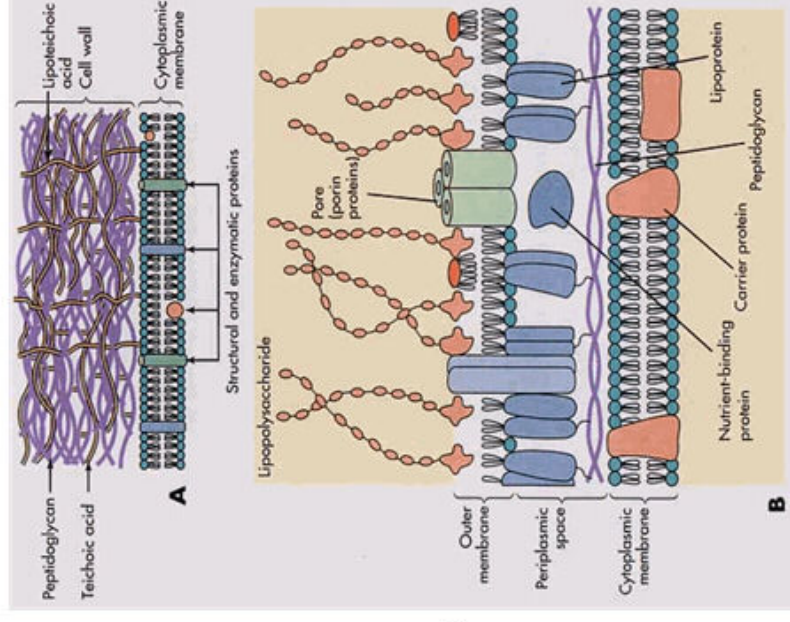
Membrane structures. **Top:** an archaeal phospholipid, **1** isoprene sidechain, **2** ether linkage, **3** L-glycerol, **4** phosphate moieties.

Middle: a bacterial and eukaryotic phospholipid: **5** fatty acid, **6** ester linkage, **7** D-glycerol, **8** phosphate moieties. **Bottom:** **9** lipid bilayer of bacteria and eukaryotes, **10** lipid monolayer of some Archaea.

2. Various shapes of prokaryotes



3. Gram-positive (A) vs gram-negative (B) bacteria



Motility/adhering abilities:

- flagella...tail-like structure provides locomotion
- pili...hair-like structures for adhesion/reproduction (cojugation)

Reproduction/Adaptations:

- fast reproductive rate under ideal conditions
- capability to form endospores (certain bacteria)...tough protective coat which protects dormant bacteria from harsh conditions

Types of metabolism/Obtaining nutrients and energy:

Energy source	
Light	Chemical
Photoautotrophs cyanobacteria	Chemoautotrophs sulfur bacteria
Photoheterotrophs purple nonsulfur bacteria	Chemoheterotrophs most bacteria

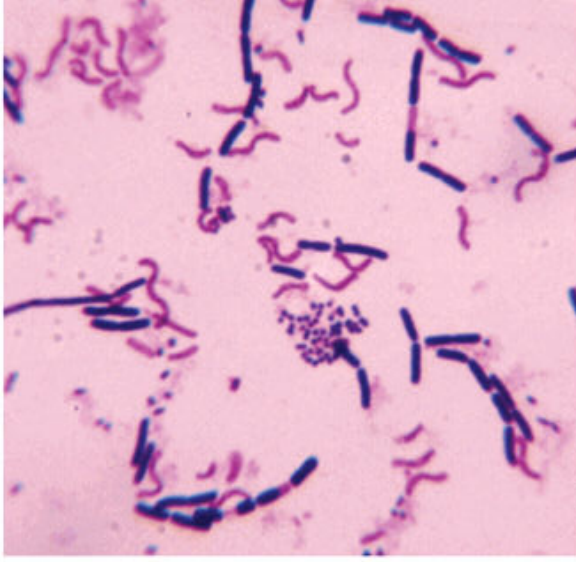
CO₂

Carbon
source

Organic
compounds

Gram-positive vs. Gram-Negative

Differences in composition of cell walls



More peptidoglycan
more simple
structure...generally
more benign

less peptidoglycan
more
complex...lipids
and
carbs...generally
more harmful

some antibiotics work because they interfere with and prevent the formation of the cell wall

Exotoxins

Botulism poisoning

Source of trouble

Low-acid foods that were improperly canned.

Trouble signs

- Clear liquids turned milky
- Cracked jars
- Loose or dented lids
- Swollen or dented cans
- An "off" odor



Home canned foods

Prevention

- Examine all canned foods before cooking
- Cook and reheat foods thoroughly
- Keep cooked foods hot (above 140 degrees) or cold (below 40 degrees)

Symptoms after eating

- Double vision
- Droopy eyelids
- Trouble speaking, swallowing or breathing
- Untreated botulism can be fatal

www.dacs.virginia.gov/foodsafety/botulism

The Roanoke Times

caused by secretion of protein
by bacterial cells

Botulism

Tetanus

Endotoxins

Meningitis

Salmonella

caused by gram-neg
bacteria releasing toxic
components of their outer
cell membrane upon cell
death

