

Bio Diversity Exam 3

Domain: Bacteria (no membrane bound nucleus) (Prokaryotes)

Domain: Archaea-(Prokaryotes)

Eukaryotes- possess a membrane bound nucleus

Roles bacteria/Archaea play

- increased in decomposition (break down) of organic matter
- sewage treatment
- cheese
- food production
- bacteria w/in us fight infection (immune function)
- vast diverse array of research
- global element cycle
 - N fixation
 - C,P,O cycling

Chapter 28 Prokaryotes

Spectrographic analysis- lipids

- 3.8 billion years ago
- NO O₂ in atmosphere anoxic

Prokaryotes are the most abundant life on Earth

- rod shaped
- spherical/oval
- spiral/helical
- colony forming prokaryotes
 - also filaments

Carl Woese- Bacteria vs archaea- woese separated them

- cell membrane structure
- plasma cell membrane differ pm in bio chemical construct-> pm is composed of lipids
- all have glycerol
- complex fatty acid tail

Both have cell walls

Bacteria- increased peptidoglycan → increased structure stability

archaea → NO peptidoglycan

→ Genetic differences associated w/protein production

Bacteria-unique simpler system

Archaea → same as Eukarya rationale underlying idea as to why archaea are more closely related to Eukarya

Archaea (found else where conditions)

- extremophiles
- Temperature, salinity, low nutrients

- chemical extremes
- high sulfur

Methanogens

- increased producers of methane (atmospheric gas)

Thermophiles:

- 60-80°C
- 140-175°F
- *Thermus aquaticus*
- PCR- Polymerase Chain Reaction
- enzyme: Taq Polymerase
- → heat stable

Hydrothermal vents

- deep in the ocean / deep freshwater lakes
- vents loaded w/hydrogen sulfide
- archaea metabolize H₂S

Acidophiles (Archae)

- low pH < 2.0
- acid mine drainage, bogs, pine-forest soils
- some foods

Halophiles: increased salinity; Great Salt Lake, Dead Sea

- 40% salinity
- soy sauce

Methanogens: Produce methane gas, dumps, garbage, pipe to power plants methane

- Wetlands habitat (loaded w/methanogens)
- large proportion of methane arises here

Methane: arises from cattle belching/ flatulence (Archaea live in stomachs digestive systems)

Termites: 4-5% of world methane production

DOMAIN Bacteria

- most basic way of characterizing diversity is by their cell wall structure
- determined by Gram staining (archaea doesn't show up)
- → indicator for biochem composition of cell wall

Gram +

- thick cell wall decrease
- major structural component is peptidoglycan
- (Plasma membrane) → stain added to the bacterial solution, stains peptidoglycan → produces purple

Gram -

- 2 layers in their cell wall

- → thin sheet of peptidoglycan
- → covering that layer is a lipid bilayer membrane porin(outer membrane)
- → lipopolysaccharides porin protein → recognition of toxins food, other orgs → determine what is allowed into cell.

Gram (-): much less susceptible to antibiotics

→ porin blocks strain from hitting peptidoglycan

- NO PURPLE
- → add another stain → gets through & stains the cell pink

Gram(+) bacteria

- Phylum Actinobacteria
 - mostly soil bacteria
 - many Actinobacteria infect plant roots forming nodules
 - fun of bacteria that “fix Nitrogen” → atmospheric N₂ → ammonia (NH₃) fertilizer → enhance growth/reproduction → interaction ++ mutualism → symbiosis
- “cry” gene has been bioengineered into plants gene into the plants
→ cause pest to die

peanut leaves w/o “cry” differences 4 mutations make cat, pillars to cry toxins.

Diamond back moth

→ now has resistance to “cry” toxin

Bacillus anthracis: anthrax- disease for grazing and oldest known, globally distributed by soil, long lived endospores

Streptococcus pneumonia → pneumonia

(cousin) Bacillus anthracis → Anthrax

→ oldest known disease of grazing animals

→ globally distributed in soil → long lived endospores

Streptococcus

- pneumonia, meningitis
- Streptococcus (respiratory)
- Staphylococcus (infectious) skin
- soft tissue
- digestive infection

“commensals

“ living on skin throat”

— no negative effect on you + for bacteria

“commensal” → +,- interaction bacteria benefits, no harm to other orgs (no help)

staph/strep “very opportunistic”

Amycolaptosis orientalis-Actinobacteria → produces vanomycin (antibiotic)

staphylococcus aureus- Marsa (commensal, can be very opportunistic)

- multi-drug resistant, staph aureus