

Biological Diversity
BSCI 10110-1
MWRF 1:10-2:00
Dr. Mark Kershner

Week 7

10/12

Exam 2: Friday, 10/16

- Chapters 22, 23, 26, 27, and 28
- everything through the end of Wednesday

Review Session: Wednesday, 10/14, 4-6 in Bowman 207

Domain Bacteria

- gram staining
 - cell wall composition
 - indicates...
 - resistance to environment
 - recognizing nutrients and other organisms
- gram positive (+) bacteria
 - thick cell wall
 - major component is peptidoglycan
 - staining colors peptidoglycan layer
 - purple
 - Fig 28.8
- gram negative (-) bacteria
 - 2 layers in cell wall
 - thin sheet of peptidoglycan
 - outer layer that is a lipid bilayer membrane
 - lipopolysaccharides, porin
 - recognition of toxins, food, other organisms
 - creates barrier that inhibits/prevents certain molecules from getting in
 - much less susceptible to antibiotics
 - porin – protein
 - regulating cell entry
 - prevents coloring of peptidoglycan layer
 - another dye is added
 - pink cells

Gram positive (+) bacteria

- Actinobacteria
 - soil bacteria
 - form nodules on plant roots
 - ex. alfalfa, bean, alder tree
 - full of bacteria
 - symbiotes
 - both plant and bacteria gain advantage

- nodules: gaining access to structure, nutrients – C
- plant: N fixation
- N₂ → NH₄ (ammonia)
- nodule (N₂ → NH₄) → made available to plant
- increased growth
- increased production
- common – dental plaque
 - biofilm – community of bacteria, fungi, algae, viruses
 - complex structure
 - side of tooth
 - early colonizers: minimum of ten species
 - late colonizers: form on top of early colonizers, toxins
- many produce antibiotics (streptomycin, tetracycline)
 - produce anti-fungal
 - very expensive energetically for bacteria to make
 - protects them from fungi/bacteria
 - growth increases
 - no competition for food (limiting resource)
- they produce spores (resting stage)
 - during drought
 - allows them to handle difficult environmental conditions
- Arthrobacter*
 - gain energy from lots of substrates
 - break down toxins, heavy metals – soil contaminants
 - bioremediation
 - Hexavalent chromium
 - Erin Brockovich
 - treated by an *Arthrobacter*
- Frankia*
 - nodule forming bacteria
- Mycobacterium bovis*
 - bovine tuberculosis
- Streptomyces*
 - good and some very bad species
 - streptomycin
- Bacillus thuringiensis* (Bt)
 - “insecticidal” bacterium
 - biocontrol
 - gypsy moths
 - agricultural pests
 - black flies
 - bacterium dehydrate → endospore and crystal
 - on plants
 - Eurasian corn borer
 - feeds on leaves
 - ingests Bt (spore and crystal)

- spore will develop into bacteria
- crystal dissolves → releases protein → binds to the gut wall → toxic → eats holes into gut wall
 - reduces digestion – starve to death
 - paralyzed – death

10/14

- Bt (review)
 - corn borers
 - Bt crystals
 - go toxic when they are digested
 - cry toxin bonds to the gut wall
 - using genetic engineering, incorporated the cry gene (responsible for toxin) into plant genome
 - present in all tissues
 - cry toxin bonds to the gut wall
 - mortality
 - corn, cotton, beans, alfalfa, peanut plants
 - presence of cry toxin in crops → evolutionary pressure
 - could select for resistant individuals
 - must reproduce
 - Diamondback moth already shows resistance
- Bacillus anthracis* (anthrax)
 - oldest known grazing animal disease
 - global → in soil
 - long-lived endospores
 - agricultural areas
 - three major forms
 - inhalation of spores – nearly always fatal
 - cutaneous – living bacterial cells
 - gastrointestinal – ingestion of spores
 - it takes a significant number of spores for a significant infection
 - approximately twenty thousand spores needed
- Streptococcus/Staphylococcus*
 - common on human skin
 - opportunistic pathogens
 - Strep*
 - pneumonia, rheumatic/scarlet fever, tooth decay
 - Staph*
 - respiratory/skin/blood/digestive, sinus infections
- Streptococcus pneumoniae*
 - pneumococcal meningitis
- Streptomyces orientalis*
 - produces Vancomycin (antibiotic)