**Bacteria**

1. **Taxonomy**
   1. Belong to the empire PROKARYOTE because they do not contain a NUCLEUS
   2. Previously, in the kingdom MONERA with ARCHAEA
2. **Structure**
   1. Size 10-100μm
   2. Lack MEMBRANE-BOUND organelles
   3. Cell wall composed of CARBOHYDRATES surrounds a CELL MEMBRANE
   4. Some have FLAGELLA that protrude from cell MEMBRANE through the cell WALL; these are used for MOVEMENT
3. **Obtaining energy**
4. Autotrophs:
   1. Phototropic autotrophs: TRAP THE SUN’S ENERGY

Example: CYANOBACTERIA

* 1. Chemotrophic autotrophs: GET ENERGY FROM INORGANIC MOLECULES SUCH AS HYDROGEN, SUFLIDE, NITRITES, SULFUR, IRON

Example: NITROSOMONAS

1. Heterotrophs
   1. Chemotrophic heterotrophs: GET ENERGY FROM BREAKING DOWN ORGANIC MOLECULES AND ABSORBING THEM

Example: MOST BACTERIA

* 1. Humans are also CHEMOTROPHIC HETEROTROPHS
     1. Many bacteria compete with us for FOOD SOURCES
     2. Example: E-COLI grows in raw meat and sewage
     3. If not properly cooked (to kill the bacteria) they will “eat” this food and release SALMONELLA into it, causing the illness we call FOOD POISONING

1. **Metabolism**
   1. Aerobic or RESPIRATION, requires OXYGEN
      1. Obligate aerobes REQUIRE O2 or they DIE
      2. Facultative aerobes do not require, but can use, OXYGEN
   2. Anaerobic or FERMENTATION, does not require OXYGEN
      1. Obligate anaerobes DIE in the presences of OXYGEN
      2. Example organism: CLOSTRIDIUM BOTULINUM
         1. Found in the SOIL
         2. Produce TOXINS that cause botulism that interfere with NERVE activity, causing paralysis and sometimes DEATH
         3. Botox:
   3. FACULTATIVE anaerobes: CAN SWITCH BETWEEN AEROBIC AND ANAEROBIC DEPENDING ON THEIR ENVIRONMENT
2. **Growth and Reproduction** 
   1. Bacterial growth is limited by:
      1. AVAILABILITY OF FOOD
      2. PRODUCTION OF WASTE
   2. Binary fission is an example of ASEXUAL reproduction



* 1. Conjugation is an example of SEXUAL reproduction, which helps introduce VARIATION



* 1. Spore formation
     1. Endospore: DNA AND SOME CYTOPLASM ENCLOSED IN THICK INTERNAL WALL
     2. During this phase bacterium are DORMANT, they do not GROW or reproduce
     3. Can remain in this phase for MONTHS until conditions improve

1. **Uses for bacteria**
   1. Bacteria are used to produce
      1. CHEESE
      2. YOGURT
      3. BUTTERMILK
      4. PICKLES
      5. SAUERKRAUT
      6. SOUR CREAM
      7. VINEGAR
   2. Industrial uses
      1. OIL SPILL CLEAN UP
      2. WASTE/POISON REMOVAL FROM WATER
      3. MINE MINERALS
      4. DRUG AND CHEMICAL SYNTHESIS
   3. Symbiosis, example: humans and E-COLI
      1. Bacteria benefit by being provided with:
         1. WARM/SAFE HOME
         2. FOOD
         3. FREE TRANSPORTATION
      2. Humans benefit by getting:
         1. HELP DIGESTING FOOD
         2. VITAMINS WE CAN’T SYNTHESIZE
2. **Bacteria in the Environment**
   1. Nutrient flow, bacteria recycle: CAN TAKE INORGANIC MOLECULES AND MAKE THEM ORGANIC
   2. Sewage decomposition: bacteria grow RAPIDLY here and as they grow: BREAKDOWN COMPLEX COMPOUNDS TO CREATE PURIFIED WATER, N2 GAS, CO2, FERTILIZERS
   3. Nitrogen fixation:
      1. ALL organisms on Earth are totally DEPENDANT on bacteria and archaea for NITROGEN
      2. Our atmosphere is 80 % nitrogen gas but living things need it in SOLID form.