The Prokaryotes

- Simplest organisms
- All unicellular
- Lack nuclei
- Lack organelles
- Peptidoglycan (cell wall)
- Multiply by binary fission
- Divers metabolism (eat about anything)
- Diverse habitats

Bacteria vs. Archaea
- Two different forms of prokaryotes
- Two separate domains
- Very different
- Ancient split

Prokaryote Shapes
- Bacilli
- Cocci
- Spiral

Pleomorphic bacteria can assume several shapes.

Range in size from 2-8 um long and 0.2-2 um in diameter.
(1 um = 1/1,000,000 m)

Some are pathogenic (disease causing), but most are harmless.
Exotoxins and Endotoxins
Prokaryotic Nutrition:
How organisms obtain carbon and energy:
  Autotrophs
    Photoautotrophs
    Chemoautotrophs
  Heterotrophs
    Photoheterotrophs
    Chemoheterotrophs

Oxygen Requirements:
  Obligate aerobes
  Facultative anaerobes
  Obligate anaerobes
  Aerotolerant anaerobes
  Microaerophiles

Many prokaryotes thrive in hostile environments (Archaea).
  *acidophiles, thermophiles, basophiles, halophiles*

Modifications for Survival
1) prokaryotic flagellum
2) pili
3) endospores
4) actinomycetes (fungus like)

Special Prokaryotes
*Cyanobacteria*
  - photosynthetic bacteria
  - blue-green
  - blooms
Nitrifying Bacteria
- convert ammonia and nitrite into nitrate
- agriculture

Nitrogen Fixing Bacteria
- fix nitrogen gas into ammonia
- root nodules of legumes

Sulfur Reducing Bacteria
- deep sea vents
- may represent earliest forms of life

The Prokaryotic Cell
I. Structures external to cell wall
   A. Glycocalyx
      - Gelatinous glycoprotein covering
      - Includes capsules and slime layers
      - Functions:
        1. Protect from phagocytosis
        2. Adherence
        3. Prevent desiccation
        4. Feeding

   B. Flagella
      - Solid, unsheathed, protein
      - Filament, hook, basal body

   C. Axial Filaments

   D. Fimbriae and Pili
II. The Cell Wall
- Rigid structure surrounds plasma membrane
- Consists of peptidoglycan
- Two different types based on structure
  1) Gram +
  2) Gram –
- Porins

III. Structures internal to cell wall
   A. The plasma membrane
      - Phospholipid Bilayer with interspersed proteins
      - Encloses the cytoplasm
      - Mesosomes = irregular infoldings of the membrane

   B. Cytoplasm
      - Fluid component of cell
      - Mostly water with soluble material

   C. The nuclear area (nucleoid region)
      - Region contains bacterial chromosome
      - Plasmids

   D. Ribosomes
      - 70S (as opposed to 80S in eukaryotes)
      - Sites of protein synthesis
      - Damaged by some antibiotics

   E. Inclusions