

Prokaryotes & Eukaryotes

Lecture #4 – Dr. Gary Mumaugh

Subjects Covered

- Life Forms: Overview
- Prokaryotes & Eukaryotes: Introduction & Assessment
- Similarities and Differences between Prokaryotes & Eukaryotes

Characteristics of Cellular Life

- Cell Organization
- Three Basic Parts of a Cell
 - Membrane (selectively porous both inside and out)
 - DNA region (located within a nucleoid or nucleus)
 - Cytoplasm & subcell parts, otherwise known as organelles

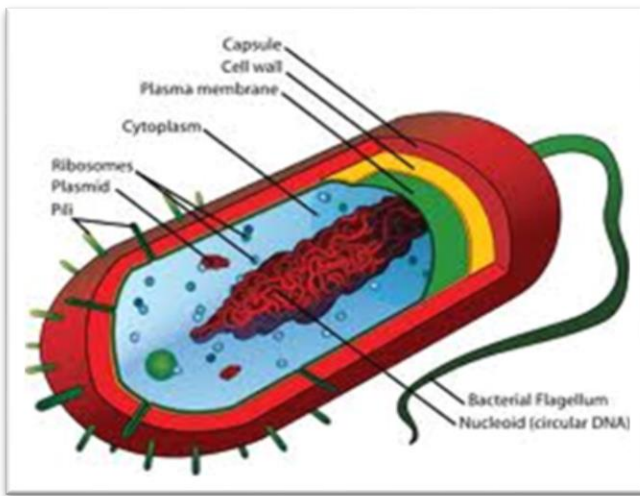
Minimal Requirements for Life

- Cell membrane that separates outside from inside
 - A cell without a membrane is, by definition, not a cell
- All cells have DNA as basic genetic material
- All cells are composed of the same basic chemicals: carbohydrates, proteins, nucleic acids, minerals, fats and vitamins
- All cells maintain some level of consistency with regard to the flow of nutrients and wastes that enter and leave the cell
- All cells have the ability to reproduce and are the by-product of reproduction
- All cells need a steady stream of energy
- All cells have extensive sensory systems
 - This information is regularly processed so that important metabolic decisions may be made in a timely manner

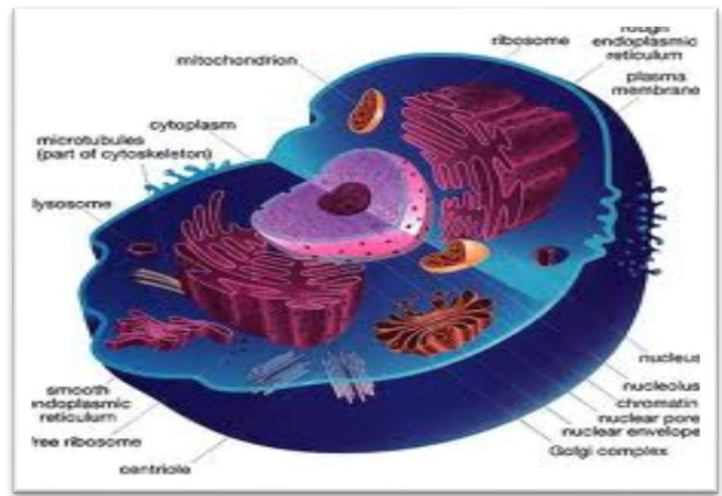
Prokaryotes: Introduction

- Prokaryotic cells are the more primitive
- Less complex than eukaryotic cells
 - Prokaryotes contain fewer organelles
- Original inhabitants of this planet
- Reputation for being the toughest of the tough
- They outlast all other living things in terms of being able to withstand the cold, heat, acidity and other extreme conditions including pressure and altitude
- Two forms: Archaea and Bacteria
 - Difference is in the structure of their cell walls
- Prokaryotes are unicellar
- They lack a cell nucleus and other membrane-bound organelles
- While the great majority of prokaryotes are bacteria, the two terms are often used interchangeably





Prokaryotes



Eukaryotes

Eukaryotes

- Organisms with a membrane-bound nuclei
- Mostly in multi-cellular form (known as protists)
- Eukaryotes are found within animals, plants and fungi

Structural Differences Between Prokaryotes and Eukaryotes

- Prokaryotes
 - Lack a nucleus and membrane-bound cell compartments
 - They do have cell walls
 - Smaller than eukaryotes
 - Contain a single loop of DNA stored in an area named the nucleoid
 - Higher metabolic rate & a higher growth rate
- Eukaryotes
 - Have a well defined nucleus
 - Much larger than prokaryotes by typically a thousand times by volume
 - Have a variety of internal membranes and structures called organelles
 - Has a cytoskeleton composed of microtubules and microfilaments
 - DNA is divided into several bundles called chromosomes

What Eukaryotes Have That Prokaryotes Do Not Have:

- Division of cells into nucleus and cytoplasm separated by nuclear envelope
- Complex chromosomes comprised of DNA
- Complex membranous cytoplasmic organelles
- Complex flagella and cilia
- Capable of ingesting fluid and certain materials within enclosed sacs
- Cellulose containing cells
- Cell division
- Two copies of genes per cell
- Sexual reproduction involving meiosis and fertilization

