Cell Organelles

Cellular Organelles

Nucleus:

- Identified by Robert Brown – 1831 Tradescantia virginiana
- Frederich Meischer – localization of DNA in 1869 from white blood cells/sperm of trout
- Nucleus is the largest organelle (10% volume of cell)
- Diameter = 10 micrometers; volume = 40 micrometers
- Found in all eukaryotic cells except mature erythrocytes and sieve tube cells of phloem
- Evolutionary origin: membrane surrounded early prokaryotic nucleoid
- Mesosome: folded invaginations of plasma membrane of bacteria produced by chemical fixation techniques for preparation in electron microscopy
    - Engulf of heterotrophic prokaryote = mitochondria
    - Engulf of photosynthetic prokaryote = plastid
- Components of nucleus:
    - Double membrane bound organelle
    - Space between outer/inner membrane is perinuclear space
    - Nuclear pore complex – 10 diameters
    - Chromatin – genetic stuff inside nucleus is DNA with histone proteins and acidic nuclear proteins
        - Heterochromatin – condensed and inactive DARK in em
        - Euchromatin – less dense and active GREY in EM
    - Nucleolus – site of rDNA genes which make RNA

    - Nucleoplasm – aqueous part of nucleus that contains enzymes, RNA, solutes, chromatin
- Role of nucleus: site of genetic information/control of cell divisions and heredity
- Chromosome structure:
    - DNA – 2nm
    - Histones –
    - Nucleosome: Histones come together and DNA wraps around it to make nucleosome (10nm)
- Chromosomes occupy different place inside nucleosome
- T. Cremer and B.Joffe – genes cluster on edge of nucleus

Nuclear Pore:

- Nuclear transport experiments done to determine pore size and transport mechanism
- 1960's: Carl Feldherr – inject gold in unicellular amoeba
    - Within a minute at nuclear pore
    - Within 10 minutes in nucleoplasm
    - 1960's
- 1970's: Experiments used fluorescent tagged proteins
    - saw that molecules <60,000 MW passed
- 1980's: Ron Laskey: studied nucleoplasmin (nuclear protein)
    - radioactively tagged nucleoplasmin
    - used autoradiography process:
        - C14 -> C12 + e-

        - Detect radioactivity in film of cell
        - Incubate cells in radioactive compound, wash cells, dehydrate cells and put on slide, put slide in radioactive emulsion, store slides in darkbox
    - Results:
        - Put tag on nucleoplasmin and inject into cytoplasm of cell
        - Used protease to separate core and tail of nucleoplasmin
        - Tagged both core and tail separately
        - Core stayed in cytoplasm
        - Tail moved into nucleus
        - Broke tail into two pieces A and B
        - Tagged both A and B separately
        - Part A tail stayed in cytoplasm
        - Part B tail moved in nucleus
    - **Nucleoplasmin has 17 sequence amino acid that targets into nucleus – NUCLEAR LOCALIZATION SIGNAL**
- Nuclear transport mechanism:
    - Nuclear transport signal attaches to molecule coming in
    - Nuclear transport receptor attaches to molecule/nuclear transport signal entity
    - Transports inside to nucleus
    - Receptor disengages from molecule

Mitochondria:

- Site of cellular respiration