Types of Cells

Prokaryotes	"Before nucleus", doesn't contain a membrane bound nuceleus
Eubacteria	Prokaryote; True bacteria
Archaea	Prokaryote; Missing link between prokaryotic and Eukaryota cells
Eukaryotes	"True nucleus", contains a membrane bound nucleus
Eukarya	Eukaryotic; domain containing eukaryotes

Eubacteria

- Small (650 nm)
- Contains cell wall, can be gram stained
- Organelles:

Nucleoid = Ring of DNA; plasmids

Cytosol = Jelly-like material

Ribosome = None-membrane bound, synthesizes proteins (rRNA)

- Gram stain is purple = positive, thick cell wall
- Gram stain is pink = negative, thin cell wall

Archaea

- Discovered in 1977
- Cannot be gram stained
- Similar organelles as eubacteria, but the cell wall is different
- Contains histones (packaging molecules, what chromosomes wrap around)
- Contains chromosomes, a eukaryotic characteristic

Eukarya

- Eukaryotic cells
- Organelles:

Nucleus

Nucleolus

Membrane bound organelles

Ribosomes

History of Cells

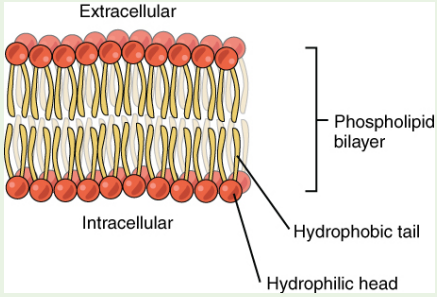
1665; Robert Hooke	Named cells
1830s; T. Schwann	Stated that cells make up all living things
1850s; Mettius Schleiden	Stated "...the vital process of individual cells must form first and is the basis of life"
Late 1850s; Rudolf Virchow	Established the cell theory with other scientists

Cell Theory

1) All living things are made of cells, cells are the unit of life for all living things

2) Cells arise from preexisting cells

Plasma Membrane



Phospholipid bilayer formed by the presence of water due to hydrophobic interaction

Function = control what goes in and out of the cell

Proteins in Cell Membrane

Integral Protein	Proteins that go completely through the protein
Peripheral Protein	Surface of the membrane, trigger/receptor proteins = transports/responds
Glycoprotein/Glycolipid	used for cell recognition

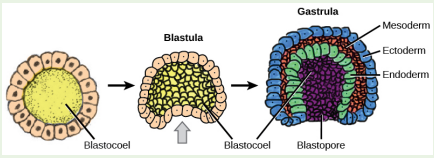
Proteins in Cell Membrane (cont)

Cholesterol	Keeps the fluid-like characteristics of the membrane

Homeostasis

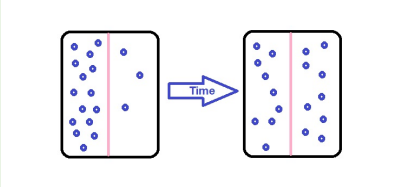
Homeostasis	Ability for a cell/organism to maintain its internal environment
Apoptosis	Programmed cell death, based on genetics
Poikilothermic	Body temperature fluctuates
Homothermic	Constant body temperature

Gastrula



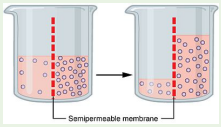
Zygote - Fertilized egg
Blastula - Hollow sphere of germ/stem cells

Diffusion



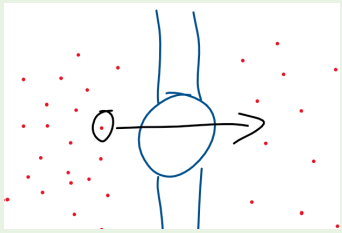
Movement of a particle/atom/molecule using a concentration gradient, move from an area of high concentration to an area of low concentration

Osmosis



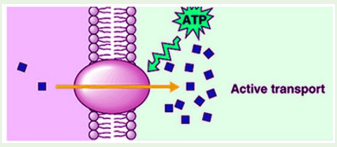
Movement of water using a concentration of water, moving from an area of high water potential to an area of low water potential

Facilitated Diffusion/Passive Transport



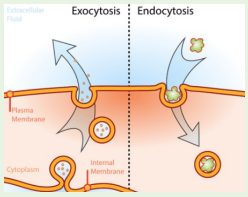
Diffusion of a large particle (ex. starch), requires an integral protein but no energy

Active Transport



Also called "pumps", pumps material against concentration gradient (low to high), requires a protein and energy

Endocytosis and Exocytosis



Other transport mechanisms

Other Transport Mechanisms

Phagocytosis	Used for large materials
Pinacytosis	Used for small materials

Forms of exocytosis and endocytosis

Transport Terms

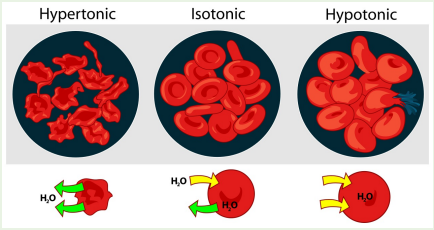
Hypertonic	High concentration
Hypotonic	Low concentration
Isotonic	Equal concentration
Crenate	Cell shrinks

Transport Terms (cont)

Lysis	Cell Explodes

If a cell is hypertonic, the solution is hypotonic and vice versa

Hypertonic/Isotonic/Hypotonic



Methods of Nutritional Feeding

Heterotrophs	Organisms consumes other organisms
Autotrophs	Organisms makes its own foods (photosynthesis)
Chemoautotrophs	Uses sulfur as a food source
Organotrophs	Uses organic compounds for food
Lithrotrophs	Uses inorganic compounds for food

Genetic Material

Nuclear Membrane
- Composed of phospholipids
- Has pores, allows mRNA to pass through

Nucleus
- Contains 2 types of DNA:

1) Chromosomes (present during cell division)
2) Chromatin (uncondensed DNA)

Nucleolus
- Not membrane-bound (= no phospholipids)
- Just condensed DNA
- Function: synthesize rRNA (ribosomes)

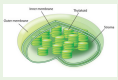
Organelles

Organelle	Organ of the cell
Cytosol	Jelly-like material, cytosol + organelles = cytoplasm
Golgi Apparatus	Membrane bound; Function: Synthesize carbs, modify proteins & lipids
Ribosome	Not membrane bound; Function: Synthesize protein, composed of rRNA
Endoplasmic Reticulum (ER)	Membrane bound; Has two types: 1) Rough - Contains ribosomes, synthesizes proteins and lipids 2) Smooth - No ribosomes, synthesizes lipids
Mitochondria	Double membrane bound; Function: Provides 95% of the cell's energy
Peroxisome	Membrane bound; Function: Break down toxins
Vacuoles	Membrane bound; Function: Stores water, minerals, etc
Lysosome	Membrane bound; Function: Breakdown organelles and produce digestive enzymes, ONLY IN ANIMAL CELLS
Cell Wall (Plants)	Composed of cellulose & pectin (protein fiber)
Chloroplast	Double membrane; Function: Photosynthesis, ONLY IN PLANT CELLS
Plastids	Double membrane; Function: Store starch, ONLY IN PLANT CELLS

Organelles (cont)

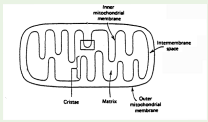
Tonoplasts	Membrane for large central vacuole (which is ~90% of of plant cells, holds water, ions, salts, and buffers)

Chloroplast



Two reactions:
1) Light reaction (Thylakoid)
2) Dark reaction (Calvin cycle, stroma)

Mitochondria



- Provides 95% of a cell's energy
- Matrix: Krebs cycle
- Cristae: Electron transport chain (ETC)

Cytoskeleton

Found in all cells, Function: Support and hold shape of the cell, organelle placement, move things

Microfilament	7 nm thick, deals with muscle contractions (actin)
Intermediate Filaments	8-10 nm thick, holds cell shape
Microtubules	25 nm thick, moves chromosomes in cell division

Other

Root Hairs	Cytoplasm projections, Function: water absorption
Alveoli	Air sacs in the lungs, needs water for gas exchange between blood and the air sac

Other (cont)

Villi	In small intestine, 1,500 microvilli on villi increases surface area

What Happens Under These Conditions?

Animal cell is in a hypertonic solution

> Cell crenates (gets smaller)

Animal cell is in a hypotonic solution

> Cell lyse (lysis -> cell expands and explodes)

Animal cell is under UV light

> Cell death, causes thymine dimers (thymine bonds with thymine in DNA)

Radiation

> Cause ionization

Growth hormones as a food additive

> Hormones are estrogen based, possibly causes delayed or early puberty

Pesticide

> Also estrogen based, alligators don't develop sexual organs