

Chpt 3: Life is Cellular

This unit will begin with the Cell Theory

- 1-the cell is the basic unit of life
the unit of structure and function of all living things
- 2-all organisms are made of 1 or more cells
- 3-all cells come from pre-existing cells

Contributors to Cell Theory: 200 years of research, many scientists contributed

Robert Hooke	1665	British
discovered cells in cork, gave name "cell"		

Anton van Leeuwenhoek	1695	Dutch
ground lenses for living, he observed micro-organisms swimming in water		

Robert Brown	1830's	British
discovered & named nucleus, dense center of cell		

Matthias Schleiden	1830's	German
botanist, used MS to examine plant tissues he stated "all plants are made up of cells"		

Theodor Schwann	1830's	German
zoologist, used MS to examine animal tissues "all animals are made up of cells"		

Rudolph Virchow	1850's	Russian
physicist & biologist, he saw cells dividing- "cells come from pre-existing cells"		

Cytology: study of cells

tools: the development of the microscope (MS) has been one of the most important tools to a biologist
Compound Light MS, can magnify up to 1000 times
our maximum in class 400 times (x400)
sends stream of light through object to focus image

Electron MS, developed in 1950's
can magnify up to 600,000 times
sends stream of electrons through specimens to
make image, image is seen on computer
downside: specimens must be specially prepared, no
longer living

2 types Electron MS

- Transmission Electron MS (TEM)

 - transmits electrons through tissues to get
image of inside

- Scanning Electron MS (SEM)

 - sends electrons to specimen & they bounce
back creating a 3D image, this gives info
about shape of cells

Electron micrographs: pictures from EM

Comparison of Prokaryotic and Eukaryotic cells

- all cells are surrounded by cell membrane
- all cells filled with jellylike substance, cytoplasm
- all cells have chromosomes carrying genes in form of DNA
- all cells have ribosomes

Differences between Prokaryotic and Eukaryotic Cells

Prokaryotic Cells	vs	Eukaryotic Cells
only found in bacteria		found in protists, fungi, plants, animals
no nucleus, DNA is found in nucleoid region		true nucleus, DNA is found here
usually single chromosome		many chromosomes
have cell wall: made of lipids, proteins, no cellulose		fungi: cell walls of chitin plants: cell walls of cellulose
have no cellular organelles except ribosomes		have many cellular organelles
size: extremely small, 1-5um		size: 10-100 micrometers

Eukaryotic cells have 4 major parts: cell membrane, nucleus, cytoplasm, & cellular organelles

- Cell Membrane: outer boundary of cell, regulates what comes in & what goes out of the cell
we will talk about structure next semester

- Nucleus: control center of cell
usually a large dense body in center of cell
most cells have 1 nucleus, some multinucleated
surrounded by nuclear membrane with pores
pores allow communication btw nucleus & rest of cell
contains genetic material: DNA in form of chromosomes
contains 1 or more nucleoli
smaller round bodies made of RNA, make ribosomes

- Cytoplasm: "living soup of cell"
mostly water, but also proteins, carbs, lipids, nucleic acids, & cellular organelles
nucleoplasm: cytoplasm w/in nucleus
2 components to cytoplasm: cytosol & cytoskeleton
cytosol: water component
cytoskeleton: network of very fine protein fibers that give organization & support to cell
a change in protein fibers allows cell to move or change shape

- Cellular Organelles: "little organs" w/in cell, each w/ specific job
mitochondria, ER, ribosomes, Golgi apparatus, lysosomes, vacuoles, centrioles, chloroplasts

Cellular Organelles

1-mitochondria: "powerhouse of the cell"

function: makes E for the cell by process of cellular respiration, takes glucose (food E) turned into ATP

structure: rod or sausage-shaped organelle surrounded by double membrane that folds inside

2-endoplasmic reticulum (ER)

w/in cytoplasm network

structure: network of membranes folded back & forth
these can connect to nucleus and/or to cell membrane

2 types: smooth ER w/no ribosomes or rough ER w/
ribosomes

function: divides cells into regions, helps make molecules
fats, transports molecules through cell

3-ribosomes

structure: small round bodies made of RNA, smallest
organelles

found attached to ER or free-floating in cell

function: work w/ER to make proteins

Cellular Organelles cont.

4-Golgi apparatus (GA): "factory" or "post office"

structure: a series of flat, membrane bound sacs that looks like stack of pancakes

function: package and secrete products for export
put products into vesicles & move out of the cell

5-lysosomes: "suicide sacs"

found in animal cells only

structure: membrane-bound vesicles that contain digestive enzymes

function: they can break down food particles, cell wastes, worn out cell parts, or cell itself

they can fuse with other vesicles & digest things inside
or they can release contents into cell & begin digest. cell

6-vacuoles

structure: these are vesicles (membrane-bound sacs) that can contain H₂O, organic compounds, salts, pigments

function: storage areas

Cellular Organelles cont.

7-centrioles

function: help with cell reproduction

found in animal cells, fungi, algae, not plants

structure: pair of cylinder-like structures made of protein tubules

only noticeable in dividing cells

8-chloroplasts

structure: roundish or oval membrane-bound sacs that contain chlorophyll, green pigment

function: photosynthesis occurs here

found in any photoautotrophic organisms: all plants, some protists

not found in photosynthetic bacteria, these have chlorophyll but not chloroplasts

Special Features of cells

flagella: long, whiplike tail for locomotion
found in sperm cells, many microorganisms

cilia: tiny hairlike structures on surface of cells
these also function in movement
in microorganisms, they function in locomotion
ex. paramecium

in multicellular organisms, they move materials
ex. found in respiratory tract, move mucous to clean
tract
found in female reproductive tract, moves egg
from ovary to oviducts to uterus