CHAPTER 7 LECTURE NOTES

- Kennedy
- biol. 1ab

STRUCTURE AND FUNCTION OF THE CELL

I. Discovery of the Cell

- Cells were discovered by scientists before electricity was in every home and horses were still the primary means of travel

1. The early 1600's

- Microbiology was in its infancy, and technology was very poor
- but that didn't stop Robert Hooke from looking for cells

2. Microscopes

- Microscopes were very simple when cells were discovered they only allowed us to see the outlines of cells not the insides

a. light microscopes

- Light microscopes gave scientists the ability to see things much more clearly
- magnification of 1000X's
- cell organelles became visible

b. transmission electron microscopes

- This microscope improved our study cells by allowing us to magnify up to 1 million X's
- two problems: specimens had to be dead and the image was only 2D

c. scanning electron microscopes

- Last great improvement on microscopy
- has the same magnification as the TEM
- images are now 3D

3. Scientists who studied the cell

- Hooke
- Van Leeuwenhoek

a. Hooke (1635-1703)

- He was the first to describe cells
- studied cork slices
- described what he saw as tiny little boxes
- looked at plant cells only

b. Van Leeuwenhoek (1632-1723)

- Continued the study of cells, and is important because he was the first to describe living cells
- viewed both plant and animal cells

4. The Cell Theory

- Developed by Schlieden and Schwann
- characteristics that all cells have in common

a.All cells come from preexisting cells

- Cells do not simply form on their own
- they arise from other cells through cell division (something that was to be studied at length later)

b.All things are made of cells

- Everything that was studied either living or once living was made of cells
- only non-living things such as rock lacked cells

c.Cells are the basic unit of life

- There is no more simple example of life

II. Cell Diversity

- Cells show a great deal of diversity in size, shape, structure and function

1. size

- Cell range from .2um to 6 meters in length
- they are restricted by the surface area to volume ratio SA^2: V^3
- .2um = bacteria
- 6 meters = giraffe nerve cells
- largest in volume = ostrich egg

2. shape

- Cell shape is primarily cubical or columnar
- other common shapes include: bacilli, cocci, and spirrilum (these are bacteria only)

3. internal organization

- Cells show two distinct types of internal organization
- this organization allows us the opportunity to classify the cells as prokaryotic or eukaryotic

a. prokaryotes Vs. eukaryotes

- Prokaryotes:
  - no nucleus
  - no organelles
  - single stranded, circular DNA
  - slime coat
  - primitive cells
  - example: bacteria

prokaryotes Vs. eukaryotes

- Eukaryotes:
  - have a nucleus
  - have organelles
  - double stranded, helical DNA
  - cell wall and/or cell membrane only
  - advanced cells
  - example: human body cells

III. Parts of the Cell

- 1. Cell membrane
- 2. cytoplasm
- 3. ribosome
- 4. Smooth E.R
- 5. rough E.R
- 6. golgi apparatus
- 7. Mitochondria
- 8. lysosomes.
- 9. microtubules + mircofilaments
- 10. cilia
- 11. flagella
- 12. cell nucleus
- 13. plant cells
- 14. cell wall
- 15. vacuoles
- 16. plastids

1. Cell membrane

- The cell gate keeper
- made of a phospholipid bilayer and proteins
- regulates what goes into and out of the cells

a. fluid mosaic model

- Model used to describe the fluidity of the cell membrane
- proteins are not looked into one place on the cell membrane they can float freely through it

2. cytoplasm

- The soupy mixture that all of the cells organelles float in
- helps to provide the cell with internal structure

3. organelles

- All the membrane bound miniature organs of the cell

a. ribosome

- Location of protein synthesis
- composed of a 30s and 50s subunit
- can be freely floating or attached to the endoplasmic reticulum

b. smooth endoplasmic reticulum

- The smooth endoplasmic reticulum transports sugars and fats only
- appears as spaghetti in the cell

c. rough endoplasmic reticulum

- The rough endoplasmic reticulum transports protein
- studded with ribosomes
- looks like spaghetti with meat balls

d. golgi apparatus

- The UPS system of the cell
- sole job is packaging and secretion of materials into and out of the cell
- looks like a stack of pancakes

e. mitochondria

- Powerhouse of the cell
- contains its own DNA and ribosomes
- divides when it wants not with the rest of the cell
- supports the theory of endosymbiosis

f. lysosomes

- Special vacuole that contain digestive enzymes
- used for digesting food, foreign invaders, or other cells
- also known as suicide sacs

g. microtubules and microfilaments

- Thin filaments of protein
- provide internal structure to the cell
- also used for cell division and locomotor structures

4. locomotion

- Ability of the cell to move from place to place or to move solutions around them

a. cilia

- Short filaments
- beat together like oars
- usually come in large numbers, covering the entire surface of the cell

b. flagella

- Long filaments
- come in small numbers 1,2,3 or 4
- cell swim with “jerky” motion

5. cell nucleus

- Control center of the cell
- has a double membrane
- membrane is porous
- regulates all cell functions including division

6. plant cells

- Contain all the same organelle as animal cells plus a few special ones

a. cell wall

- Composed of cellulose
- used for structure for the plant cell
- is porous

b. vacuoles

- Large storage vessicles in the cell
- used to store food, water and wastes

c. plastids

- Specialized vacuoles used to store food and pigments
- example: chloroplasts(location of photosynthesis)
- also support the theory of endosymbiosis

IV. Multicellular organization

1. cells
2. tissues
3. organs
4. organ systems
5. organisms

1. cells

- Individual cells
- body cells and bacteria

2. tissues

- Collection of cells all working together to perform a common task
- example: muscle tissue, bone, nervous tissue

3. organs

- Collection of tissues all working together to perform a common goal
- examples:heart, lungs, brain...

4. organ systems

- Collection of organs all working together to perform a common goal
- examples: digestive, respiratory, nervous

5. organisms

- Collection of organ system all working together to achieve a common goal
- example: humans