

Human Body 1

Semester 1, 2018

Week 2

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The Cell

The Cell

Organisms are composed of cells and products. Cells are alive and there are over 200 types! Most cells are very small; however, some cells are very large (like egg cells). Cells vary in shapes, some can be very long.

Parts of a cell -

Plasma membrane -

- Surrounds the cell - like a cell wall

Cytoplasm -

- Jelly-like substance in the cell that holds the cytoskeleton, organelles and inclusions
- The membrane is not static - it is very dynamic
- Inclusions can include pigment, glycogen, etc... something not normally found in the cell - like a mitochondrion is not an inclusion
- 60% of the water in the body is found intracellularly (inside the cell)
- FUN FACT: Scurvy is due to the loss of the protein cytoskeleton! Not a fun fact, but it's a fact!

Nucleus -

- The nucleus is the control centre, it holds DNA and protein (which is looked at further in the course, check the semester 2 notes for more information! It's very interesting)
- The nucleolus is also included (which assembles ribosomes), the nuclear envelope (which is the membrane around the nucleus) is also a major part of the nucleus. The envelope has holes called pores, which control the movement of substances

Endoplasmic reticulum -

- Network of membranes channels and sacs - in the cytoplasm
- There are two types of endoplasmic reticulum, explored in the table below:

Rough	Smooth
Ribosomes <ul style="list-style-type: none">- Continuous nuclear envelope- Produces phospholipids- Produces and packs proteins	No ribosomes <ul style="list-style-type: none">- Synthesis steroids- Detoxifies alcohol and drugs (in liver)- A tolerance build-up (to alcohol) occurs through the synthesis of the smooth reticulum- Hepatitis causes problems with detoxification, and in turn, medication amounts must be reduced

Ribosomes -

- Are mainly involved with RNA and protein. Ribosomes read messenger RNA and produce proteins specific to the code they've read. They also aid in killing bacterial cells. Its important to note that no ribosomes = no protein = cell death

Golgi Complex (or Apparatus) -

- It is membranous
- It synthesises carbohydrates
- It modifies proteins, moving them into vesicles (transporting proteins around the cell)

Lysosomes -

- Contain enzymes that break things down like old organelles, and bacteria. An example of a lysosome that breaks down old organelles is the osteoclast. The osteoclast works in the bones, aiding in regeneration! If there are too many osteoclasts, however, or they break things down too quickly, the bones become weak

Mitochondria -

- You guessed it, the powerhouse of the cell!
- In the whole body, the surface area of all the mitochondria equal the surface area of 3 soccer fields
- They produce energy - ATP
- ATP requires oxygen - this is the only reason we breathe - for mitochondria!
- Things like cyanide knock out the mitochondria's ability to make energy

Cytoskeleton -

- Provide structure of the cell, strength, and a means of transportation. The cytoskeleton is made of three main types of fibres:

Intermediate fibres	Microfilaments	Microtubules
Thick and stiff	Fine (thin)	

Glycocalyx -

- 'Sugar cup' - the sugary coating of a cell
- It absorbs water and helps cells move slickly
- It aids in cell adhesion, cushioning, protection and cell identity

The next few parts are not directly parts of a cell. They do play major roles in cell maintenance, however, so they are still important!

Cilia -

- Hair-like and acting as an antenna
- The plasma membrane has mobile cilia, around 50 - 200 per cell

Pseudopods -

- Are white blood cells, which are filled with a cytoplasm. The plasma membrane controls transport. These molecules use active and passive transport!

Types of transport:

Passive transport (osmosis) -

- No ATP is required, items move from high to low concentrations

Facilitated diffusion -

- Uses the plasma membrane to do the job. Water moves down the concentration gradient until equilibrium is reached

It is also important to note that there are different levels of tonicity (concentrations):

Hypotonic	Less solute than water
Isotonic	Equal solute to water
Hypertonic	More solute than water

*Most IVs are isotonic

Dehydration = lack of cell water

Here are some brief definitions and explanations regarding tissues:

Tissues -

- Are a group of cells with similar structure and function

There are 4 main types of tissue:

Nervous	Muscle
Epithelial	Connective

Epithelium -

- "upon" literally translated
- Is it the covering or layer of cell tissue, allowing the body to control what goes in and what goes out
- It is located both internally and externally
- It provides protection, absorption, filtration and secretion

The next three things are different types of connectors between cells.

Tight junctions	Function of phospholipid layers (zipper-like)
Desmosomes	Patch and hook-like proteins, it runs continuously with the cytoskeleton
Gap junctions	A channel between cells made of protein

When tissue layers are avascular (like the outermost layer of the skin), they receive nutrients from connective tissues below!

Classification -

- The number of cell layers
- Simple: one layer, quick transport, lungs, filtering and diffusion
- Stratified: more than one layer, good for wear and tear (like constant food abrasion in the throat), found in skin, too

Shapes of cells -

- Squamous, cuboidal and columnar

Forms of membranes -

- Simple squamous (found in endothelium and serosa)
- Stratified squamous (protective covering where common friction, keratinised dead cells (making a dry surface), non-keratinised where occurred)
- Epithelial cells vary all over the body - group to form gland
- Glands are: endocrine (hormone generation) and exocrine (sweat)

Connective tissue -

- Most abundant type of tissue, it provides movement, support, insulation and energy
- It is composed of extracellular matrix
- Ground substances - water, protein, gel, rubbery
- Protein fibres - produced by cells, collagen and elastic

There are many different tissue types:

Fibrous, adipose, blood, bone, cartilage, and of course connective

The dominant type of fibrous tissue is collagen, its very important in the skin

Some connective tissues include tendons, ligaments and even the skin. Tendons connect muscle to bone, ligaments connect bone to bone.

Loose connective tissue -

- Is the most widely distributed tissue. It has few cells and fibres, and if the spaces in the tissue fill with water, it causes swelling (oedema)

Brief information about organs and microorganisms:

Organs -

- The structure of organs is composed of two or more tissue types. Organs may belong to one or more organ systems. There are 11 organ systems in total, with many interrelationships and a lot of overlapping. They are all physically connected.
- Our bodies are counted as "super organisms", because 50% of the cells don't belong to us. This is due to microbiota, like good bacteria in the gut!

Microorganisms -

- We lose 37 million microorganisms a day, they can be excreted or shed off the skin, or lost another way. They include bacteria, protozoa, viruses, etc..., but most are not dangerous, some are beneficial!