Lab 2: Cells and Tissues
Pre Lab 2 Test

1. Is fungus a eukaryotic or prokaryotic organism?

2. Define
   - ❖ Cells:

   - ❖ Tissues:

3. Name 4 types of human tissues.
   a) _____

   b) _____

   c) _____

   d) _____

For each word listed below, identify to which tissue type it belongs.

4. neuron _____

5. skin _____

6. femur _____

7. biceps _____

8. Heart _____

Lab 2: Cells and Tissues

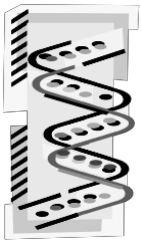
In this lab you will

- Examine the results of the Bacterial Gardens "Experiment"
- Review Eukaryotic and Prokaryotic Distinctions
- Look at how cells are organized into tissues
- Identify and describe the general characteristics of 4 human tissues (Epithelial, Connective, Nervous and Muscle)

Levels of Organization

- Most organisms are made up of increasingly complex levels of form and function. Today we will look at ourselves, and examine generally how these different levels are organized to make well-functioning, homeostatic, thinking biology students.


atom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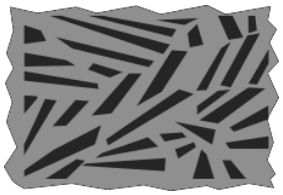
tissues →→→


organs→→→

organ systems →→→ORGANISM→→→POPULATION→→→

SPECIES→→→Community→→→

Ecosystem→→→Biome→→→Biosphere

Bacteria Gardens "Experiment" – Results

1. Keeping the Petri plates closed, examine your bacteria garden and that of your lab partner. You will likely see representatives of two major kingdoms growing on the agar—bacteria & fungi.

    - **Bacteria** are prokaryotic and are unicellular (even though some do grow in chains or groups). They lack the complexity of organization typical of most animals and plants.

    - **Fungi** (including molds, mildews, yeasts, mushrooms) are eukaryotic and most are multi-cellular. However, their bodies are relatively undifferentiated; they lack the distinct tissues and organs.

2. **How can you distinguish bacteria and fungi on the Petri plates?** First off, each dot, no matter how small, represents a colony or group of cells—not just one! With bacteria, large colonies may include millions of individual cells. Fungi, too, form colonies on agar. There are some major morphological differences, however, that generally distinguish bacteria and fungi.

    - The surfaces of **bacterial colonies** are often smooth and glossy. They may be very brightly colored (yellow, red, white etc.). Typically they grow outward from their starting points, and look circular. The colonies tend to be smaller than those of fungi (though this depends on kind and growth conditions).

    - **Fungi** tend to look fuzzy. The colonies are often composed of filamentous threads of cells (called hyphae). The colonies are often seen as concentric rings of differing colors (greens, blues, grays), and may have irregular edges. Often you'll see tiny black specks across a colony's surface; this indicates the mold is producing spores.

    - **Yeasts** are unicellular fungi; their colonies often look similar to those of bacteria because the cells don't form hyphae.

Describe the appearance of your Petri plates below.

Exposure Site	Bacterial Growth*	Fungal Growth*

- For example, 20 small bright yellow, glossy colonies; 2 large green & white ringed fuzzy colonies etc.

TISSUES In animals, most cells have differentiated into distinct tissues.

- **Tissues** are composed of differentiated cells that aggregate to perform specific functions. For example, the connective tissue blood is formed from red blood cells (which specialize in carrying O_2 and CO_2), white blood cells, platelets and other types of cells.
- **Organs** are one or more tissues that aggregate to perform specific functions. So the heart is an organ composed of muscle, connective tissue and nervous tissue, which specializes in pumping blood through your body.
- The heart in turn is part of a larger **organ system**, the circulatory system, composed not only of the heart, but veins and arteries and capillaries and blood and associated muscle and connective tissue.

Let's look at some animal tissues (animals are more complicated than plants in the tissue-department). The tissue slides are grouped into 4 major categories: epithelial, connective, muscle and nervous tissue. Working with your lab partner,

1. Pick up a slide in each of the major tissue categories. Please return these to the correct trays as quickly as you can – we don't have enough to go around.
2. Briefly describe each tissue, sketch some of its cells, and list general functions and a location or two in your own body for each tissue. Refer to charts and other references provided, too.

Many of these slides are composite—more than one tissue type may be present. Be sure you're able to distinguish them. Call your instructor if you have difficulty.

I. EPITHELIAL TISSUE:

Think coverings and linings—many epithelial tissues line ducts or other structures in our bodies, and skin is largely made of epithelial tissue.

- Named by
  a) shape (squamous, cuboidal, columnar)

  b) and # of layers (simple, stratified, pseudostratified)

    - Found throughout the body
    - Underside is connected to basement membrane
    - Divide readily/ good for healing
    - Tightly packed/ not much extracellular matrix
    - Function:
      - Secretion/ Absorbtion/ excretion
      - Protective barrier
      - Sensory reception

Tissue Name	Characteristics/ function/location	Sketch under magnification
Squamous epithelium	single layer of thin, flat cells (look like floor tiles) ❑ Common @ sites of diffusion/filtration ❑ Lines the alveoli of the lungs, walls of capillaries, blood & lyumph vessels ❑ So thin & delicate, it damages easily ❑ Cheek cells	

Cuboidal epithelium	cube shaped, single layer ❑ Usually has centrally located, spherical nuclei ❑ Covers ovaries, lines kidney tubules, ducts of glands ❑ In kidneys: secretion & absorption ❑ In glands: secretes glandular products (hormones, saliva etc)	
Columnar epithelium	elongated, single layer with nuclei @ about same level near basement membrane ❑ Its elongation makes tissue thick (for protection of the underlying tissues.) ❑ Non-ciliated, lines uterus and most organs of the digestive tract. ❑ Secretes digestive fluids ❑ Have microvilli to increase surface area and to increase exposure for substance to increase absorption	
Ciliated columnar epithelium	cilia extend from the free surfaces of cells and move constantly ❑ Ovarian tubes ❑ Assist in moving the egg down the ovarian tubes to the unterus	

Pseudostratified Columnar Epithelium:	seems layered but really is not. ❑ Looks layered because nuclei are @ different levels. ❑ Commonly have cilia ❑ Line respiratory tract, cilia moves mucus.	
Transitional		

II. CONNECTIVE TISSUE:

A large class of tissues, many serve to hold organs in place, connect bones and muscles, and make up bone, cartilage and fat. Blood is included in this category because it is produced in bone marrow.

- Binds structures
- Provide support
- Protect
- Fill spaces
- Framework
- Store fat
- Has more extracellular matrix than epithelial tissue

Some Examples:

a) Adipose Tissue
b) Hyaline Cartilage
c) Bone
d) Blood

Tissue Name	Characteristics/ function/location	Sketch under magnification
Adipose tissue (fat)	Loose Connective Tissue/ Areolar ❑ 40-50 billion cells in Adult ❑ lies beneath skin, between muscles, around kidneys ❑ behind eyes, on heart, abdomen, joints ❑ cushions joints, organs, insulates, stores energy	
Hyaline cartilage	Dense Connective Tissue/ 3 Types of Cartilage ❑ Has fine, collagenous fibers in extracellular matrix ❑ Looks like white glass ❑ Ends of bones, soft part of nose ❑ Chondrocyte is a cartilage cell	
Bone	Dense Connective Tissue (osteocyte is a bone cell) ❑ Most rigid of all connective tissues due to mineral salts (calcium phosphate) ❑ Matrix has many collagenous fibers ❑ Supports, provides a framework, has marrow to RBC, ❑ Extracellular matrix deposidted in layers called lamellae, around central canals ❑ Osteocytes found in lacunae ❑ Central canal has blood vessel	

Blood (be able to ID red and white blood cells)	RBC, WBC, Plateletts ❑ Formed Elements suspended in fluid matrix called plasma ❑ Transports, helps maintain homeostasis ❑ 5 types of WBC ❑ WBC larger in size than RBC	

III. MUSCLE TISSUE:

This tissue is responsible for motility or movement as well as for driving the circulatory system. Muscle tissue must be contractile, elastic, and excitable. There are 3 types of muscle tissues.

Tissue Name	Characteristics/ function/location	Sketch under magnification
Smooth muscle	Found in the gut, Not voluntary No striations Shorter than skeletal One central nucleus per cell Walls of hollow organs (stomach, urinary bladder, uterus) involuntary	
Striated muscle (aka skeletal muscle)	Attaches to bone for movement Aids in shock absorption Voluntary Striations Each cell has many nuclei	
Cardiac muscle (heart muscle)	Found only in the heart Not voluntary single nucleus striated beats every moment of every day of your entire life	

IV. NERVOUS TISSUE:
Composed of billions of cells that conduct impulses, respond to stimuli. The nervous system is composed of the brain, the spinal cord and peripheral nerves. There are estimated to be as many as 100 billion neurons in our nervous system!

- A nerve cell is called a NEURON
- Cell body + dendrites + axon
- Electrical impulses are conducted from one neuron to another.

A typical neuron has all the parts that any cell would have. The main portion of the cell is called the **cell body**. It contains the **nucleus**, which in turn contains the genetic material in the form of chromosomes.

Dendrites look likes branches or spikes extending out from the cell body. Receive and respond to chemical messages from other neurons.

Axon. A long extension from the cell body that is usually much longer than the dendrites. It carries the electrical impulse AWAY from the cell body. Axonal length can vary considerably. In the neurons that make up the nerves running from the spinal cord to your toes, the axons can be as long as three feet!

Longer axons are usually covered with a **myelin sheath**, a series of fatty cells which have wrapped around an axon many times. These make the axon look like a necklace of sausage-shaped beads. They serve a similar function as the insulation around electrical wire.

Synaptic Knob: The very end of the axon. Here the electrical impulse is converted into a chemical message that travels to the next neuron.

Synapse: the space between the synaptic knob and the dendrites of the next neuron. (aka synaptic gap, or synaptic cleft).

Post Lab 2 Test Questions

1. What are the functions of epithelial tissue? Name the different kinds and give a location for each.

2. What type of connective tissue:
   - Stores mega amounts of energy? _____
   - Helps fight infection? _____
   - Is the most dense? _____
   - Attaches muscle to bone _____
   - Is found in between vertebra _____

3. Is all muscle tissue voluntary? Which type is striated with many nuclei?

4. What type of cell is found in nervous tissue? Which organs are made up of nervous tissue?