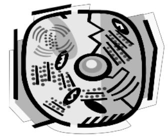
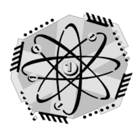


LAB 2: CELLS AND TISSUES

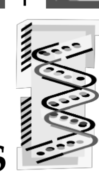
In this lab we'll take a look at how cells are organized into bigger units in our bodies (and those of most other animals). We'll also examine the results of your Bacteria Gardens "Experiment" from last week.

LEVELS OF ORGANIZATION

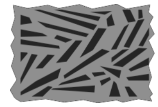
• As your text discusses (Life Builds from the Bottom Up), most organisms are made up of expanding levels of form and function. We will look today at ourselves, and examine generally how these different levels are organized to make well-functioning, homeostatic, thinking biology students who interact with the rest of the biosphere rationally and with concern.
• **Basic Levels of Organization**, from semi-smallest to most inclusive. (Note: we'll be considering these through the quarter, not just today, so don't forget them!):

ATOMS 

MOLECULES  + 

MACROMOLECULES 

CELLS 

TISSUES 

ORGANS 

ORGAN SYSTEMS 

ORGANISM 

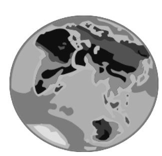
POPULATION 

SPECIES 

COMMUNITY 

ECOSYSTEM 

BIOME 

BIOSPHERE 

• Today’s lab will deal with some cells, tissues, organs, organ systems and organisms (you). By examining slides and models we hope you’ll get a better idea of how complex all these levels of organization are, and how they act to permit the complex behaviors typical of most animals. In subsequent labs, we’ll examine the functions of some of the smaller levels in organisms, major groups of organisms (taxonomy) and their interactions with one another and the non-living world (i.e. the science of ecology).

BACTERIA (UNICELLULAR & ALL PROKARYOTIC) AND FUNGI (MOST MULTICELLULAR & ALL EUKARYOTIC)

• Examine your bacteria garden and those of your lab partners. You will likely see representatives of two major Kingdoms growing happily on the agar—Monera & Fungi. Remember that bacteria are prokaryotic (remember?) and are unicellular (even though some do grow in simple chains or groupings). The complexity of organization typical of most animals and plants is therefore missing in these organisms.
• Fungi (including molds, mildews, yeasts, mushrooms) are eukaryotic and most are multicellular; however, their bodies are relatively undifferentiated; they lack the distinct tissues and organs which most animals have.
• How can you distinguish bacteria and fungi on the petri plates? First off, each dot, no matter how small, represents a colony/group of cells—not just one! With bacteria, large colonies may include millions of individual cells! Obviously you’re not able to see the single cells, even at highest power of our ‘scopes (unless you use oil immersion and even then it’s tough)—they’re just too small. Fungi, too, form colonies on agar. There are some major morphological differences, however, that generally divide the Monera and Fungi.
• The surfaces of <u>bacterial colonies</u> are often smooth and glossy. They may be very brightly colored (yellow, red, white etc.). Typically they grow smoothly 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).
• <u>Fungi</u> 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.
• <u>Yeasts are unicellular fungi</u>; their colonies often look similar to those of bacteria as the cells don’t form hyphae.
• You may notice interaction between bacteria and fungi on your petri plate and/or those of classmates. Some fungi inhibit the growth of bacteria, or may actually kill the bacteria. You may find bacterial groups which have been inhibited by neighboring fungal colonies so that the bacteria’s normal growth pattern is distorted. Or, there may be a clear area surrounding the fungus where bacteria have been kept from growing altogether. An example of a bacterial inhibitor: *Penicillium* is a soil fungus from which we derive the antibiotic penicillin, once the most potent antibiotic known (why isn’t it any more?).

• Describe the appearance of your petri plate in the table below:

Exposure Site	**Bacterial Growth***	**Fungal Growth***

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

• You may be horrified by the lush growth of bacteria and fungi in the plates. No need. Remember that the agar and warm temperature you kept them at over the week encourages such growth, much as a greenhouse encourages plants. Furthermore, it's rare we see highly pathogenic (disease-causing) types in this experiment (though we keep the plates closed just in case). Even many pathogenic types are not especially harmful unless your immune system is already compromised. Lastly, most bacteria and fungi are <u>not</u> pathogenic—they are indispensable decomposers and symbionts of other organisms and are therefore incredibly beneficial to ecosystems!

• Also examine any samples of specific bacteria and fungi we might have available. Again, do not open any of the plates or slants (tubes)! Some of these are of medical significance to humans—list a few below which may cause illness/infection:

MOST ANIMALS HAVE CELLS DIFFERENTIATED INTO DISTINCT TISSUES

• Let's look at some animal tissues (animals are more complicated than plants in the tissue-department). The slides we have today are tissue slides divided into major categories. Work with your lab partner to examine and record these, being sure to sketch them too.
• Be aware that many of these slides are composite—more than one tissue type may be seen. Be sure you're able to distinguish them. Call your instructor if you have difficulty.
• What are tissues? Note they're placed between cells and organs in your Levels of Organization chart. <u>Tissues are composed of differentiated cells aggregated to perform specific functions</u>. For example, red blood cells (which specialize in carrying O_2 and CO_2 to and from other cells) and other cells and material aggregate to form the connective tissue blood.

• Next, organs are one or more tissue types aggregated to perform specific functions. So the heart is an organ composed of muscle, connective tissue & nervous tissue, which specializes in pumping that blood through your body. The heart in turn is part of the larger organ system, the circulatory system, composed not only of the heart, but veins and arteries and capillaries and blood and associated muscles and connective tissue etc. etc.!
• Get the slides provided (on side counter) in each of the major tissue categories listed below. Please return these to the correct trays as quickly as you can, as we don't have enough to go around. Briefly describe each tissue, sketch some of its cells, and be able to list general functions and a location or two in your own body for each tissue. Refer to charts and other references provided, too.

MAJOR TISSUE GROUPS (Not all included here!)

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

Squamous epithelium

Cuboidal epithelium

Columnar epithelium

Ciliated columnar epithelium

CONNECTIVE TISSUE: A large class of tissues, many of which serve to hold organs in place, connect bones and muscles, and make up bone, cartilage and fat. Blood is included in this category as it is a product of bone in us.

Adipose tissue (fat)

Hyaline cartilage

Bone

Blood (be able to ID red & white blood cells)

MUSCLE TISSUE: This group of tissues is responsible for motility or movement of animals as well as for driving the circulatory system. Note that the slides may include more than one type of muscle tissue and/or orientation, as well as epithelial and other tissue groups too. Call your instructor over for help if you're having difficulty!

Smooth muscle

Striated muscle (aka skeletal muscle)

Cardiac muscle (heart)

NERVOUS TISSUE: Conducts impulses, allows for sensitive responses to stimuli—the communication system composed of our brains, spinal cords, and peripheral nerves.

Multipolar neurons