

BI315- ANIMAL CELLS, TISSUES, AND ORGANS
Required Histology Slides – Fall 2010

Slide boxes will be available as the slides are assigned. Once the slides are out in the lab, they will remain for the rest of the semester. Slides have been cleaned and organized correctly over the summer; it is up to you to keep them clean and organized throughout the semester. It is very frustrating to try to find a slide that has been put in the incorrect location. Slides may be cleaned with lens tissue or Kimwipes. MICROSCOPES MAY BE CLEANED WITH LENS TISSUE ONLY!! Broken slides should be reported to me immediately for replacement or repair.

Epithelial Tissue:

Epithelium - General--

1. squamous epithelium, human mouth, w.m. (whole mount) **or** epithelium, simple squamous, oral smear -- These cells and the cells in the next two slides are mounted so that they are viewed from the top.
2. frog skin, w.m.
3. mesothelium, silvered (simply a different way to stain cells) -- from where do you suppose the mesothelium comes?
4. columnar epithelium, small intestine, w.m. -- Most cells are separated from the epithelial sheet; the tissue was teased apart so the cells are lying individually or in small clumps.
5. simple columnar epithelium, amphibian gut -- The epithelium lines the gut lumen.
6. simple cuboidal epithelium, kidney **or** cuboidal epithelium: sec -- Cuboidal cells line many tubules. Remember that the tubules are cut in a variety of orientations, so the cells will have a variety of orientations as well.
7. colon, goblet cells, c.s. (cross section) **or** goblet cells, columnar epithelium: sec -- Cells are in the epithelial sheet lining the lumen. Goblet cells are mucous cells, and they are intermingled with the other cells of the epithelial sheet.
8. pseudostratified ciliated columnar epithelium, trachea **or** ciliated epithelium trachea, sec. -- There may be several different epithelia on the slide; make sure you are looking at the correct one.
9. stratified squamous epithelium, (monkey) esophagus -- Cells line the lumen. Are these keratinized or non-keratinized? Why?
10. stratified squamous epithelium, sole **or** stratified squamous epith. cornified sec. (human) -- These are from the foot, not the fish.

11. transitional epithelium, urinary bladder, sec. (section).
12. bladder, contracted & distended: sec -- Count the apparent layers of epithelial cells in the two different states.
13. epithelium composite mammal, sec. **or** epithelia, 3 types: sec (Amphiuma) -- There are several different tissue sections on these slides. Identify completely the types of epithelia present.
14. columnar epithelium section -- similar to slide # 5
15. squamous epithelium: frog skin -- similar to slide #2

Epithelium - Glands --

16. parotid gland, sec. -- A serous gland.
17. sublingual gland, sec. -- A mucous gland, but with occasional mixed or serous acini present.
18. submaxillary gland, sec. (monkey) -- Same as the submandibular gland. A mixed gland.
19. salivary glands composite, sec. -- There is a section from each salivary gland on this slide. Compare the three salivary glands prepared the same way.
20. metachromasia of mucin (salivary gland) -- Which salivary gland is this? This is just another way to distinguish the different cell types.
21. mammary gland, active, sec. (human) -- Look for the secretory cells in this section. Be careful; there are many cell types.
22. mammary gland, inactive (resting), sec. (human) -- You should find fewer secretory cells and smaller cells than in the active mammary gland.
23. (axillary) skin, human, sec. **or** skin, scalp (human), c.s. -- look for secretory tissue of sweat glands and of sebaceous glands beneath the outer epithelium. There are a variety of tissues on this slide!!

Connective Tissue:- Loose CT, Dense CT, and Fat --

1. mesenchyme, (pig) embryo, sec. -- An embryonic mesodermal tissue fills most spaces in this embryo. Look for the numerous mesenchymal cells in the loosely-packed tissue. There are numerous other developing tissues on this slide, so make sure you have identified the mesenchyme correctly. You can ignore all the other stuff...
2. mucous tissue, umbilical cord, c.s. -- Look for the mesenchymal cells in the loosely-packed tissue throughout most of the section.
3. fibroblasts, salamander, sec. -- Before placing this slide on the microscope stage, hold it up to the light and notice the long processes extending to the top and bottom of each section. The fibroblasts are within the CT of the long tissue processes. You can ignore all the other stuff...

4. areolar tissue, spread (film) -- Look for different cell types and fibers. Slides will vary so examine different slides. This is also known as loose irregular CT.
5. white fibrous tissue, teased -- These are tendon fibers pulled apart...not very impressive, but you'll compare these fibers to muscle fibers and nerve fibers later.
6. yellow elastic tissue, l.s. (sec.) -- Lots of elastin fibers are in this tissue. The different slides may have different amounts of elastin. What specific type of CT is this?
7. tendon, c.s. & l.s. -- There are at least two tissue sections on each slide. Notice the appearance of the tissue differs depending on the section angle.
8. adipose tissue, frog, sec.
9. adipose tissue, osmic acid, sec. -- Osmic acid stains the lipid droplets.
10. brown adipose tissue mammal, sec. -- Compare the size and shape of these cells and nuclei to those of white adipose tissue.
11. fat cells, developing, w.m. -- Look for the larger cells with the peripheral nucleus. In what type of CT are these developing fat cells?
12. mast cells w.m. fish -- Look for the large, very granular mast cells among the smaller, more numerous cells.
13. fibrous tissue white, (tendon): l.s. & c.s. -- similar to slide #7.
14. adipose tissue fat stained, w.m. -- similar to slide #9 (but prettier).

Connective Tissue: - Cartilage and Bone (Boxes 1 & 2) --

14. perichondrium, sternum, sec. -- Several types of CT are present.
15. hyaline cartilage, xiphisternum, sec. -- Similar to slide # 14.
16. fibro (or fibrous) -cartilage, mammal, sec. -- The fibrocartilage is most obvious towards the middle of the section. Be careful; there is lots of other stuff here!
17. human intervertebral disc, sec. -- This tissue is a nice example of fibrous cartilage (but it looks very different from slide #16).
18. elastic cartilage, epiglottis, sec. (mammal) -- This tissue is stained specifically for elastin.
19. intramembranous ossification, fetal skull -- The osteoblasts surround the forming cancellous bone. There are numerous other tissues in this section.
20. membranous bone, foetal skull -- Learn these bone tissues by structure, not color! Compare slides.
21. endochondral ossification, early -- Identify the cartilage and bone, as well as all transition stages.
22. diarthrodial joint, mammal, l.s. -- Similar to slide # 21. You don't need to know the joint structure, just the developing bone.

23. developing long bone -- Same type as slide # 21.
24. developing bone, x.s. -- These are long bones cut in cross section. Lots of developing skeletal muscle is also present.
25. bone, decalcified, mammal -- Decalcified during preparation to soften it, allowing for adequate sectioning. All of the bones slides are decalcified like this (except slide #28). One of these slides shows osteoclasts very well.
26. femur, kitten -- Some beginning remodeling is visible. You should be able to spot some osteoclasts in this one, but their nuclei are not visible.
27. femur, mammal, c.s. -- Some remodeling is visible.
28. bone, dry, ground -- This is compact bone.
29. red bone marrow (section) -- Identify erythrocytes, megakaryocytes, and fat cells.
30. mouse tail: c.s. -- Identify as many tissue types as possible. Muscle and nerve are also present. You may want to save this one until you know all your tissues extremely well. This is a superb summary slide of many tissue types, but it is not easy.
31. developing intramembranous bone: sec -- identify the new bone, osteoblasts, and osteocytes.
32. developing endochondral bone c.s. shaft -- similar to slide # 24.
33. developing cartilage bone. l.s. -- similar to slide # 21.

Muscle Tissue:

1. smooth muscle, stomach - Smooth muscle is found usually in multilayered sheets with alternating fiber orientations. The sheets are usually not the same thickness. How many sheets of smooth muscle surround the epithelium lining the stomach lumen? Are there any layers of connective tissue between the sheets of muscle?
2. smooth muscle (c.s. & l.s) - More views of smooth muscle
3. smooth muscle, teased - Smooth muscle fibers are composed of one cell with a single nucleus, and they are between 20 and 200 μm long. This slide shows smooth muscle fibers teased apart from a sheet of smooth muscle to show you the length and shape of the individual cells.
4. skeletal (or striated) muscle, mammal, c.s. & l.s. - Skeletal muscle is one form of striated muscle, so named for the striated appearance of the fibers in longitudinal section. Skeletal muscle fibers are composed of one multi-nucleated cell, which is formed from the fusion of cells called myoblasts. The contractile units of the fibers, the fibrils, fill the cell and squeeze the nuclei to the cell periphery. Each fiber is between 1 and 4 mm long. This slide shows skeletal muscle in two orientations.

5. skeletal muscle, tongue, c.s. & l.s. - Notice the epithelium in this slide. Can you tell what type it is? Does the epithelium look homogeneous over the entire surface of the tongue? Bands of skeletal muscle of different orientations fill the tissue of the tongue. Why?
6. heart muscle, sec. - Cardiac muscle is the other type of striated muscle. Cardiac muscle fibers are composed of several cells connected end-to-end by specialized junctions called intercalated discs. Each cell is about 100 μm long and contains one, or sometimes two, nuclei. The nuclei are in the center of the cell (compare to skeletal muscle). The cells may branch.
7. cardiac muscle, intercalated discs (heart) - Search for a thin area for good intercalated disc viewing.
8. muscle composite, sec. - Identify the different muscle types in these sections. How many types are represented?
9. heart, Purkinje fibers, sec. - The Purkinje fibers are muscle cells specialized for conductance. They are large diameter cells and they have fewer myofibrils than typical cardiac muscle. You will need to compare pictures in your atlases to the slides to determine if you are looking at the right cells.
10. muscle-tendon connection, sec. - observe how the muscle tissue and connective tissue interdigitates at their interface.
11. muscle-bone connection, sec. - compare to slide #10. In this case, the muscle is attached directly to bone.
12. heart, cardiac infarct: sec (human) - compare the cardiac tissue of this heart attack victim with the normal cardiac muscle examined above. What are the obvious differences, and what cell types are probably responsible for those differences.
13. muscle cardiac: section (intercalated discs) trichrome stain -- like slide # 6 or # 7, but with a different stain.
14. muscle, red and white section -- skeletal muscle supposedly showing the two different fiber types (I got ripped off!). Just consider this as another example of skeletal muscle.

Nervous Tissue:

1. nerve cells, spinal cord, smear -- The larger, purple-staining cells are multipolar neurons. The smaller nuclei around the neurons belong to glial cells, many of them oligodendrocytes.
2. giant multipolar neurons, smear -- This is the same type of preparation as slide # 1.
3. medullated nerve (osmic acid), teased -- These are myelinated nerve fibers that have been teased apart and stained for myelin. The gaps visible along the fiber are nodes of Ranvier.

4. nerve, medullated, (or medullated nerve) c.s. & l.s. -- These sections show a peripheral nerve cut in two orientations. The cross section shows the nerve fibers surrounded by the different layers of connective tissue: endoneurium, perineurium, and epineurium.
5. spinal cord (mammal), c.s. -- You may want to observe this slide on a dissecting scope first. White matter is peripheral. What is the orientation of the fibers in the white matter? Gray matter is more central (in the shape of an "H") and contains cell bodies.
6. spinal cord, ganglion-one root (dorsal root ganglion), mammal -- Observe the spinal cord again, and then examine the peripheral ganglia. The large cells are ganglion cells, and they are surrounded by smaller satellite cells.
7. spinal cord and ganglion, c.s. -- Similar to slide #6, but two ganglia may be present on either side of the spinal cord, and a different stain was used.
8. cerebellum (monkey), sec. -- Notice the outer gray matter and the central white matter of the cerebellum. The gray matter is composed of an outer layer (the molecular layer) and an inner layer (the granular layer). Between these two layers is a single layer of large Purkinje cells. Purkinje cells are not the same as Purkinje fibers in the heart.
9. cerebrum, monkey, sec. -- The outer, molecular, layer of the cerebral cortex is thinner than in the cerebellum. Below the molecular layer are a number of less distinct layers of cell bodies, with large pyramidal cells throughout. Deepest in the cerebrum is the white matter.
10. cerebrum, cerebellum, medulla -- Identify the different parts of the brain (which section is which part). Based on what you have learned so far, try to identify the gray matter and the white matter of the medulla. Don't spend lots of time on this; just revel in the experience!
11. argyrophil reaction, fixed tissue, sec. -- From where in the organism did this tissue come?
12. human astrocytes, sec. -- The astrocytes are stained specifically in this preparation.
13. motor end organs, w.m. -- This slide shows the connection of the axon terminus and skeletal muscle. The nervous tissue is stained darkly. Some slides are more impressive than others. Be careful with these, because they are thick mounts; don't run the objective lenses through them!
14. artery, vein, & nerve, c.s. - Blood vessels often can be identified by the muscle around them, and by their diameter. Arteries will have a smaller diameter and thicker muscle; veins will have a greater diameter, but thinner muscle. Can you tell which is which? Also, try to identify the nerve bundle in this slide.
15. Spinal cord, nissel and myelin stain: c.s. -- Similar to slide # 5, but with a different stain.