Histology Lab

Histology Boot Camp

Objectives

• Recognize the most common stain used in pathology (H&E) and describe the characteristic staining pattern
• Summarize the concept of “power” when microscopically visualizing histologic sections
• Define “special stains” and give examples of use
• Identify the following basic cellular components histologically:
  – Nucleus – Nucleolus – Cytoplasm – Cell borders
• Identify basic tissue types histologically
  – epithelial tissue, connective tissue, adipose tissue, blood vessels, muscle tissue, nervous tissue, inflammatory cells

2 Volunteers, please
Describe what you see

Describe what you see

Describe what you see

Describe what you see
Describe what you see

Describe what you see

Describe what you see
Describe what you see

What did we just do?
Zoomed into a specific part of St. Peter’s Basilica starting from a map of the world

What knowledge/skills were needed to do what you just did?
• Geography
• Map reading
• Italy
• Architecture
• Church architecture

• Thank you, Volunteers
2 new Volunteers, please

Describe what you see

Describe what you see
Describe what you see

Describe what you see

Describe what you see
What did we just do?

“Zoomed into” a histologic image of the palm from an image of an arm

What knowledge/skills were needed to do what you just did?

• Human anatomy
• Surface anatomy
• Parts of the arm, hand, fingers
• Distinguish palmar surface of hand
• Distinguish gross anatomy from histology
• Recognize and name basic tissue types histologically
• Recognize and name microscopic anatomy of the skin

Thank you, volunteers

HISTOLOGY

*It is not all new to you...*
How do we visualize microscopic anatomy (histology) and pathology (histopathology)?

- Traditional Microscope

- Digitally scanned slides
  - SSOM "Zoomify" = Digitally scanned slides
    - Viewable via a "virtual microscope"
    - Simulates traditional microscope
During MHD Labs

- We will be displaying histology and histopathology slides on different powers largely via static images
- Zoomify Histology Slides are included in the “Histology for Pathology” modules on Sakai for your review

Objective

Recognize the most common stain used in pathology (H&E) and describe the characteristic staining pattern

Hematoxylin and Eosin (H&E stain)

- Hematoxylin
  - A basic dye
  - Stains structures containing nucleic acids blue
- Eosin
  - An acidic dye
  - Stains structures containing protein (e.g. cytoplasm) pink
Objective

Define “special stains” and give examples of when they are used
“Special Stains”

Staining techniques used to:

• demonstrate specific cellular components
  – structures and/or substances
• Identify micro-organisms
• Aid pathologists in the diagnosis of disease

Objective

Summarize the concept of “power” when microscopically visualizing histologic sections
What is “power”?  

- Many objectives from 2x – 100x  
- Low power – 2x-10x – to see overall structure of tissue  
- High Power – 20x-100x – examine smaller structures / cellular level  

• [http://zoomify.lumc.edu/histonew/skin/skin_main.htm](http://zoomify.lumc.edu/histonew/skin/skin_main.htm)  
  Thick skin palm  
  Review slide from low power to high power
Objective

- Identify basic cellular components histologically:
  - nucleus
  - nucleolus
  - cytoplasm
  - cell borders

Basic Histology – Cellular level

Identify basic cellular components histologically: Nucleus, nucleolus, cytoplasm, cell borders
Thyroid Gland: Identify cells, nuclei, cytoplasm

Appendix: Identify cells, nuclei, nucleoli, cytoplasm

Objective
Identify basic tissue types histologically

- Epithelium
- Adipose tissue
- Adipose tissue
- Blood vessels
- Muscle
- Inflammatory cells
- Nervous tissue
Epithelium

- Tissue which covers nearly all body surfaces
- Functions:
  - Protects (skin, esophagus)
  - Absorbs (GI tract, kidney)
  - Transports (ciliated cells of trachea)
  - Secretes (glands)
  - Gas exchange (lung)
  - Lubricates (pleural cavity)

Peritoneum: Simple Squamous (scale-like)

Kidney Tubule: Simple Cuboidal

What is the PAS stain outlining on this section?

Basement Membrane
Appendix: Simple Columnar

Skin – Epidermis: Stratified Squamous

Respiratory Tract: Nasopharynx

*Cells originate from a layer of cells along a basal lamina and form a multilayered structure. Cells toward the surface have smaller nuclei and greater amounts of cytoplasm with keratin.

*Not all the cells along the basal lamina reach the luminal surface, but all contact basal lamina.
Self-Assessment: Type of Epithelium?

Columnar

Objective

Identify basic tissue types histologically:
- epithelial tissue
- connective tissue
- adipose tissue
- blood vessels
- muscle tissue
- nervous tissue
- inflammatory cells

Connective Tissue

- Provides structural support
  - Binds cells and tissues together
  - Provides metabolic support

Types
- Dense connective tissue, loose connective tissue
  - Fibers (mostly collagen)
  - “Fibroblast” = nuclei
- Adipose Tissue
  - Primary site of fat storage
- Elastic tissue, reticular tissue
Dense connective tissue?

Identify fibroblasts and collagen fibers

Adipose Tissue
Cells = Adipocytes

- Thin cell membrane
- Surrounds cytoplasmic lipid (cytoplasm appears clear because processing removes the actual lipid)
- Cell nucleus is pushed to the side by cytoplasmic lipid

“Special Stain” Example

Oil Red O

- Fat soluble dye
- Stain lipids, triglycerides and some lipoproteins
- Requires special processing of tissue sections

Objective

- Identify basic tissue types histologically:
  - epithelial tissue
  - connective tissue
  - adipose tissue
  - blood vessels
  - muscle tissue
  - nervous tissue
  - inflammatory cells
Blood Vessels

- Arterial
  - Arteries, arterioles, capillaries
- Veins
- Lymphatics

All lined by endothelium and have a smooth muscle layer of various thickness
Objective

- Identify basic tissue types histologically:
  - epithelial tissue
  - connective tissue
  - adipose tissue
  - blood vessels
  - muscle tissue
  - nervous tissue
  - inflammatory cells
Muscle
From your FHB Lecture – Muscle 1 – L3

Different Types of Muscle

Tongue:

a) What tissue type is covering the surface of the tongue?
   Epithelium - Tissue which covers nearly all body surfaces

b) Where is the muscle?

What kind of epithelium covers the surface of the tongue?
   Stratified Squamous
Muscle – point out cross sections and longitudinal sections

CT

Muscle

Skeletal muscle

Cross section

Longitudinal section

F = muscle fibers

Where are the Nuclei?

Identify nuclei, fibers, cross-striations
Objective

• Identify basic tissue types histologically:
  – epithelial tissue
  – connective tissue
  – adipose tissue
  – blood vessels
  – muscle tissue
  – nervous tissue
  – inflammatory cells

What are these cells?
Nerve bundle: Cross section

Nervous tissue

Ganglion cells
Nerve cell bodies that are part of the sympathetic and parasympathetic nervous system

Identify the
Nucleus
Nucleolus
Cytoplasm
of the ganglion cells
Inflammatory Cells in tissue

- Neutrophils
- Eosinophils
- Lymphocytes
- Plasma cells
- Macrophages

Sometimes lymphocytes and plasma cells can be part of “normal” histology of an organ
- Appendix
- Ileum

Normal Appendix – what cells are the arrows highlighting on low power and the predominant cell type on high power?
What cells are highlighted in the image?

“Final Exam”

Ileum
Identify:
Epithelium – name the type
Smooth muscle
Loose Connective tissue
Dense Connective tissue
Adipose tissue
Blood vessels
Inflammatory cells

http://zoomify.lumc.edu/histonew/overview
overview_main.htm
Ileum #131