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TISSUE TYPES

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On-line Medical Dictionaries

http://cancerweb.ncl.ac.uk/omd/
http://medical-dictionary.thefreedictionary.com/
The Cell and Its Membrane Molecules

Figures by MIT OpenCourseWare.
Viewing Histological Sections
Effects of the Plane of Sectioning

Figure by MIT OpenCourseWare.
TISSUE CLASSIFICATION

Connective Tissue
Epithelia
Muscle
Nerve
TISSUE CLASSIFICATION

Connective Tissue

Epithelia

Muscle

Nerve

Extracellular matrix continuous; and in some tissues also cell continuous

Cell continuous

Muscle and nerve cells are surrounded by a basal lamina

Basal epithelial cells are attached to a basement membrane

Basal lamina=basement membrane
BASEMENT MEMBRANE

Continuous sheet, 50-300 nm thick
No cells contained within the BM; it is a nonliving structure
Principal protein constituents
  Laminin
  Type IV collagen
  Type XVIII collagen
Diagram removed due to copyright restrictions.
Image removed due to copyright restrictions. Diagrams of muscle, epithelial sheet, and kidney glomerulus structures.
Scanning Electron Micrograph of the Cornea of a Chick Embryo

E: Epithelial cells
BL: Basal lamina
C: Collagen fibrils in the underlying CT

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Connective Tissues

Image removed due to copyright restrictions. See http://cal.vet.upenn.edu/projects/histo/Index.htm

Loose and dense connective tissue from a cow's planum.
Loose Connective Tissue  Dense Connective Tissue

Images removed due to copyright restrictions.
Connective Tissue: Adipose Tissue (Fat)

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Connective Tissue: Bone

Image removed due to copyright restrictions.
Connective Tissue: Cartilage

**Hyaline Cartilage:** Trachea  
**Elastic Cartilage:** Epiglottus

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See http://cal.vet.upenn.edu/projects/histo/Index.htm

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**Fibrocartilage**

Cartilage identification is principally based on morphology; rounded cells in a lacuna; ECM is type I collagen (fibrocartilage) or type II cartilage (hyaline), with (elastic) or without elastin.
Simple squamous epithelium, which generally occurs as a thin sheet-like layer allowing for minimal resistance to diffusion, is also been called "pavement" epithelium, because it can look like like paving stones as seen from above. Examples include the linings of the peritoneal, pleural and pericardial cavities. Other places simple squamous epithelium can be found include: the glomerulus of the kidney, the walls of capillaries, and the alveoli of the lungs.
Simple Cuboidal Epithelium
(collecting ducts in the medulla of a mammalian kidney)

This type of epithelium is thicker than simple simple squamous epithelium, so it does not allow for passive diffusion as readily.
Since columnar cells are quite thick, they do not readily allow passive diffusion. As a result, these cells use active transport to move nutrients through them from the intestine to the blood. This is what we commonly call "absorption." To help with this, they have numerous microvilli on their apical (lumenal) surface, which increases their surface area to allow for greater absorption.
This is a section through the edge of a gallbladder. There is a layer of simple columnar epithelium overlying the connective tissue as indicated by the arrows.
This is an example of stratified squamous epithelium from the esophagus of a cat. Arrows show nuclei of the outermost layer. This is normal for mucosa. Most stratified squamous cells in other areas, such as skin, lose their nuclei by the time they approach the outermost layers.
The cells of the basal layer of the epidermis (closest to the dermis) are cuboidal to columnar in shape. These cells are actively mitotic, producing new cells that get pushed upward into the overlying layers. As these cells are pushed up, they become flatter and longer taking on the typical squamous shape. When the cells reach the top, they are sloughed off and replaced by cells from below. The dermis which underlies the epidermis is composed of a dense, irregular connective tissue, which we will see again later.
This is an example of ciliated pseudostratified columnar epithelium from the trachea. The arrows indicate the layer of cilia on the surface of the pseudostratified columnar cell layer.
Intestinal Epithelium

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BM: basement membrane
Lu: lumen
Cp: capillary
Co: collagen fibrils
SM: smooth muscle cell
M: mitochondria
NF: nerve fibers

KR Porter & MA Bonneville, Fine Structure of Cells and Tissues (1973)
Ciliated Epithelium

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C: cilia
SER: vesicles
F: fibroblasts
El: elastic fibers

Convoluted Tubule of the Kidney: Epithelium

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KR Porter & MA Bonneville, Fine Structure of Cells and Tissues (1973)
Photo removed due to copyright restrictions.
Kidney: Epithelium

US: urinary space

KR Porter & MA Bonneville, Fine Structure of Cells and Tissues (1973)

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Transmission Electron Micrograph of a Rat Kidney Glomerulus

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From R Kessel and R. Kardon, Tiss and Org, p.233 (1979)
Muscle

Drawings removed due to copyright restrictions.
1. Smooth muscle
2. Cardiac muscle
3. Voluntary muscle fiber.
Muscle

Smooth (Involuntary) Muscle

Striated (Skeletal; Vouuntary) Muscle

Cardiac Muscle
Cardiac Muscle

SC: Schwann cell
CT: connective tissue

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KR Porter & MA Bonneville, Fine Structure of Cells and Tissues (1973)
Nerve

Figure by MIT OpenCourseWare. After McNaught and Callander, Illustrated Physiology, Williams and Wilkins, 1967.
An isolated nerve cell - neuron (large arrow) - from a mammalian spinal cord showing and the nuclei of the surrounding neuroglial cells (small arrows). Note the numerous cytoplasmic extensions emanating from the neuronal cell body and the size of the neuron compared with the neuroglial cells.
Peripheral Nerve: Rat Sciatic

Photo removed due to copyright restrictions.

Molecular Cell Biology, J Darnell, et al., 1990
This is a myelinated nerve from the thoracic wall. A indicates the myelin sheath around the actual nerve fibers (B).
Embryonic Stem Cells

Diagram removed due to copyright restrictions. Flow chart from ovum fertilization through cleavage, blastulation, implantation, and beginnings of tissue differentiation.

From *Illustrated Physiology* (A.B. McNaught and R. Callender, 1967)
Embryonic Germ Disc

- **Ectoderm** becomes:
  - Epithelia of *external* surfaces
  - Nervous system tissues

- **Mesoderm** becomes:
  - Muscular tissues
  - Connective tissues
  - Urogenital system
  - Lining of body cavities and blood vessels

- **Endoderm** becomes:
  - Epithelia of most *internal* surfaces
  - Some glands (e.g. thyroid, pancreas, liver)