

Cardiovascular System Blood

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Objectives

- Order of blood vessels in systemic circulation
- Morphology of blood vessels
- Different types of arteries
- Different types of capillaries
- Anastomes

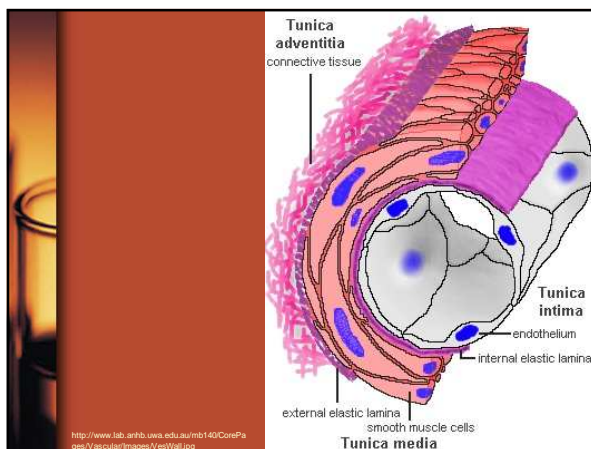
Systemic Circulation

- Aorta
- Arteries
- Arterioles
- Capillaries
- Venules
- Veins
- Vena Cava
- Right Atrium

MORPHOLOGY OF BLOOD VESSELS

Layers:

1. Tunica intima (Innermost):
 - Simple squamous epithelium
 - Some underlying CT
2. Tunica media (Middle):
 - Circular arrangement of smooth muscle with sheets of elastic tissue
 - Thickest layer of arteries
3. Tunica adventitia (Outer):
 - Collagen and elastic fibers



Comparison of Veins and Arteries



Arteries:

Veins:

Functional Properties of Arteries

- Carry blood away from heart
- Elasticity
- Contractility
- Various types of arteries
- Classified according to tissue type

Elastic Arteries

- Large arteries that contain more elastic fibers than smooth muscle in tunica media
- Operate under high pressure and propel blood by rebound of elastic fibers
- Also called conducting arteries
- Aorta

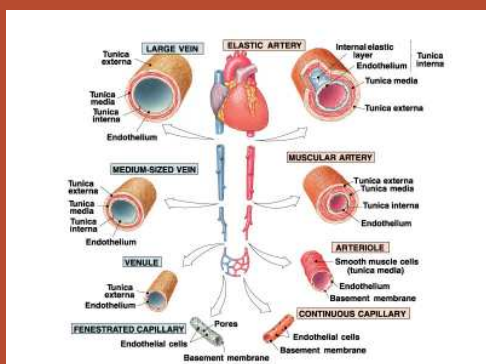
Muscular Arteries

- Thinner tunica media, but contain more muscle than elastic arteries
- Also called distributing arteries
- Majority of arteries are muscular arteries

Arterioles

- Smaller arteries that deliver blood to capillary network
- Contain 1-6 layers of smooth muscle
- Capable of vasoconstriction and vasodilation to affect lumen size
- Greatly affects distribution of blood during times of hypoperfusion

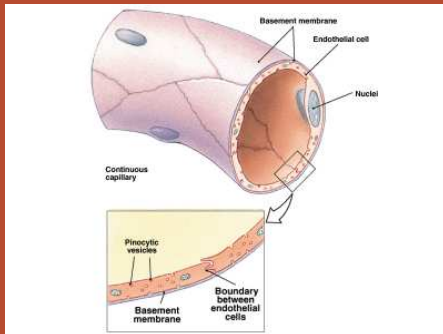
Histological Structure of Blood Vessels



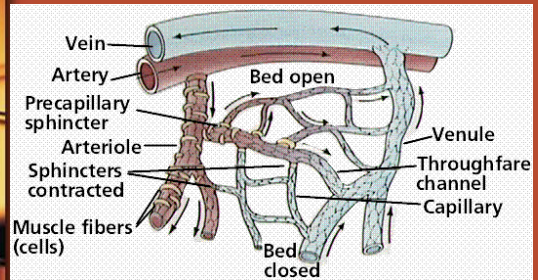
Capillaries

- Consists of simple squamous epithelium and underlying CT
- In some cases, one cell forms entire circumference of capillary
- Do not contain a media or adventitial layer
- Responsible for exchange of nutrients and waste between blood and tissues
- Flow is accomplished in beds

Capillary Structure



Precapillary Sphincters



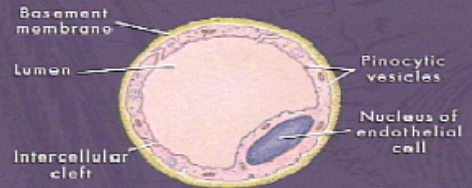
<http://www.emc.maricopa.edu/faculty/farabee/BIOBK/thorough.gif>

Types of capillaries

- Continuous Capillaries
 - Found in muscle, brain, and CT
 - Continuous sheets without fenestrations or pores
 - Held together by tight junctions
 - Allows for diffusion of water and small hydrophilic molecules
 - Larger molecules require transcytosis (active transport mechanism)

Capillary Types

Continuous Capillary



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<http://www.cayuga-cc.edu/people/faculty/pages/green/bio204/vessels1/MG00005.gif>

Types of capillaries

- Fenestrated
 - Found in intestines and kidneys
 - Contain numerous pores
 - Allows for rapid exchange of water and small molecules

Capillary Types

Fenestrated Capillary

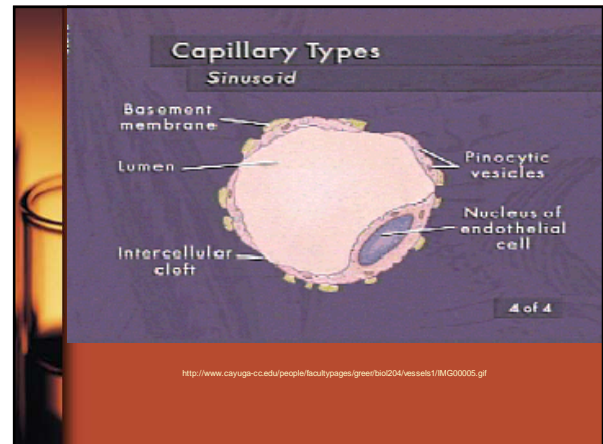


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<http://www.cayuga-cc.edu/people/faculty/pages/green/bio204/vessels1/MG00005.gif>

Types of capillaries

- Sinusoidal
 - Found in liver, bone marrow, and some endocrine glands
 - Contain large irregular channels that allow large molecules and proteins to pass through



Venules

- Vessels that drain blood from capillaries

Veins

- Contain same three layers but with different properties
- Thinner walls than arteries
- Larger lumens
- Small amount of muscle in media
- Thicker adventitia
- Contains valves

Comparison of Veins and Arteries



Arteries:

Veins:

Anastomes

- Arterial
 - Assures that capillary bed circulation continues if blockage occurs
- Venous
 - Allows for alternative passageway if occlusion occurs
- Arteriovenous
 - Bypass capillary bed
 - Important in skin for thermoregulation