The Human Body in Health and Illness

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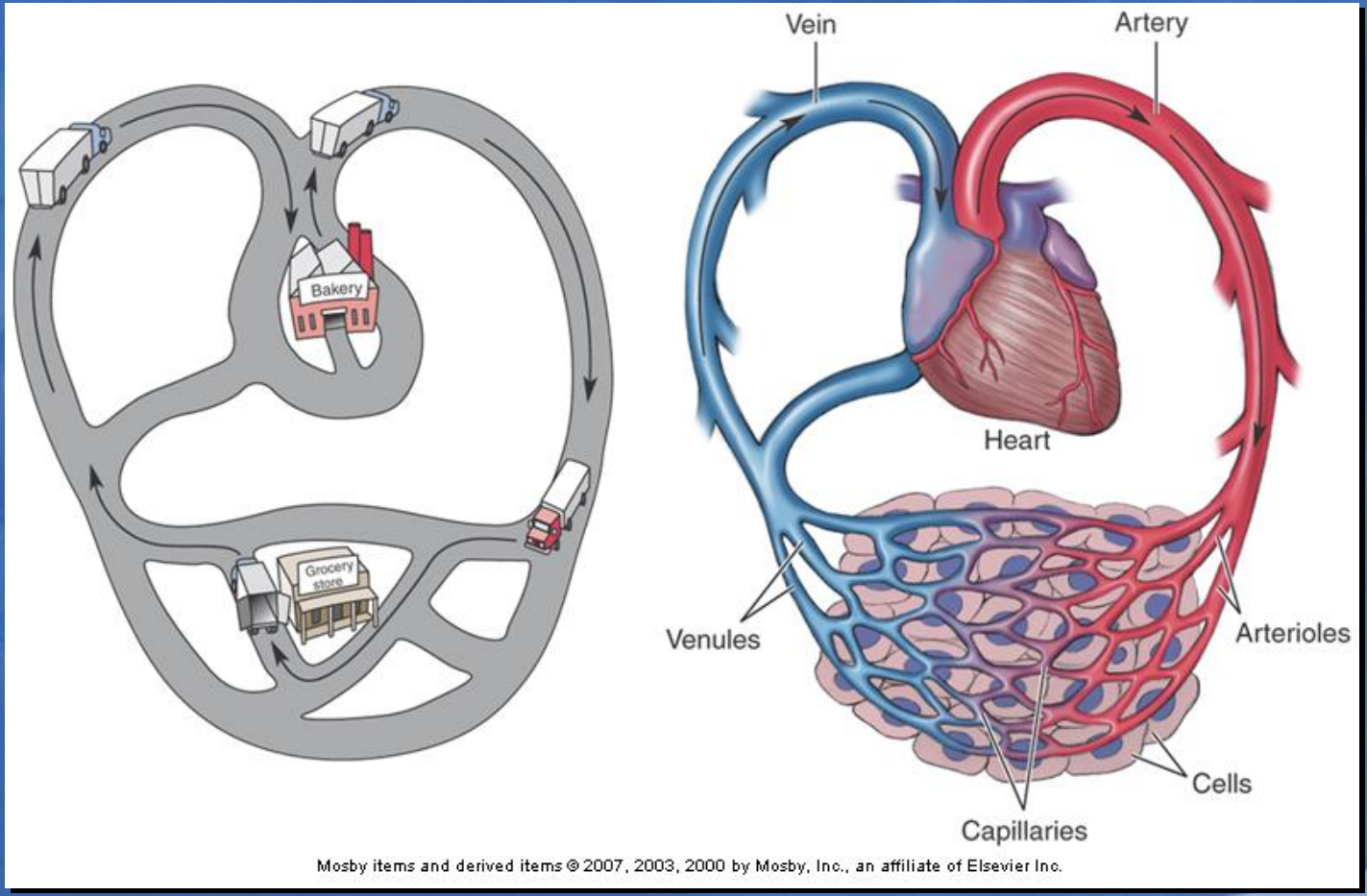
Chapter 18:
Anatomy of the Blood Vessels

Lesson 18.1 Objectives

- Describe the pulmonary and systemic circulations.
- Describe the structure and function of arteries, capillaries, and veins.
- List the three layers of tissue found in arteries and veins.
- Explain the functions of conductance, resistance, exchange, and capacitance vessels.

Circles, Circuits, and Circulation



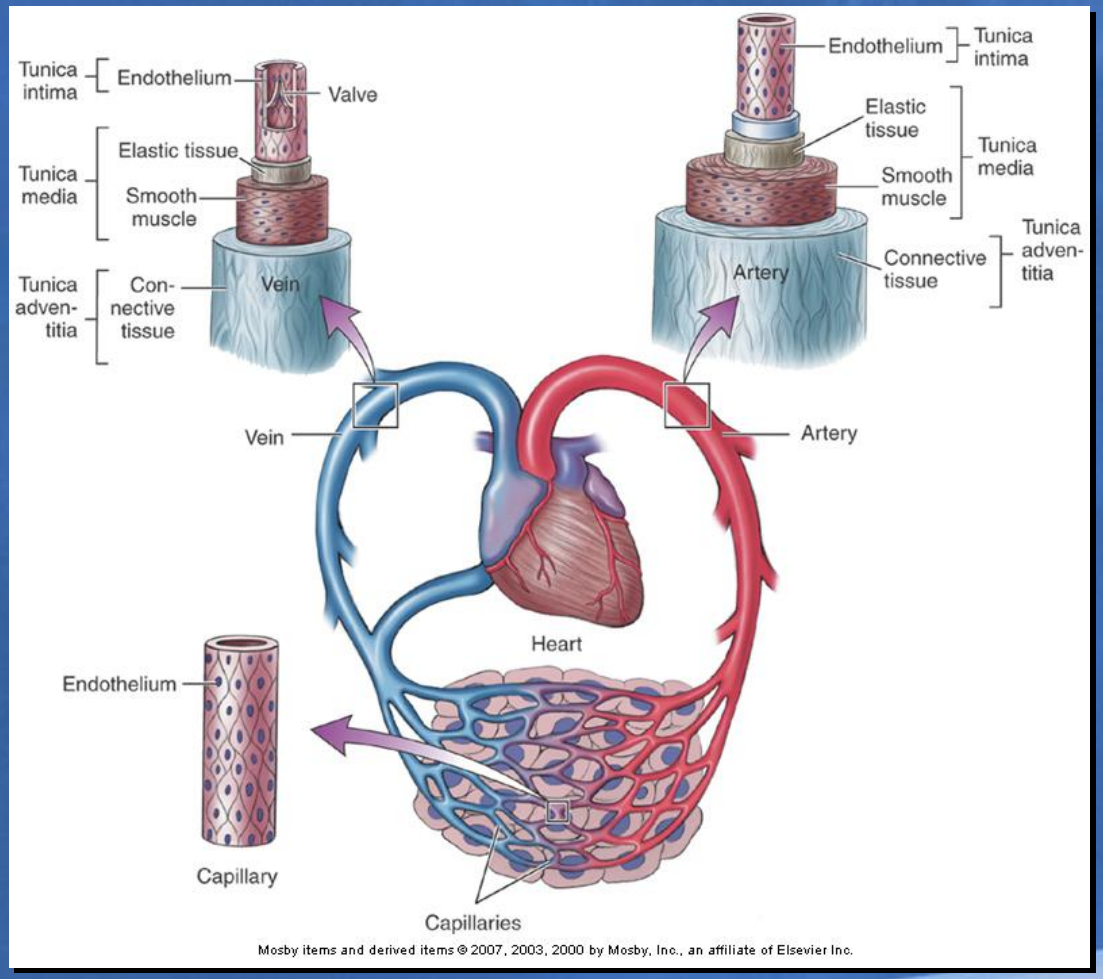
Circles, Circuits, and Circulation (cont'd.)

- Pulmonary circulation: carries blood from the right ventricle of the heart to the lungs and back to the left atrium of the heart
- Systemic circulation: provides the blood supply to the rest of the body

Types of Blood Vessels

- Arteries –
  - Smallest are called Arterioles
- Capillaries
- Veins
  - Smallest are called Venules

Types of Blood Vessels (cont'd.)



Types of Blood Vessels (cont'd.)

- Arteries
  - Structure: thick wall with three layers
  - Function: carry blood from the heart to the arterioles
  - Arterioles: thinner walls, contract and relax due to muscle changes

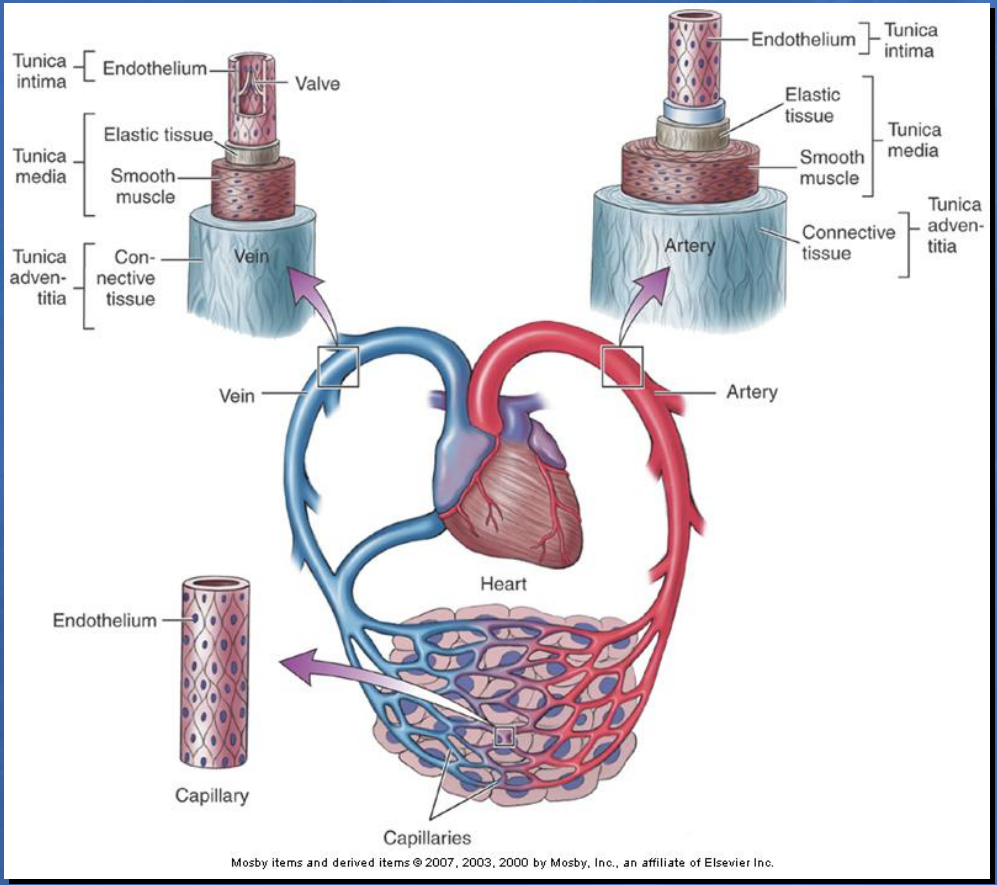
Types of Blood Vessels (cont'd.)

- Capillaries:
  - Smallest & most numerous, close to every cell of the body
  - Structure: layer of endothelium
  - Function: exchange vessels, connect arterioles to venules

Types of Blood Vessels (cont'd.)

- Veins
  - Structure: three layers, but thinner and less elastic than arteries; contain valves
  - Function: collect and return blood from the tissues to the heart
  - Venules: thin walls, hold and store blood

Blood Vessel Walls



Blood Vessel Walls (cont'd.)

- Layers:
  - Tunica intima: innermost layer; endothelium
  - Tunica media: middle layer; elastic tissue and smooth muscle
  - Tunica adventitia: outer layer; connective tissue

Blood Vessels: What They Do

- Arteries
  - Conductance vessels: large arteries conduct blood from heart to arterioles
- Arterioles
  - Resistance vessels: arterioles resist the flow of blood by constricting, or offer less resistance by dilating

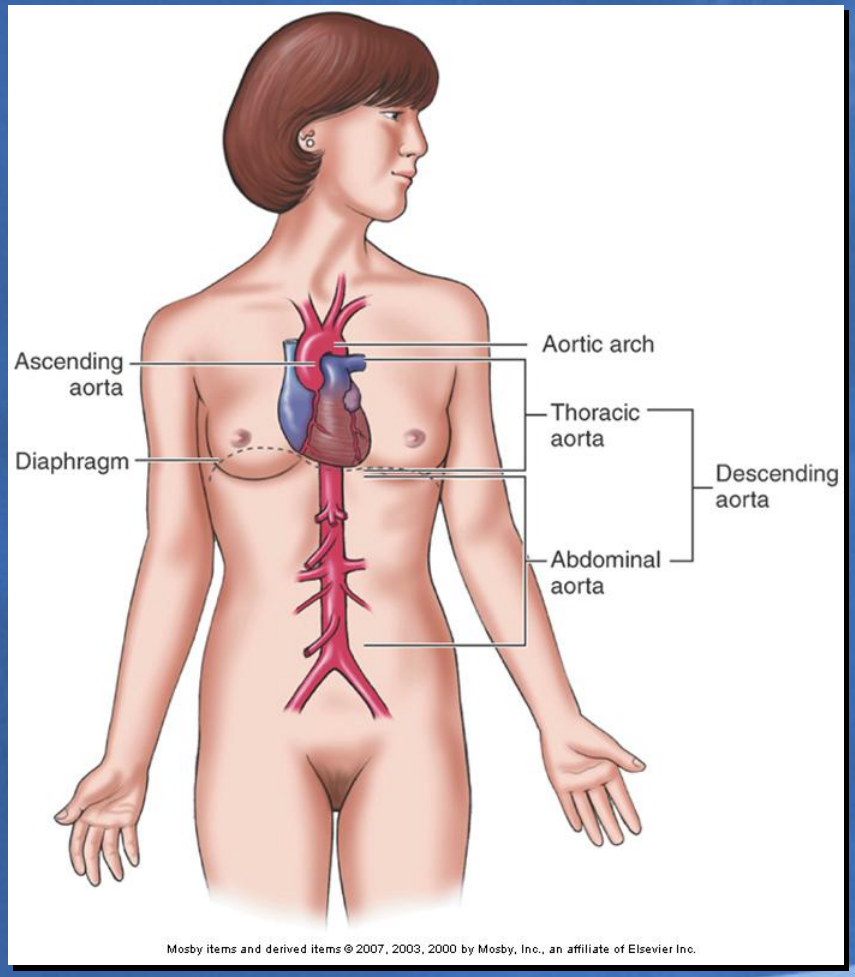
Blood Vessels: What They Do (cont'd.)

- Capillaries
  - Exchange vessels: capillaries allow exchange of nutrients and waste
- Veins and venules
  - Capacitance vessels: collect and return blood, blood storage

Lesson 18.2 Objectives

- List those major arteries of the systemic circulation that are branches of the ascending aorta, aortic arch, and descending aorta.
- List the major veins of the systematic circulation.
- Describe the following special circulations: blood supply to the head and brain, hepatic circulation, and fetal circulation.

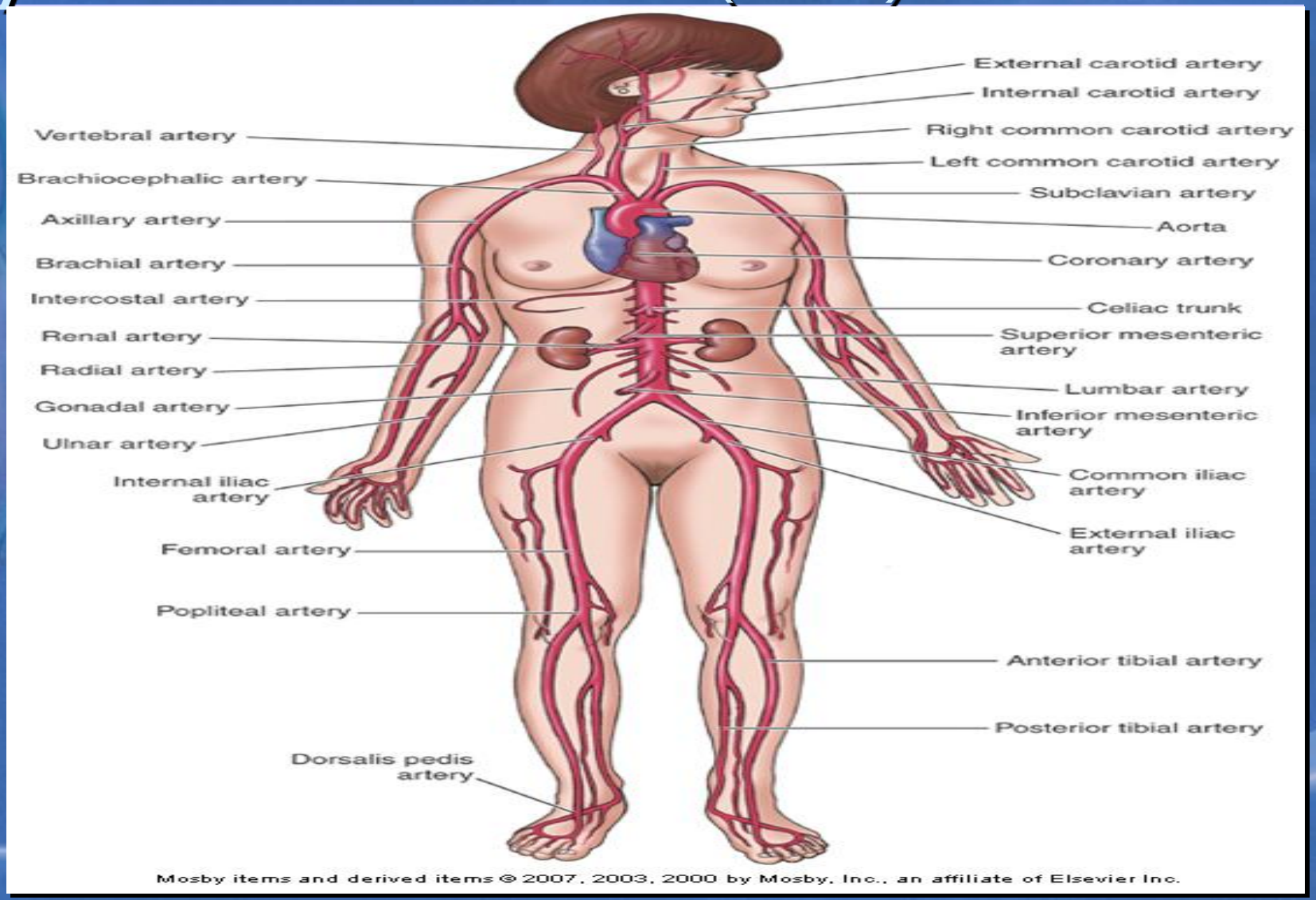
Major Arteries of the Systemic Circulation



Major Arteries of the Systemic Circulation (cont'd.)

- Aorta: the mother of all arteries
  - Location: originates in the left ventricle of the heart, curves and descends through the thorax and abdomen, then splits into two common iliac arteries
  - Branches:
    - Ascending aorta
    - Aortic arch
    - Descending aorta (thoracic aorta)
    - Descending aorta (abdominal aorta)

Major Arteries of the Systemic Circulation (cont'd.)



Major Arteries of the Systemic Circulation (cont'd.)

- Branches of the ascending aorta:
  - Right coronary artery
  - Left coronary artery

Major Arteries of the Systemic Circulation (cont'd.)

- Branches of the aortic arch:
  - Brachiocephalic artery
  - Left common carotid artery
  - Left subclavian artery
  - Right subclavian artery

Major Arteries of the Systemic Circulation (cont'd.)

- Branches of the descending aorta (thoracic aorta):
  - Intercostal arteries
  - Other small arteries supply the organs in the thorax

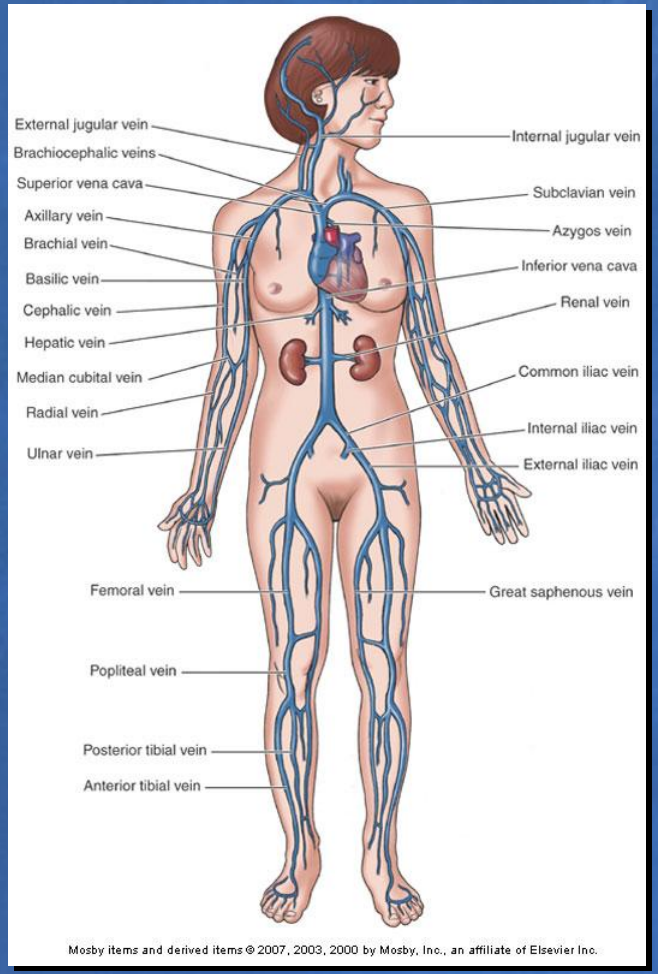
Major Arteries of the Systemic Circulation (cont'd.)

- Branches of the descending aorta (abdominal aorta):
  - Celiac trunk: gastric artery, splenic artery, and hepatic artery
  - Mesenteric arteries: superior mesenteric artery and inferior mesenteric artery
  - Renal arteries, gonadal arteries, and lumbar arteries
  - Right and left common iliac arteries
  - Major arteries of the thigh, leg, and foot

Major Veins of the Systemic Circulation

- Vena cava: the main vein
  - Superior vena cava (SVC)
  - Inferior vena cava (IVC)

Major Veins of the Systemic Circulation (cont'd.)



Major Veins of the Systemic Circulation (cont'd.)

- Superior vena cava: receives blood from the head, shoulder, and upper extremities
- Veins that drain into the SVC:
  - Cephalic vein
  - Basilic vein
  - Medial cubital vein
  - Subclavian veins
  - Jugular veins
  - Brachiocephalic veins
  - Azygos vein

Major Veins of the Systemic Circulation (cont'd.)

- Inferior vena cava: receives blood from all regions of the body below the diaphragm
- Veins that drain into the IVC:
  - Tibial veins
  - Peroneal veins
  - Popliteal veins
  - Femoral veins
  - Iliac veins
  - Great saphenous veins
  - Renal veins
  - Hepatic veins

Special Circulations

- Blood supply to the head and brain
- Blood supply to the liver
- Fetal circulation

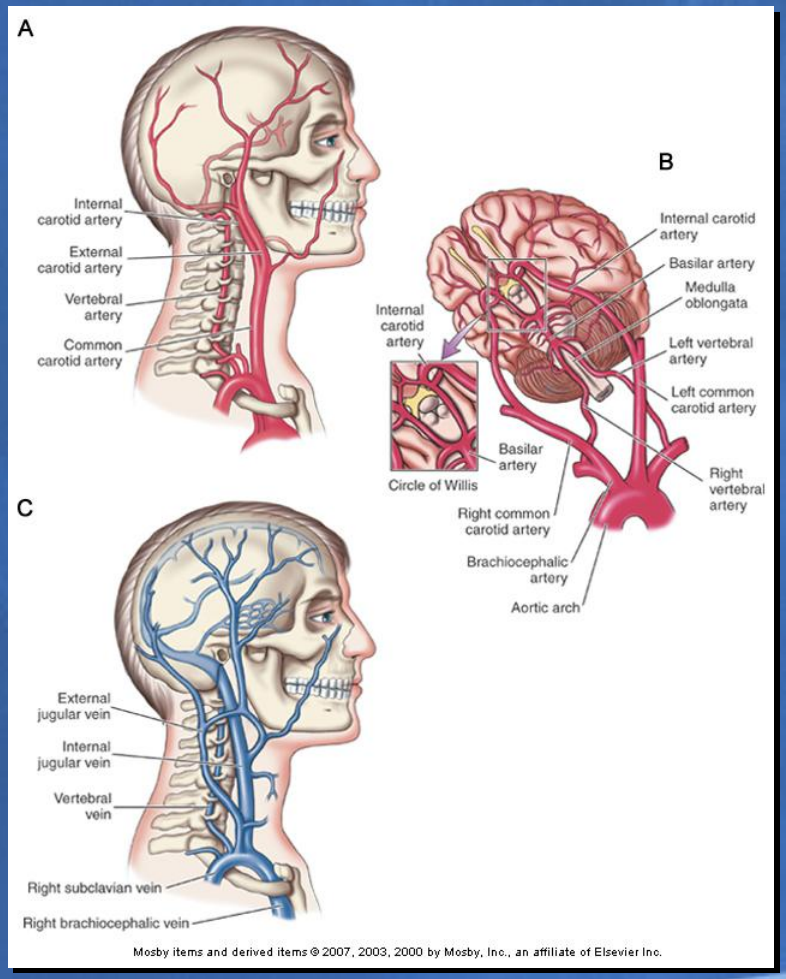
Special Circulations (cont'd.)

- Head and brain blood supply:
  - Carotid arteries:
    - Right and left common carotid arteries
    - External and internal carotid arteries
  - Vertebral arteries:
    - Right and left vertebral arteries
    - Basilar artery
- Circle of Willis: circle of arteries composed of branches from the internal carotid arteries and the basilar artery

Special Circulations (cont'd.)

- Venous drainage of the head and brain:
  - External jugular veins: drain blood from the posterior head and neck region
  - Internal jugular veins: drain blood from the anterior head, face, and neck

Special Circulations (cont'd.)



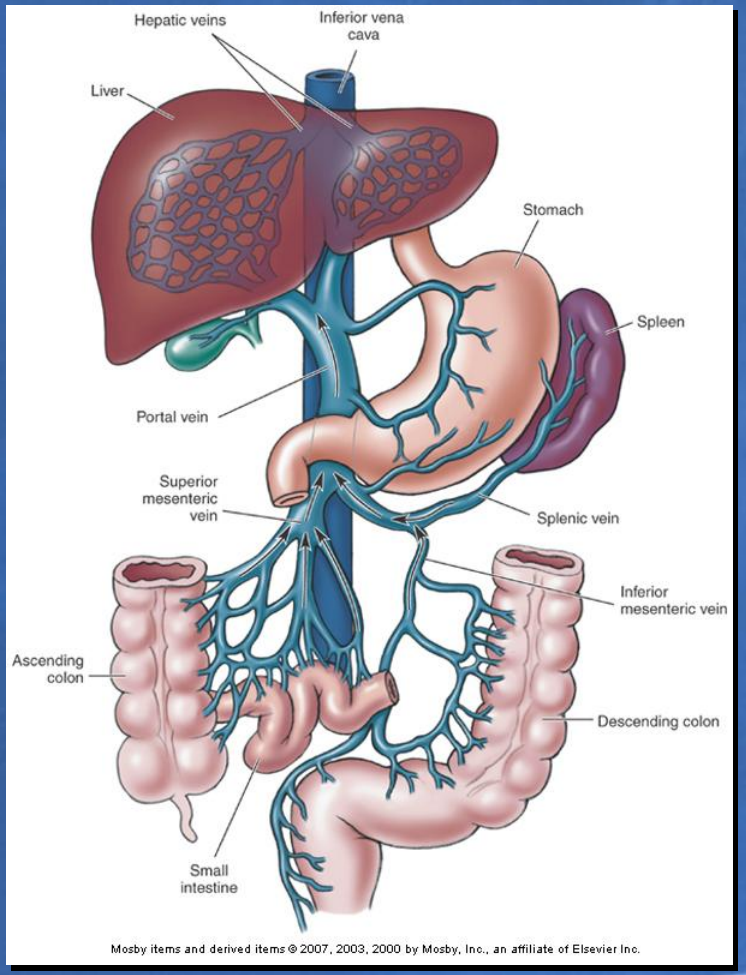
Special Circulations (cont'd.)

- Blood supply to the liver:
  - Portal vein: carries blood rich in digestive end products from the organs of digestion to the liver
  - Hepatic veins: drain blood from the liver and deliver it to the IVC
  - Hepatic artery: carries oxygen-rich blood to the liver

Special Circulations (cont'd.)

- Splanchnic circulation: blood flow to the stomach, spleen, pancreas, intestines, and liver; very adjustable

Special Circulations (cont'd.)



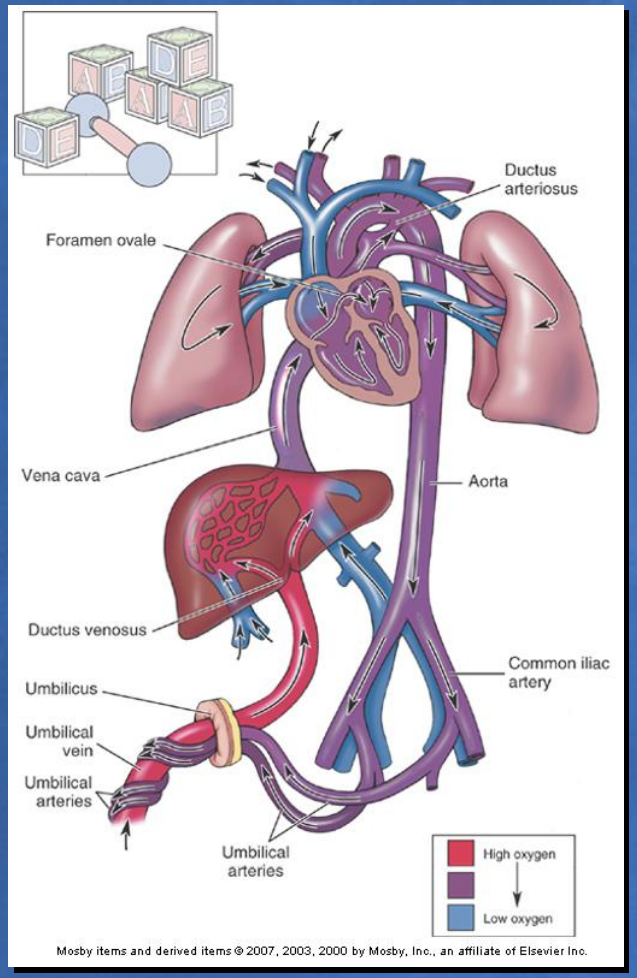
Special Circulations (cont'd.)

- Fetal circulation modifications:
  - Umbilical blood vessels:
    - Umbilical vein: carries blood rich in oxygen and nutrients from the placenta to the fetus
    - Umbilical arteries: carry carbon dioxide and other waste from the fetus to the placenta

Special Circulations (cont'd.)

- Fetal circulation modifications (cont'd.):
  - Ductus venosus: vessel that connects the umbilical vein with the IVC in the fetus
  - Foramen ovale: opening in the interatrial septum of the heart
  - Ductus arteriosus: short tube that connects the pulmonary artery with the aorta

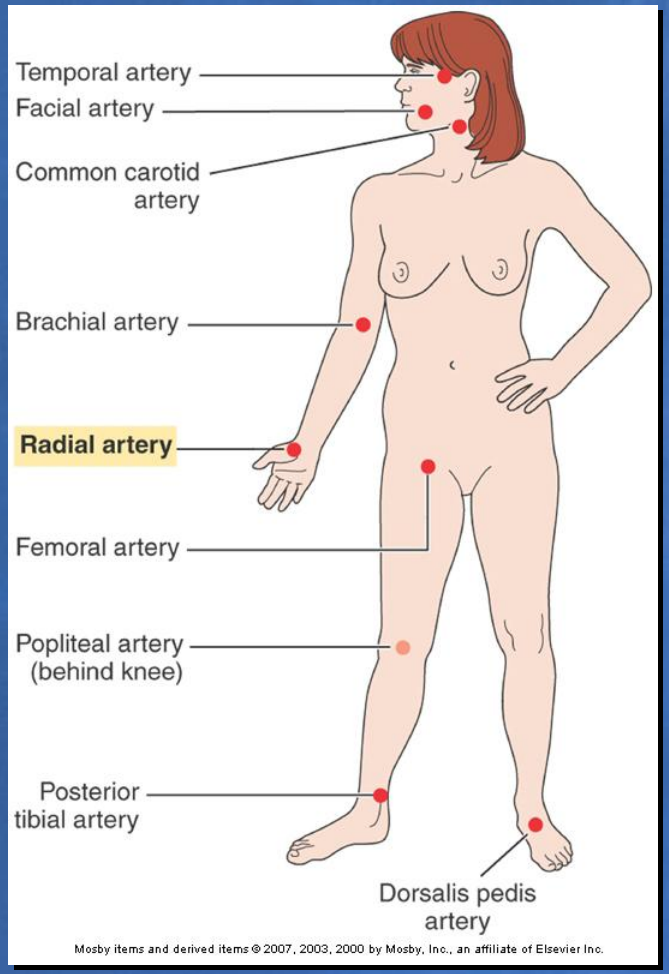
Special Circulations (cont'd.)



Pulse

- Pulse: pressure wave caused by the alternating expansion and recoil of the arteries with each beat of the heart
- Helps determine:
  - Heart rate
  - Rhythm
  - Strength
  - Arterial circulatory health

Pulse (cont'd.)


Temporal artery
Facial artery
Common carotid artery
Brachial artery
Radial artery
Femoral artery
Popliteal artery (behind knee)
Posterior tibial artery
Dorsalis pedis artery
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