

### Functions of the Circulatory System

- Carries nutrients (O<sub>2</sub>) to cells
- Takes waste away from cells
- Distributes heat throughout the body
- Regulates levels of body fluids
- Sends chemical messengers to different parts of the body (hormones)
- Defends against foreign organisms

### Types of Blood Vessels

**Arteries** The muscular-walled tubes by which blood (mainly oxygenated) is delivered from the heart to all parts of the body, *high pressure vessels*

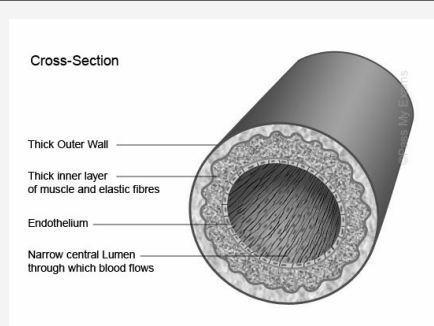
**Arterioles** Small arteries that lead into capillaries, *still have high pressure but not as much as arteries*

**Capillaries** Composed of a single layer of cells, ideal for fluid and gas exchange

**Venules** Small veins that lead from capillaries, *low pressure*

**Veins** Vessels that carry mainly deoxygenated blood to the heart that have a larger diameter than arteries, *low pressure vessels*

### Arteries



Arteries carry blood away from the heart  
Most arteries carry oxygenated blood  
(**except the pulmonary artery that goes from heart to lungs**)

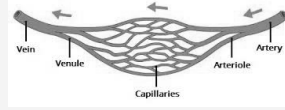
They have thick walls with 3 layers:

**Inner and outer walls:** connective tissue

**Middle layers:** made of muscle fibres and elastic connective tissue

The walls **stretch** with every heart contra-

### Arterioles & Venules



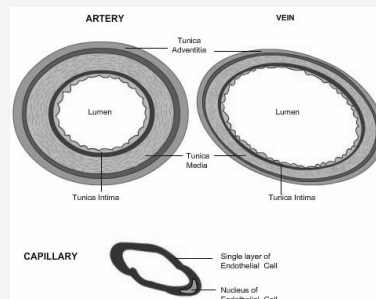
#### Arterioles:

- Middle layer is smooth muscle and elastic fibre
- Pressure is still high but less than arteries
- *The diameter is controlled by the autonomic nervous system*, messages from the ANS can cause **vasoconstriction** or **vasodilation**
- Pre-capillary sphincters regulate blood flow, so not all arterioles are open at any given time

#### Venules:

- Lined with smooth muscle, but not 3 layers (like seen in arteries)
- Not enough blood pressure to return blood to heart

### Veins



- Mainly carry deoxygenated blood (**exception of the pulmonary vein which brings blood from the lungs to the heart**)
- Blood pressure in the veins is much lower than in the arteries **therefore, veins are lined with valves to prevent backflow**
- If blood pools, the vein will swell in front of the valve
- Blood moves through veins as the vein is squeezed by *skeletal muscles*
- Act as blood reservoirs (65% of total blood volume can be found in the veins)

### Capillaries

### Arteriosclerosis

**Arteriosclerosis:** a group of disorders that cause the blood vessels to thicken, harden, and lose elasticity

**Atherosclerosis:** a degeneration of blood vessels caused by the accumulation of fat deposits in the inner wall

Caused by a lipid build-up along with calcium and other minerals to form a plaque

Leads to high blood pressure, if this forms a blood clot and it breaks off, it can cause a heart attack

### Aneurysm

**Aneurysm:** a bulge in the weakened wall of a blood vessel, usually an artery

Often due to atherosclerosis

If an aneurysm bursts, less oxygen and nutrients are delivered to the tissues, resulting in cell death

**Stroke:** aneurysm in the brain

### Pulse & The Control of Blood Flow

#### Pulse

When the ventricle contracts, blood surges forward into arteries, when a pulse is felt, it is the artery expanding and contracting

#### Decreasing Blood Flow

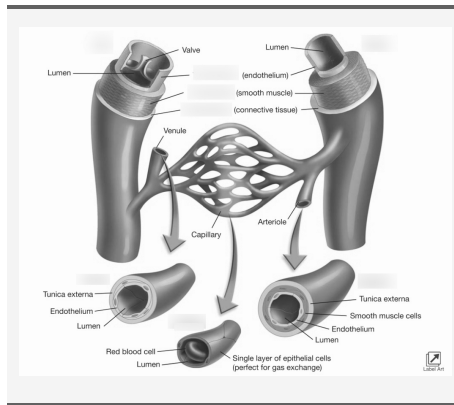
Smooth muscles on arterial walls contract to decrease blood volume and pressure

#### Capillary Blood Flow

Precapillary sphincters close off to limit blood volume and pressure in capillaries

Through-fare channels are always open to allow blood flow

ction and **recoil** after the blood has passed through



- Composed of a single layer of cells
- Small diameter, slows the flow of red blood cells
- Thin wall ideal for gas and fluid exchange
- Due to high surface area, the pressure drops significantly
- 85% of fluid returns to capillaries (remaining 15% returns via lymph)



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