

Blood Vessels

- Blood vessels form a closed system that transports blood to the tissues and back to the heart
 - Vessels that carry blood **away from the heart** are **arteries and arterioles**
 - Vessels that play a role in **exchanges between tissues and blood** are **capillaries**
 - Vessels that return blood **toward the heart** are **venules and veins**

Microscopic Anatomy of Blood Vessels

- Three layers (tunics) in arteries, arterioles, veins, and venules:

1. Tunica intima

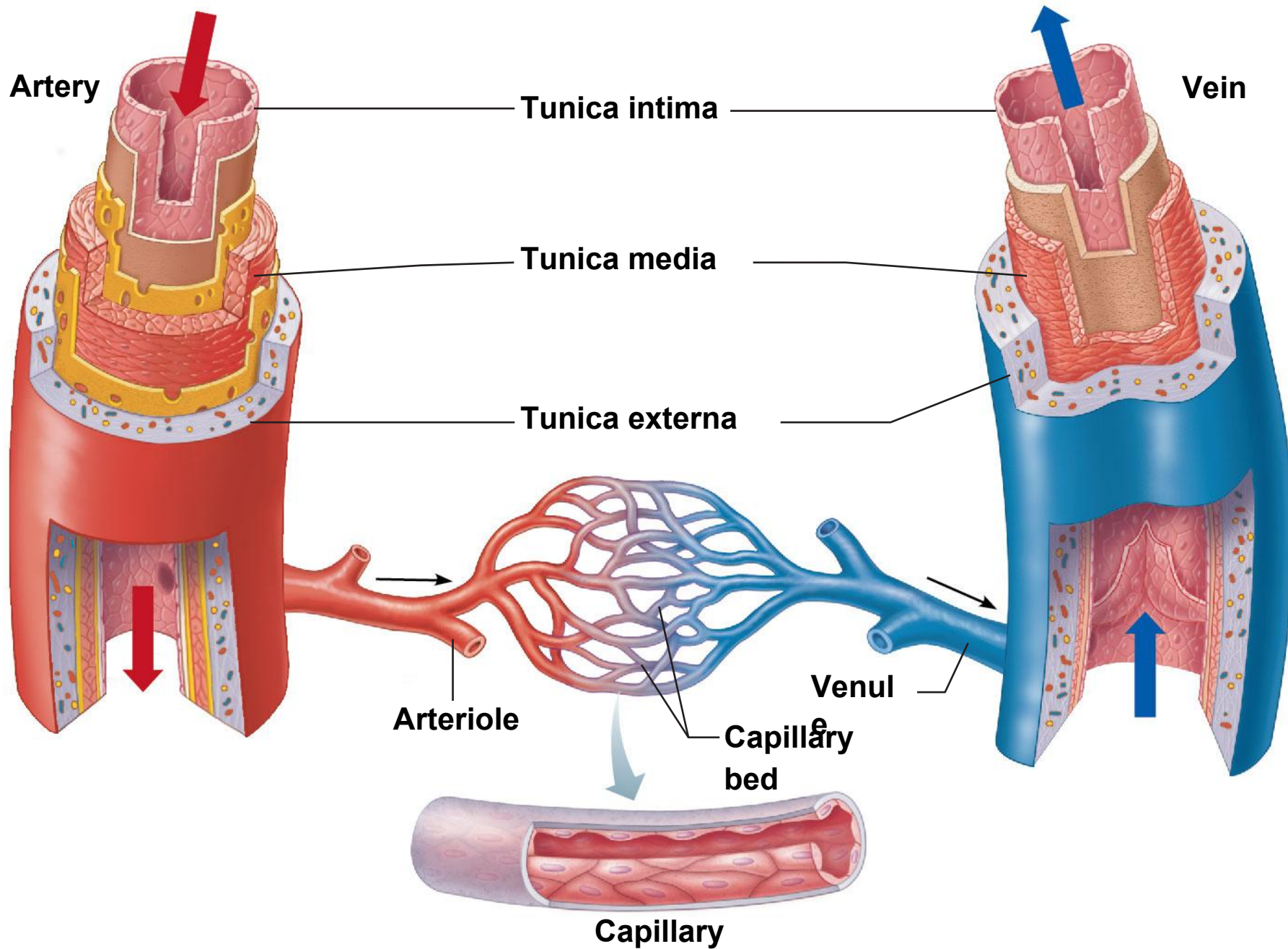
- **Inner layer**
- Composed of **epithelial tissue**
- **Forms a friction-reducing lining**

2. Tunica media

- **Middle layer**
- Composed of **smooth muscle and elastic tissue**
- **Contracts to regulate diameter of vessel**

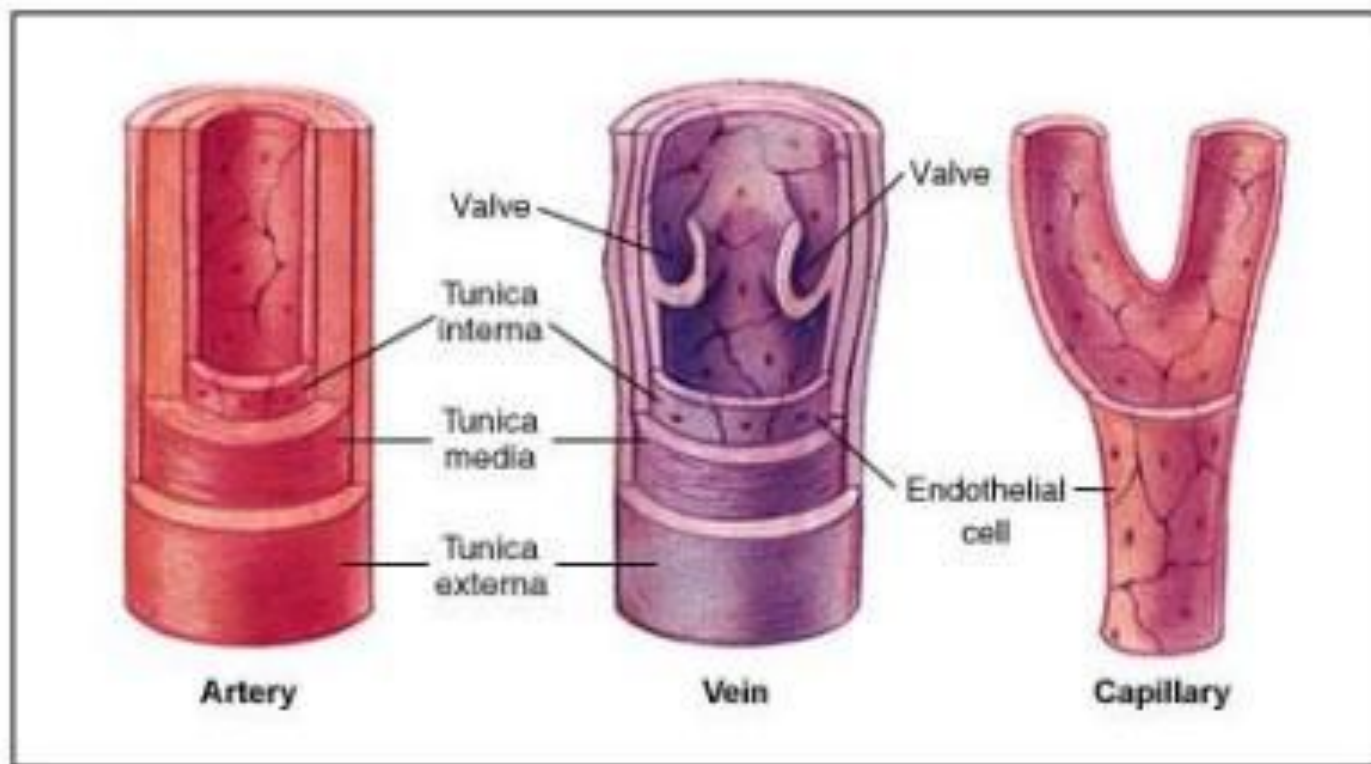
3. Tunica externa

- **Outer layer**
- Composed of **fibrous connective tissue**
- **Supports and protects the vessel**



Microscopic Anatomy of Blood Vessels

- Blood capillaries are composed of a **single cell layer**
- Capillaries only have a **tunica intima**



Comparative Anatomy of Blood Vessels

- Arteries have a **heavier, stronger, stretchier tunica media** than veins to **withstand changes in pressure**

Vasoconstriction and Vasodilation



Dilated Artery

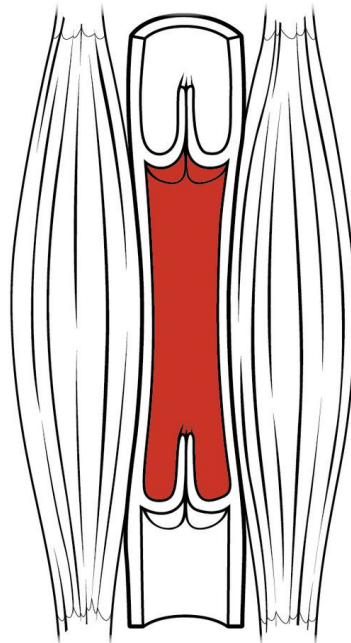
Normal Artery

Constricted Artery

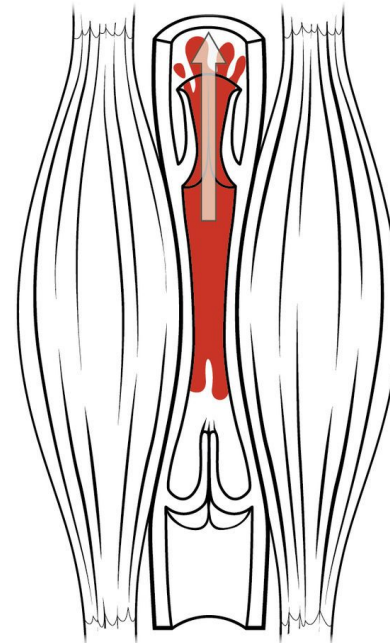
Comparative Anatomy of Blood Vessels

- Veins have a **thinner tunica media** than arteries and **operate under low pressure**
 - Veins also have **valves to prevent backflow** of blood
 - Skeletal muscle “milks” blood in veins toward the heart

Muscles relaxed,
valves closed



Muscles contracted,
valve above muscle opens

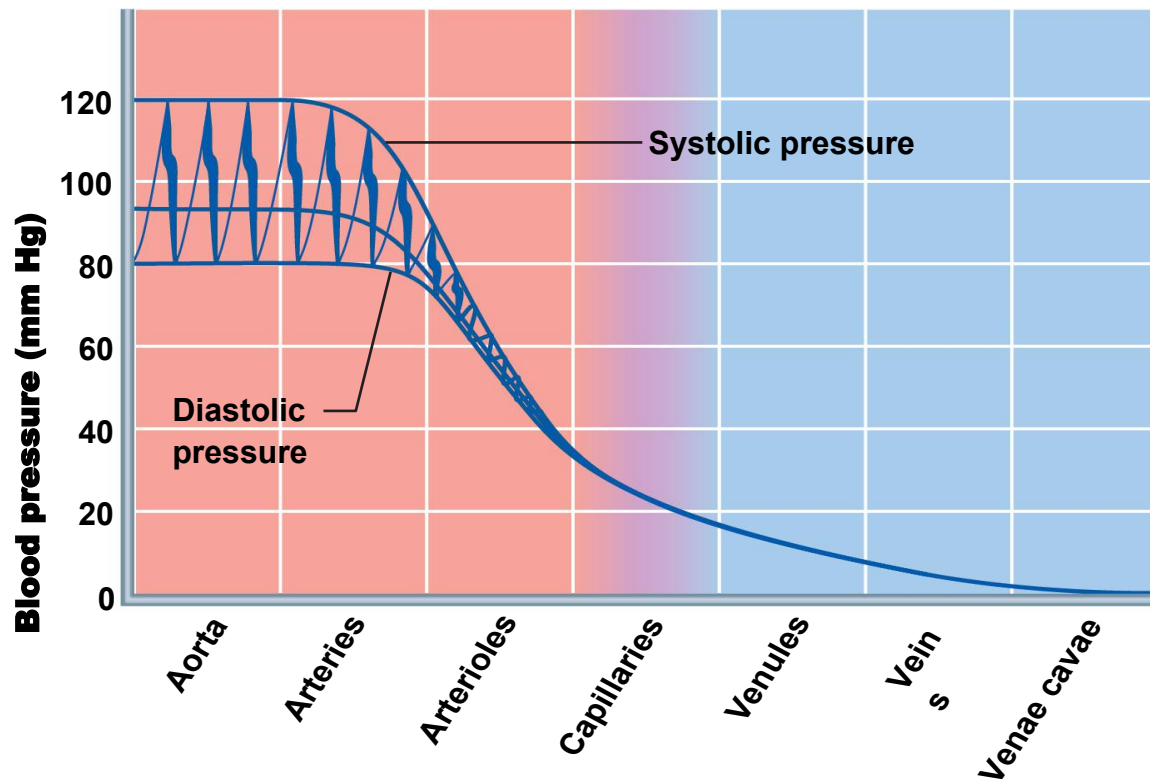


Blood Pressure

- Blood pressure is the **pressure the blood exerts against the inner walls of the blood vessels**
 - The force that causes blood to continue to flow in the blood vessels
- When the ventricles contract:
 - **Blood is forced into elastic arteries close to the heart**
 - **Blood flows along a descending pressure gradient**

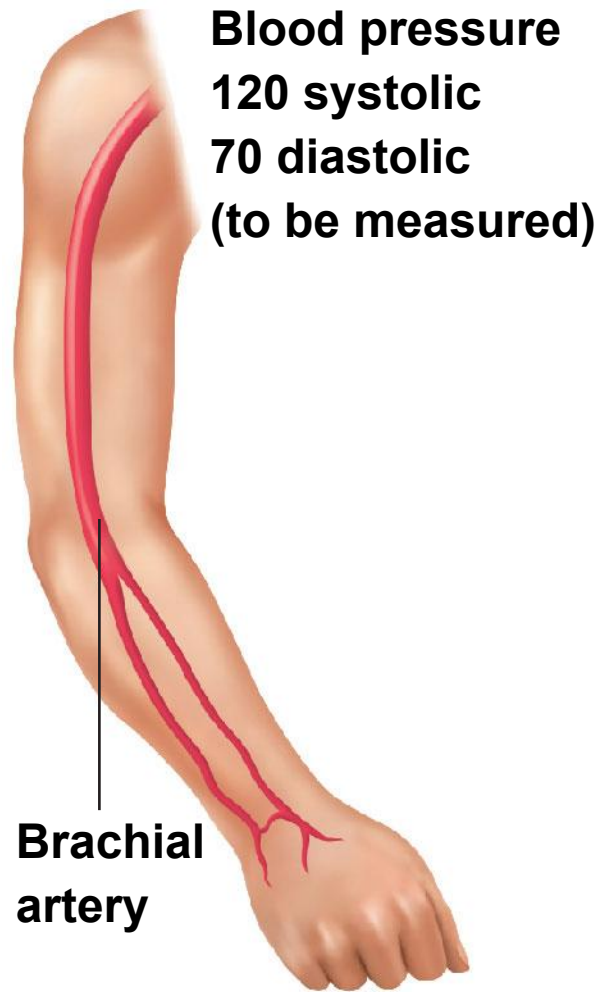
Blood Pressure

- Pressure **decreases** in blood vessels as distance from the heart **increases**
- Pressure is **high in the arteries, lower in the capillaries, and lowest in the veins**

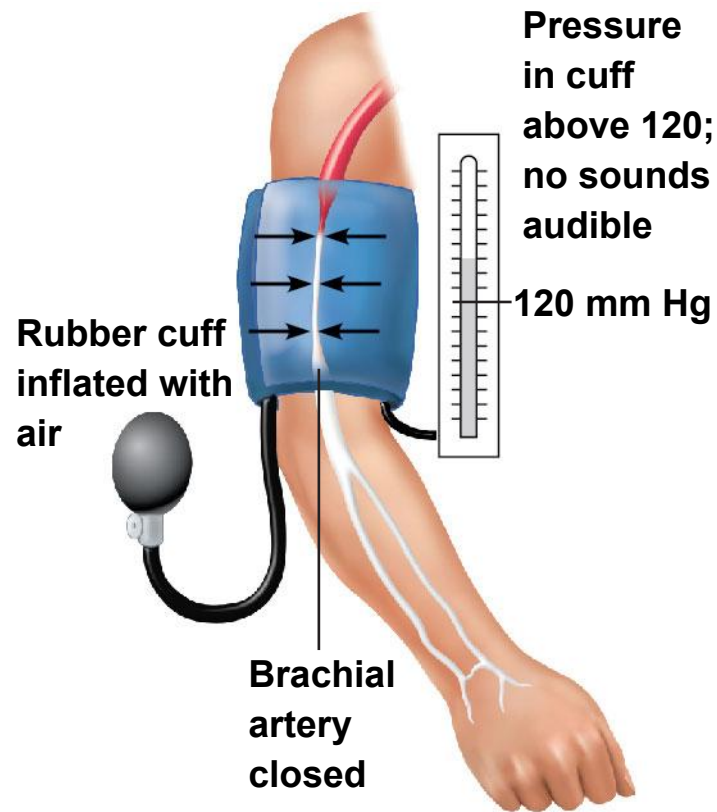


Measuring Blood Pressure

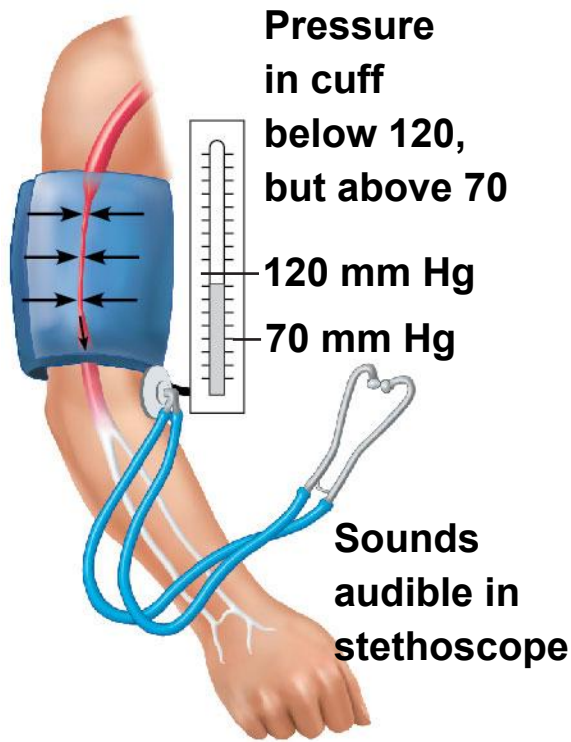
- Two arterial blood pressures are measured
 1. **Systolic—pressure in the arteries at the peak of ventricular contraction**
 2. **Diastolic—pressure when ventricles relax**
- Expressed as **systolic pressure over diastolic pressure** in millimeters of mercury (mm Hg)
 - For example, 120/80 mm Hg
- Blood pressure is measured **indirectly**, most often in the **brachial artery**



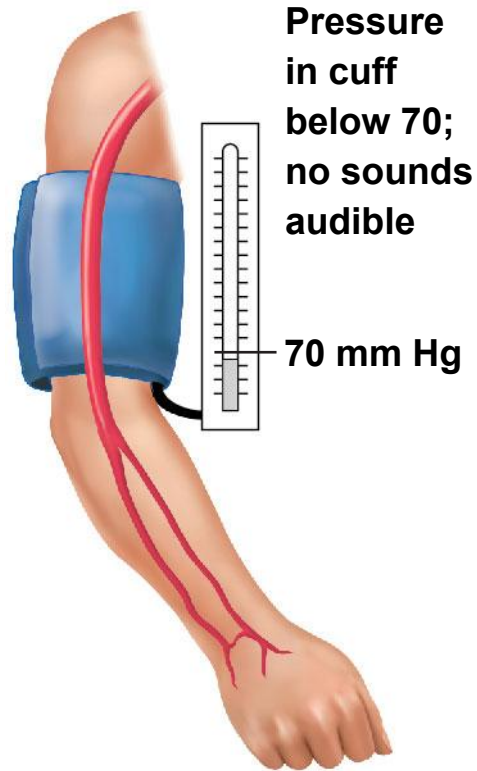
The course of the brachial artery of the arm. Assume a blood pressure of 120/70 in a young, healthy person.



The blood pressure cuff is wrapped snugly around the arm just above the elbow and inflated until the cuff pressure exceeds the systolic blood pressure. At this point, blood flow into the arm is stopped, and a brachial pulse cannot be felt or heard.



The pressure in the cuff is gradually reduced while the examiner listens (auscultates) for sounds in the brachial artery with a stethoscope. The pressure read as the first soft tapping sounds are heard (the first point at which a small amount of blood is spurting through the constricted artery) is recorded as the systolic pressure.



As the pressure is reduced still further, the sounds become louder and more distinct; when the artery is no longer constricted and blood flows freely, the sounds can no longer be heard. The pressure at which the sounds disappear is recorded as the diastolic pressure.