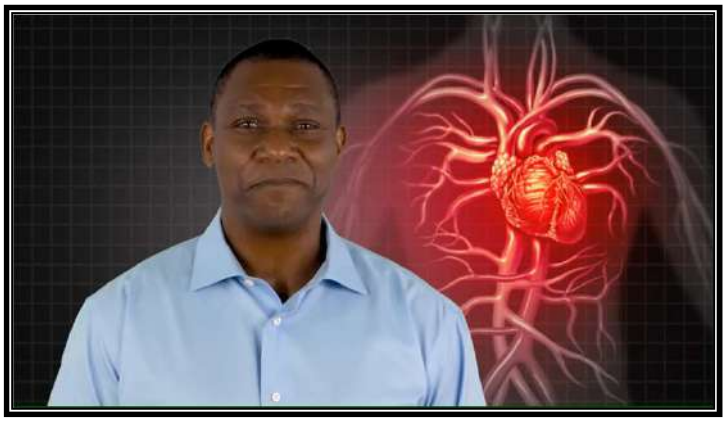
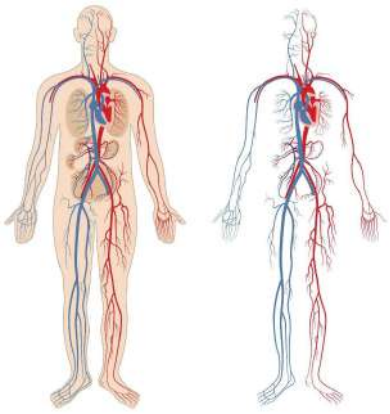




The Circulatory System

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Now, as we explore this topic about bleeding and shock, we begin with a lesson about the circulatory system.

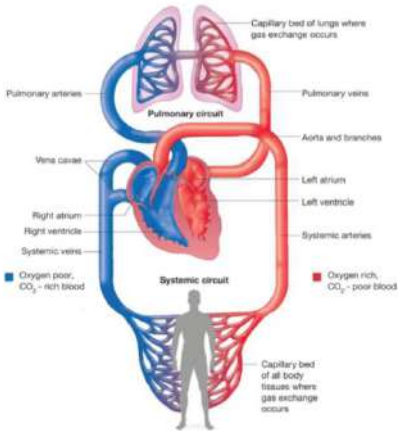
The circulatory system, also called the cardiovascular system, delivers nutrients and oxygen to all the cells in the body. It consists of the heart, the blood vessels, and the blood.

Arteries carry blood away from the heart; the veins carry it back. The system of blood vessels resembles a tree where the trunk is the main artery called the aorta. The aorta branches into large arteries, which then lead to smaller and smaller vessels. The smallest arteries end in a network of tiny vessels known as the capillary network.

And as we go through this lesson, consider the metabolic process of the cells as it relates to the circulatory system.

Circulatory System

- Two blood circulatory systems:
  - ✓ Systemic circulation system: Provides organs, tissues, and cells with blood
  - ✓ Pulmonary circulation system: Is where the fresh oxygen enters the blood



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Now, we will describe the role of the circulatory system including the functions it provides to the body, and its components, plus the role each component plays within the system.

Note that there isn't only one blood circulatory system in the human body, but two. The systems are connected. They are:

1. The systemic circulation system, which provides organs, tissues, and cells with blood so that they get oxygen and other vital substances. And
2. The pulmonary circulation system, which is where the fresh oxygen we breathe, enters the blood, while at the same time, enabling carbon dioxide to be released.

Circulatory System | Main Components

- Heart
- Blood vessels
- Blood

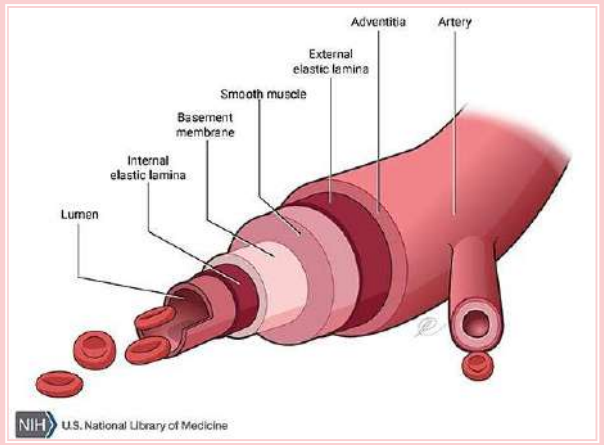


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So, let's review the three main components of the circulatory system.
First, the heart is an organ about the size of your fist that pumps blood through your body. It is made up of multiple layers of tissue. The heart is at the center of the circulatory system. This system is a network of blood vessels, such as the arteries, veins, and capillaries, that carry blood to and from all areas of your body.
Next, the blood vessels are the components of the circulatory system that transport blood throughout the human body. These vessels transport blood cells, nutrients, and oxygen to the tissues of the body. They also take waste and carbon dioxide away from the tissues.
And third, blood circulates through our body and delivers essential substances like oxygen and nutrients to the body's cells. It also transports metabolic waste products away from those same cells.

Circulatory System | Main Components (Cont.)

- Arteries
  - ✓ Carry oxygen-rich blood away from the heart
  - ✓ Comprised of thick, muscular walls that enable dilation and constriction



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The arteries are the blood vessels that deliver oxygen-rich blood from the heart to the tissues of the body. They are comprised of thick, muscular walls that enable dilation and constriction.

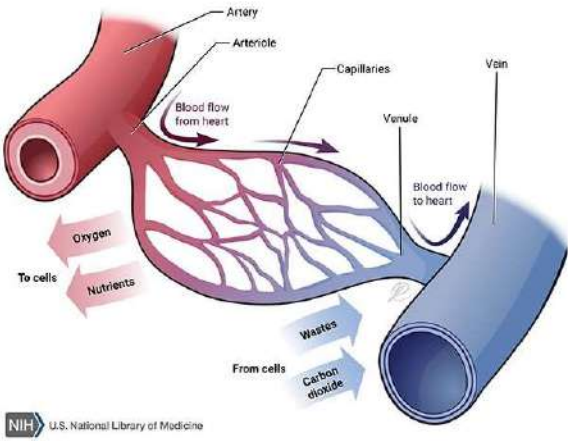
Each artery has three layers:

- The intima, the inner layer lined by a smooth tissue called endothelium
- The media, a layer of muscle that lets arteries handle the high pressures from the heart, and
- The adventitia, connective tissue anchoring arteries to nearby tissues

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Circulatory System | Main Components (Cont.)

- Capillaries
  - ✓ Microscopic blood vessels
  - ✓ Vital exchange site
  - ✓ Oxygen, nutrients passed through capillary walls in exchange for carbon dioxide from cells

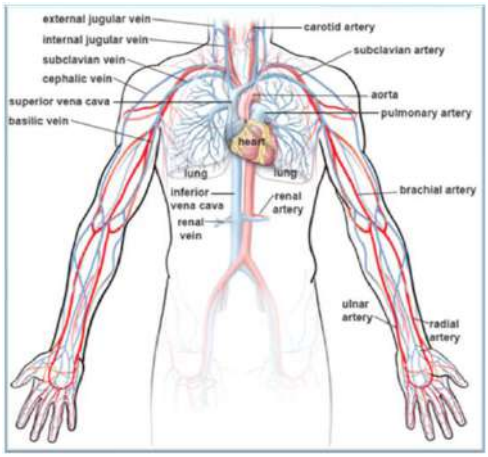


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Capillaries are microscopic blood vessels, enabling the vital exchange of Oxygen. While nutrients pass through capillary walls in exchange for carbon dioxide from cells. Capillaries are the smallest of blood vessels. They serve to distribute oxygenated blood from arteries to the tissues of the body, and to feed deoxygenated blood from the tissues back into the veins. The capillaries are thus a central component in the circulatory system, essentially between the arteries and the veins.

Circulatory System | Main Components (Cont.)

- Veins
  - ✓ Carry oxygen-depleted blood rich in carbon dioxide back to the heart
  - ✓ Contain one-way valves to prevent back flow of blood



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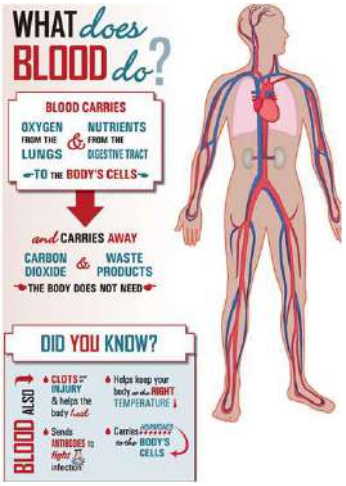
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Veins are blood vessels that carry blood towards the heart, while arteries carry the blood away. Most veins carry oxygen-depleted blood, rich in carbon dioxide. Exceptions are the pulmonary and umbilical veins, both of which carry oxygenated blood.
Interesting note: Veins contain one-way valves to prevent the backflow of blood.

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CIRCULATORY SYSTEM | MAIN COMPONENTS (CONT.)

- Functions of blood
  - ✓ Transportation of gases
  - ✓ Nutrition
  - ✓ Excretion
  - ✓ Protection
  - ✓ Regulation



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Blood is a vitally important fluid for the body. It is thicker than water, and feels a bit sticky. The temperature of the blood in the body is 38° C, which is about one degree higher than body temperature. How much blood you have depends mostly on your size and weight.

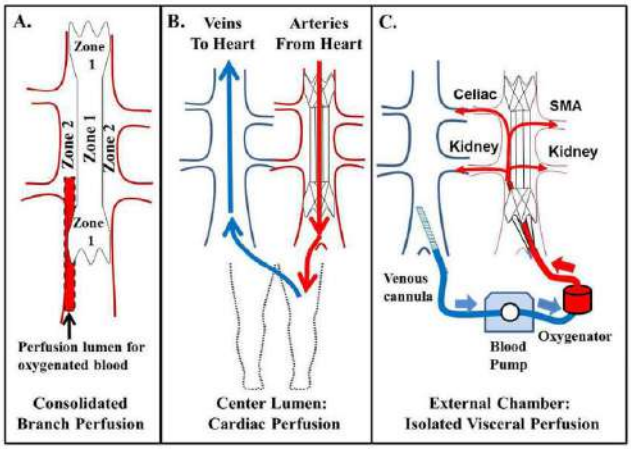
Blood has these important functions:

- Transportation of gases: The blood transports oxygen from the lungs to the cells of the body, where it is needed for metabolism. The carbon dioxide produced during metabolism is carried back to the lungs by the blood, where it is then exhaled.
- Nutrition: providing essential nutrients to cells, such as amino acids, fatty acids, and glucose
- Excretion: removing waste materials, such as carbon dioxide, urea, and lactic acid
- Protection: If a blood vessel is damaged, certain parts of the blood, clot together very quickly and make sure that a scrape, for instance, stops bleeding. This is how the body is protected against losing blood. White blood cells and other messenger substances also play an important role in the immune system, and
- Regulation: The blood helps to keep certain values of the body in balance, by regulating acidity or PH levels, and body temperature.

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CIRCULATORY SYSTEM | MAIN COMPONENTS (CONT.)

- Perfusion
  - ✓ Adequate circulation of blood throughout body
- Hypoperfusion
  - ✓ Inadequate perfusion of body's tissues and organs



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Perfusion is the passage of fluid through the circulatory system to an organ or a tissue. This usually refers to the delivery of blood to a capillary bed. Perfusion is measured as the rate at which blood is delivered to tissue.

Hypoperfusion or shock is the inadequate delivery of vital oxygen and nutrients to the body tissues, which if left unchecked, will result in organ system failure and death.

The medical world recently recategorized shock into four primary areas. These are:

- First: Hypovolemic Shock, which is decreased intravascular fluid volume.
- Second is Distributive shock, this refers to increased vascular “pipe” size; peripheral vasodilation, and vascular permeability.
- Then, Cardiogenic shock refers to the Primary heart “pump” failure.
- And Obstructive shock refers to blood Vessels that are obstructed.

So, that’s it for the circulatory system. Missah will be joining you for the next lesson on bleeding.