

THE CIRCULATORY SYSTEM

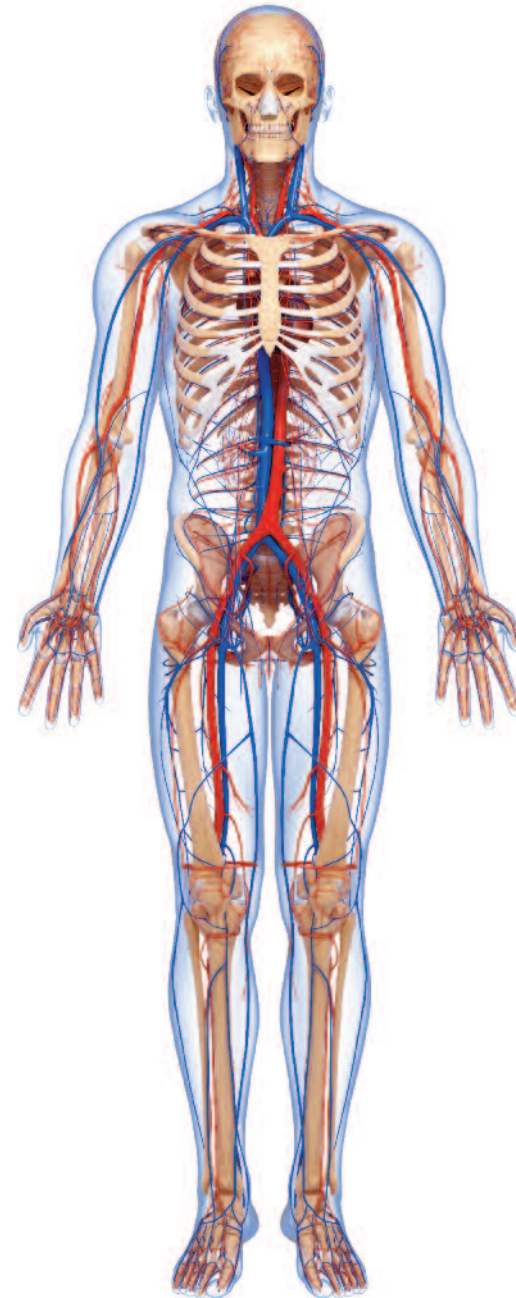
Overview

The Circulatory System is the main transportation and cooling system for the body: an organ system that passes nutrients (such as amino acids, electrolytes and lymph), gases, hormones and blood cells to and from cells in the body to help fight diseases, stabilize body temperature and pH, and to maintain homeostasis. The system also removes carbon dioxide and waste products. There are two parts to the circulatory system: cardiovascular and lymph.

The essential components of the human **cardiovascular system** are the heart, blood, and blood vessels. It includes: the pulmonary circulation, a “loop” through the lungs where blood is oxygenated; and the systemic circulation, a “loop” through the rest of the body to provide oxygenated blood. An average adult contains five to six quarts of blood. Two types of fluids move through the circulatory system: blood and lymph. Blood consists of plasma, red blood cells, white blood cells, and platelets. The lymph, lymph nodes, and lymph vessels form the **lymphatic system**. Lymph is essentially recycled blood plasma after it has been filtered from the blood cells and returned to the lymphatic system. Please note: The cardiovascular system and the lymphatic system collectively make up the circulatory system.

Veins are used to carry blood to the heart. Arteries carry blood away from the heart. Most of the time, blood in the veins is blood where most of the oxygen and nutrients have already been delivered to the cells. This blood is called “deoxygenated” and is dark red. Most of the time blood in the arteries is loaded with oxygen and nutrients and the color is bright red. Exceptions: There is one artery that carries deoxygenated blood and there are some veins that carry oxygenated blood.

The circulatory system, shown right, has over 60,000 miles of blood vessels in a 150 pound human being.



THE VENOUS SYSTEM (VEINS)

The venous system carries the blood back to the heart. The blood flows from the capillaries, to venules (very small veins), to veins. The two largest veins in the body are the superior and inferior vena cava. The superior vena cava carries the blood from the upper part of the body to the heart. The inferior vena cava carries the blood from the lower body to the heart. In medical terms, superior means above and inferior means under.

Many people believe that the blood in the veins is blue; it is not. Venous blood is really dark red or maroon in color. Veins do have a bluish appearance and this may be why people think venous blood is blue. Both the superior and inferior vena cava end in the right atrium. The superior vena cava enters from the top and the inferior vena cava enters from the bottom.

Veins are classified in a number of ways:

- **Superficial veins** are those whose course is close to the surface of the body, and have no corresponding arteries.
- **Deep veins** are deeper in the body and have corresponding arteries.
- **Communicating veins** (or perforator veins) are veins that directly connect superficial veins to deep veins.
- **Pulmonary veins** are a set of veins that deliver oxygenated blood from the lungs to the heart.
- **Systemic veins** drain the tissues of the body and deliver deoxygenated blood to the heart.



THE ARTERIAL SYSTEM (ARTERIES)

Arteries are blood vessels that carry blood away from the heart. This blood is normally oxygenated, exceptions made for the pulmonary and umbilical arteries. The arterial system is the higher-pressure portion of the circulatory system. Arterial pressure varies between the peak pressure during heart contraction, called the systolic pressure, and the minimum, or diastolic pressure between contractions, when the heart expands and refills. This pressure variation within the artery produces the pulse which is observable in any artery, and reflects heart activity. Arteries also aid the heart in pumping blood.

Types of arteries:

- **Pulmonary arteries** carry deoxygenated blood that has just returned from the body to the heart towards the lungs, where carbon dioxide is exchanged for oxygen.
- **Systemic arteries** can be subdivided into two types; muscular and elastic. Larger arteries are generally elastic and smaller ones tend to be muscular. Systemic arteries deliver blood to the arterioles, and then to the capillaries, where nutrients and gasses are exchanged.
- **The aorta** is the root systemic artery. It receives blood directly from the left ventricle of the heart via the aortic valve. As the aorta branches, and these arteries branch in turn, they become successively smaller in diameter, down to the arteriole.
- **Arterioles**, the smallest of the true arteries, help regulate blood pressure by the variable contraction of the smooth muscle of their walls, and deliver blood to the capillaries.
- **The capillaries** are where all of the important exchanges happen in the circulatory system. The capillaries are a single cell in diameter to aid fast and easy diffusion of gases (such as when carbon dioxide is exchanged for oxygen in the lungs), sugars and other nutrients to surrounding tissues.



The Heart and Arterial Tree

THE BLOOD VESSELS OF THE HEAD

From the neck, their origin is superficial, being covered by a tough outer protective layer (integument) as they pass beneath the jaw muscles to the back of the throat; the latter of which separates it, at the summit of its arch, from the lower and back part of the tonsil.

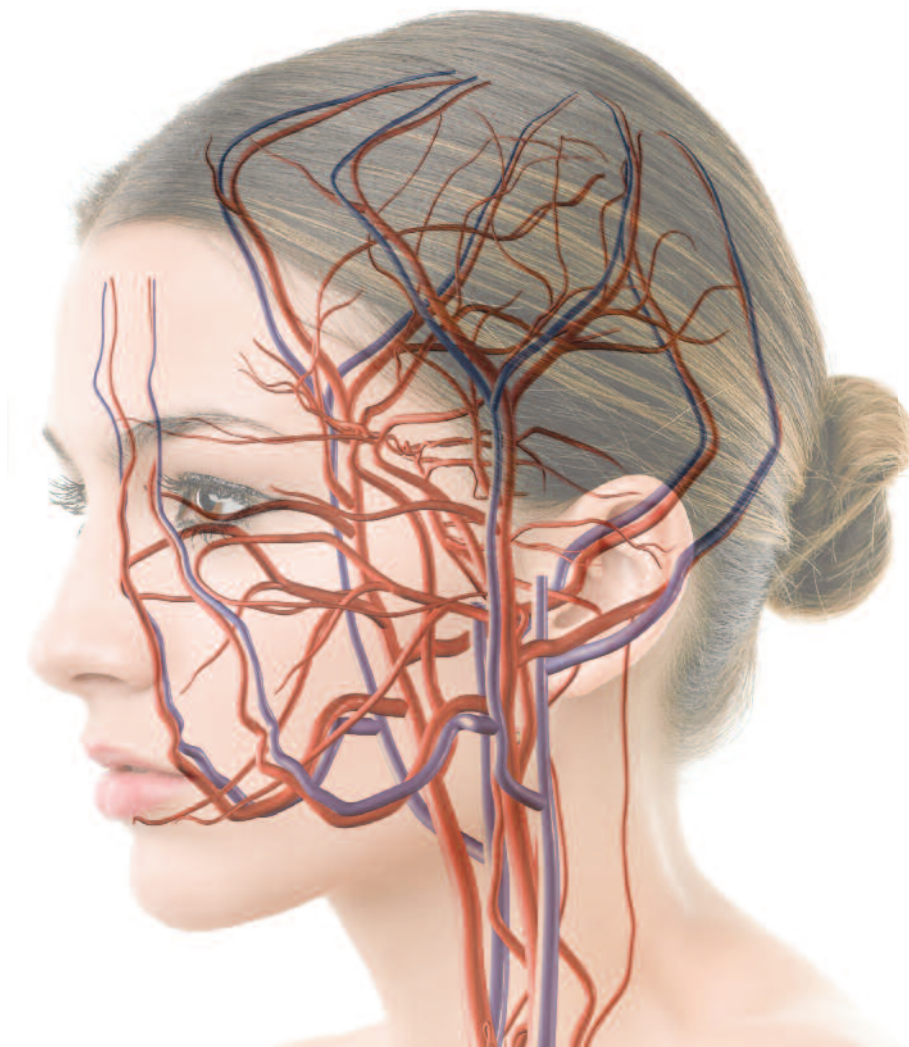
On the face, where it passes over the body of the jaw (mandible), it is comparatively superficial, lying immediately beneath the dilators of the mouth. In its course over the face, it is covered by the integument, the fat of the cheek, and, near the angle of the mouth, by the platysma (a broad sheet of muscle fibers extending from the collarbone to the angle of the jaw). It rests on the flat, thin muscle in the wall of the cheek.

The anterior facial vein lies lateral/posterior to the artery, and takes a more direct course across the face, where it is separated from the artery by a considerable interval. In the neck it lies superficial to the artery. The branches of the facial nerves cross the artery from behind forward.

BLOOD VESSELS AND FACIAL SKIN HEALTH

Sometimes, small, blood vessels of the face dilate (telangiectasias) and may become visible. Also called “spider veins,” they look like short, fine lines, “starburst” clusters, or a web-like maze. The causes of facial spider veins vary, but the main reasons people get them are excessive sun exposure and natural aging. Surgery, laser vein removal, intense pulse light treatment, facial creams, and herbal supplements are just a few of the facial spider vein treatments used commonly to eradicate this problem.

Erythema is a superficial reddening of the skin, usually in patches, causing dilatation of the blood capillaries. The exact cause is unknown. The disorder is believed to involve damage to the blood vessels of the skin, followed by damage to skin tissues. This condition can be a subset cause of the disease “rosacea.”



Veins are pictured as BLUE. Arteries are in RED.