BLOOD VESSELS

Blood vessels are how blood travels through the body.

Whole blood is a fluid made up of red blood cells (erythrocytes), white blood cells (leukocytes), platelets (thrombocytes), and plasma. It supplies the body with oxygen.
There are two basic types of blood vessels: veins and arteries.

Veins carry blood back to the heart and arteries carry blood from the heart out to the rest of the body.

Factoid!
The smallest blood vessel is five micrometers wide. To put into perspective how small that is, a strand of hair is 17 micrometers wide!
BASIC BLOOD VESSEL STRUCTURE

Blood vessels have walls composed of three layers.

The tunica externa is the outermost layer, primarily composed of stretchy collagen fibers. It also contains nerves.

The tunica media is the middle layer. It contains smooth muscle and elastic fiber.

The tunica intima is the innermost layer. It contains endothelial cells, which manage substances passing in and out of the bloodstream.
Blood carries CO₂ and waste into venules (super tiny veins). The venules empty into larger veins and these eventually empty into the heart.

The walls of veins are not as thick as those of arteries. Some veins have flaps of tissue called valves in order to prevent backflow.

**Factoid!**
Valves are found mainly in veins of the limbs where gravity and blood pressure combine to make venous return more difficult.
The superior vena cava drains blood from the upper half of the body.

This large blood vessel is formed from the junction of the two brachiocephalic veins.

Its base sends blood into the right atrium.

**Factoid!**
The superior vena cava contains no valves.
The inferior vena cava is formed by the junction of the common iliac veins. It transports blood from the lower body back to the heart through the bottom of the right atrium.

Essentially, all the veins that don’t empty into the superior vena cava empty into the inferior vena cava.
Blood passes through major arteries as the heart pumps, and then onward into smaller arteries called arterioles.

The walls of arteries are robust and muscular with thick layers of smooth muscle and elastic tissue that allow them to change in diameter to accommodate changes in pressure.
The aorta begins at the base of the left ventricle of the heart, where it receives blood through the aortic valve.

The aortic arch extends backward over the root of the left lung, passing downward to supply blood to the thorax and abdomen.

Factoid!
The aorta is the largest artery in the body!
AORTA (DESCENDING)

The aorta descends down into the thorax and abdomen, supplying blood to the internal organs below the diaphragm (examples include the liver, spleen, pancreas, and kidneys).

**Factoid!**
If all the blood vessels in the body (including both veins and arteries) were laid out end to end, they would stretch about 60,000 miles (100,000 km). This is enough to wrap around the world almost two and a half times!
Blood pressure typically refers to arterial pressure, reported in millimeters of mercury (mm Hg). When blood pressure is measured, two numbers are used.

The first number, systolic blood pressure, measures how much pressure the blood exerts on the arterial walls when the heart beats. The second number, diastolic blood pressure, measures the amount of pressure on the arterial walls between heartbeats.

Normal blood pressure is less than 120/80mm Hg.
The lungs contain blood vessels that help replenish the blood’s oxygen supply.

Pulmonary veins carry oxygenated blood back to the heart’s left atrium for future circulation throughout the body.

**Factoid!**
The pulmonary veins are the only veins in the body that carry oxygenated blood.
The pulmonary arteries carry deoxygenated blood from the right ventricle to the lungs. The right pulmonary artery is larger than the left and runs horizontally behind the aorta.

In the lungs, pulmonary arteries branch into arterioles and then into networks of pulmonary capillaries. This is where the gas exchange (CO₂ for O₂) begins.
Capillaries are tiny vessels that form networks known as capillary beds, weaving to surround individual cells.

The cells of the alveoli collect carbon dioxide from the blood in the capillaries and allow for oxygen to replace it.

Factoid!
The number of capillaries in a given body tissue varies based on the tissue’s metabolic needs.
Now let’s look at how the heart’s chambers link up with the veins and arteries you’ve just learned about.

The superior and inferior vena cava empty deoxygenated blood into the right atrium. This blood then empties into the right ventricle through the tricuspid valve.

When the right ventricle contracts, it squeezes blood out to the lungs through the pulmonary artery.
Freshly oxygenated blood returns to the left atrium via the pulmonary vein. This blood then passes through the mitral valve into the left ventricle.

When the left ventricle contracts, it sends oxygenated blood out through the aorta.

Factoid!
The heart beats about 150,000 times a day and pumps around 2,000 gallons of blood.
Blood circulates even within the heart itself. The muscle tissue of the myocardium needs oxygen to keep the heart pumping!

Veins in the heart carry deoxygenated blood to the right atrium. The anterior cardiac veins empty directly into the right atrium.
The coronary sinus connects the right atrium to the posterior vein of the left ventricle and the great, middle, and small cardiac veins.

**Factoid!**
The coronary sinus is the largest vein inside the heart and plays a key role in procedures such as left ventricular pacing (implanting a pacemaker to stimulate the left ventricle).
The right and left coronary arteries originate at the base of the aorta.

The right coronary artery supplies oxygenated blood to the right atrium, portions of both ventricles, and portions of the conducting system of the heart including the sinoatrial node and the atrioventricular node.
The left coronary artery supplies blood to the left ventricle, left atrium, and the interventricular septum. It branches into the circumflex artery and the anterior interventricular artery.

The circumflex artery supplies blood to the left atrium and the anterior interventricular artery is the main supplier of blood to the interventricular septum.
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