**Capillaries deliver oxygen to every cell in the body.**

***Without oxygen, every cell in our bodies will die.***

**How many capillaries are in a human body?**

1. 10 million
2. 50 million
3. 500 million
4. 10 billion
5. 40 billion

If you haven’t been to medical school lateky, you will not know the answer. The correct answer is forty billion!!!

Every cell is connected to a blood vessel, because every cell needs oxygen. In our lungs, which take in oxygen from our breathing, these blood vessels are called capillaries. These blood vessels get really small to deliver oxygen to each cell in your, and my body.

During normal breathing, some cells do not get oxygen. How do we fix this!

The answer is deep breathing, which will maximize our intake of oxygen and provide oxygen for all our capillaries, so that all our cells will get oxygen. Our brains need a lot of oxygen, so deep breathing helps our brains. Sorry that there is no evidence that deep breathing will make us smarter, but delivering lots of oxygen to our brains will make us more alert. It is suspected that maximizing oxygen to the brains slows down dementia and maybe even delay Alzheimers. Do you need more information to convince you to deep breath? More good news, we do not need to spend money to deep breath. Just learn more about taking deep breathes and do it.

If you want to be healthy and mentally sharp, you (and I) need to breathe deeply as often as possible to make sure we provide all the cells in our body with oxygen and then then the exhaling of all the carbon dioxide, and then you (and I) can take another deep breath to continually providing oxygen to all our cells. Here is one You Tube lecture to help you. There are many YouTube lectures on deep breathing so search You Tube to get additional data. You won't be sorry.

***https://youtu.be/4Lb5L-VEm34***

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[***https://www.verywellhealth.com/what-are-capillaries-2249069***](https://www.verywellhealth.com/what-are-capillaries-2249069)

**Capillary Structure and Function in the Body**

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Capillaries are the smallest blood vessels in the body, connecting the smallest arteries to the smallest veins. These vessels are often referred to as the "microcirculation."

Only two layers of cells thick, **the purpose of capillaries is to play the central role in the circulation, delivering oxygen in the blood to the tissues, and picking up carbon dioxide to be eliminated. They are also the place where nutrients are delivered to feed all of the cells of the body.**

There are three primary types of capillaries—continuous, fenestrated, and discontinuous or sinusoidal that are found in different regions of the body, and specialized capillaries in the brain make up the blood-brain barrier.

Tests that evaluate the capillaries are important in assessing people medically, and there are several medical conditions associated with these vessels.1﻿

Capillaries are very thin, approximately 5 micrometers in diameter, and are composed of only two layers of cells—an inner layer of endothelial cells and an outer layer of epithelial cells. They are so small that red blood cells need to flow through them single file.

**It's been estimated that there are 40 billion capillaries in the average human body.** Surrounding this layer of cells is something called the basement membrane, a layer of protein surrounding the capillary.2

**If all the capillaries in the human body were lined up in single file, the line would stretch over 100,000 miles.**

**Capillaries in the Circulatory System**

**Capillaries may be thought of as the central portion of circulation. Blood leaves the heart through the aorta and the pulmonary arteries traveling to the rest of the body and to the lungs respectively.**

These large arteries become smaller arterioles and eventually narrow to form the capillary bed. From the capillaries, blood flows into the smaller venules and then into veins, flowing back to the heart.3﻿

**Number of Capillaries Varies by Tissue Type**

The number of capillaries in a tissue can vary widely. Certainly, the lungs are packed with capillaries surrounding the alveoli to pick up oxygen and drop off carbon dioxide. Outside of the lungs, capillaries are more abundant in tissues that are more metabolically active.2﻿

**Types of Capillaries**

There are three primary types of capillaries in the circulation:

* **Continuous**: These capillaries have no perforations and allow only small molecules to pass through. They are present in muscle, skin, fat, and nerve tissue.
* **Fenestrated**: These capillaries have small pores that allow small molecules through and are located in the intestines, kidneys, and endocrine glands.
* **Sinusoidal or discontinuous**: These capillaries have large open pores—large enough to allow a blood cell through. They are present in the bone marrow, lymph nodes, and the spleen, and are, in essence, the "leakiest" of the capillaries.4﻿

**Blood-Brain Barrier**

In the central nervous system the capillaries make up what is known as the blood-brain barrier. This barrier limits the ability of toxins (and, unfortunately, many chemotherapy agents and other medications) to pass through into the brain.

Looking for drugs that can pass through the blood-brain barrier, and hence, treat conditions such as brain metastases from a number of cancers, is an active area of research.5﻿

**Function**

**The capillaries are responsible for facilitating the transport and exchange of gases, fluids, and nutrients in the body**. While the arteries and arterioles act to transport these products to the capillaries, it is at the level of capillaries where the exchange takes place.

The capillaries also function to receive carbon dioxide and waste products that are then delivered to the kidneys and liver (for wastes) and the lungs (for exhalation of carbon dioxide).2﻿

**Gas Exchange**

In the lungs, oxygen diffuses from the alveoli into capillaries to be attached to hemoglobin and be carried throughout the body. Carbon dioxide (from deoxygenated blood) in turn flows from the capillaries back into alveoli to be exhaled into the environment.6﻿

**Fluid and Nutrient Exchange**

Likewise, fluids and nutrients **diffuse** through selectively permeable capillaries into the tissues of the body, and waste products are picked up in the capillaries to be transported through veins to the kidneys and liver where they are thus processed and eliminated from the body.6﻿

**Blood Flow Through Capillaries**

Since the blood flow through capillaries plays such an important part in maintaining the body, you may wonder what happens when blood flow changes, for example, if your blood pressure would drop ([hypotension](https://www.verywellhealth.com/low-blood-pressure-overview-4581941)).

Capillary beds are regulated through something called autoregulation, so that if blood pressure would drop, flow through the capillaries will continue to provide oxygen and nutrients to the tissues of the body. With exercise, more capillary beds are recruited in the lungs to prepare for an increased need for oxygen in tissues of the body.

The flow of blood in the capillaries is controlled by precapillary sphincters. A precapillary sphincter is the muscular fibers that control the movement of blood between the arterioles and capillaries.7﻿

**Capillary Microcirculation**

Regulation of fluid movement between the capillaries and the surrounding interstitial tissues is determined by the balance of two forces: the hydrostatic pressure and osmotic pressure.

On the arterial side of the capillary, the hydrostatic pressure (the pressure that comes from the heart pumping blood and the elasticity of the arteries) is high. Since capillaries are "leaky" this pressure forces fluid and nutrients against the walls of the capillary and out into the interstitial space and tissues.

On the vein side of the capillary, the hydrostatic pressure has dropped significantly. At this point, it is the osmotic pressure of the fluid within the capillary (due to the presence of salts and proteins in the blood) that draws fluids back into the capillary.

Osmotic pressure is also referred to as oncotic pressure and is what pulls fluids and waste products out of the tissues and into the capillary to be returned to the bloodstream (and then delivered to the kidneys among other sites).8﻿

**Medical Significance**

Capillaries are important medically in many ways, and there are ways that you can actually indirectly observe these tiny blood vessels.

**Skin Blanching**

If you've ever wondered why your skin turns white when you put pressure on it the answer is the capillaries. Pressure on the skin presses blood out of the capillaries resulting in the blanching or pale appearance when the pressure is removed.9﻿

**Petechiae**

If you develop a rash, a physician may push on your skin to see if the spots turn white. When capillaries are broken, the blood leaks into the skin and the red spots will remain even with pressure. These are called petechiae and are associated with different conditions than rashes that do blanch with pressure.10

**Capillary Refill**

Doctors often check for "capillary refill." This is tested by observing how rapidly the skin becomes pink again after pressure is released and can give an idea of the health of the tissues.

An example of this use would be in [people with burns](https://www.verywellhealth.com/degrees-of-burns-1298906). A second-degree burn may reveal capillary refill to be somewhat delayed, but in a third-degree burn, there would be no capillary refill at all.

Emergency responders often check capillary refill by pushing on a fingernail or toenail, then releasing pressure and waiting to see how long it takes for the nailbed to appear pink again. If color returns within two seconds (the amount of time it takes to say capillary refill), circulation to the arm or leg is probably OK.

If capillary refill takes more than two seconds, the circulation of the limb is probably compromised and considered an emergency. There are other settings in which capillary refill is delayed as well, such as in dehydration.11﻿

**Third Spacing and Capillary Permeability**

You may hear doctors talk about a phenomenon known as "third spacing." Capillary permeability refers to the ability of fluids to pass out of the capillaries into the surrounding tissues.

Capillary permeability can be increased by [cytokines](https://www.verywellhealth.com/what-are-cytokines-189894) (leukotrienes, histamines, and prostaglandins) released by cells of the immune system. The increased fluid (third spacing) locally can result in [hives](https://www.verywellhealth.com/urticaria-overview-1068810). When someone is very ill, this third spacing due to leaky capillaries may be widespread, giving their body a swollen appearance.12﻿

**Capillary Blood Samples**

Most of the time when you have your blood drawn, a technician will take blood from a vein in your arm. Capillary blood may also be used to do some blood tests, such as for those who monitor their blood sugar. A lancet is used to cut the finger (cut capillaries) and can be used for [testing blood sugar](https://www.verywellhealth.com/how-to-monitor-your-blood-sugar-2616336) and blood pH.13﻿

**Associated Conditions**

There are several common and uncommon conditions that involve the capillaries.

**Port-Wine Stain (Birthmark)**

A small percentage of children are born with "birthmarks" consisting of an area of red or purple skin related to dilated capillaries. Most port-wine stains are a cosmetic problem rather than a medical concern, but they may bleed easily when irritated.14﻿

**Capillary Malformation**

Capillary malformation (arteriovenous malformation syndrome) may occur as part of an inherited syndrome present in roughly 1 in 100,000 people of European ancestry. In this syndrome, there is more blood flow than normal through the capillaries near the skin, which results in pink and red dots on the skin.

The may occur alone, or people may have other complications of this syndrome such as [arteriovenous malformations](https://www.verywellhealth.com/basics-of-brain-avm-symptoms-treatment-prognosis-3146023) (abnormal connections between arteries and veins) which, when in the brain, can cause headaches and seizures.15﻿

**Systemic Capillary Leak Syndrome**

A rare disorder known as capillary leak syndrome involves leaky capillaries which result in constant nasal congestion and episodes of fainting due to rapid drops in blood pressure.16﻿

**Macular Degeneration**

[Macular degeneration](https://www.verywellhealth.com/macular-degeneration-4158439), now the leading cause of blindness in the United States, occurs secondary to damage in the capillaries of the retina.17﻿

[Signs of Macular Degeneration](https://www.verywellhealth.com/how-macular-degeneration-is-diagnosed-4160590)

**A Word From Verywell**

Though the tiniest of blood vessels, capillaries play the biggest role in being the location where oxygen and carbon dioxide are exchanged in all tissues, and where nutrients are delivered and waste is removed from cells.

Capillaries also very important in medical diagnosis and give sometimes critical information on a person's medical condition. While once thought to be responsible for primarily cosmetic conditions, that's changed as their role in macular degeneration was found.7﻿