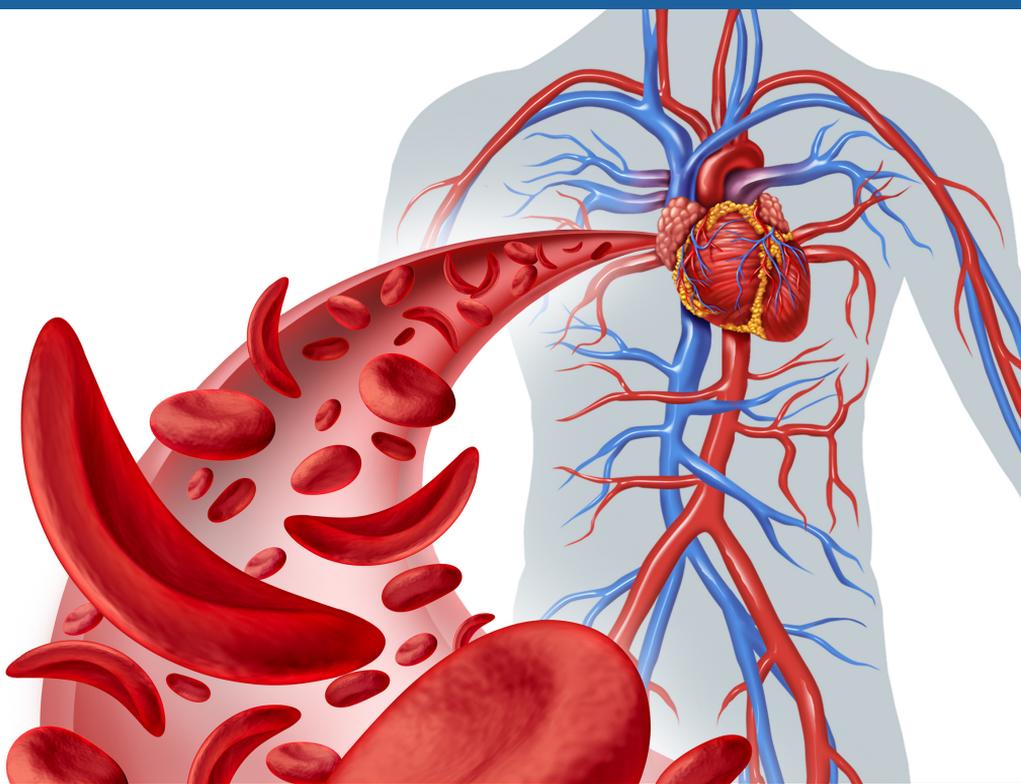


MEN'S GUIDE TO CIRCULATION

WHAT CIRCULATION IS AND HOW YOU CAN
IMPROVE YOURS



JUDSON BRANDEIS, MD

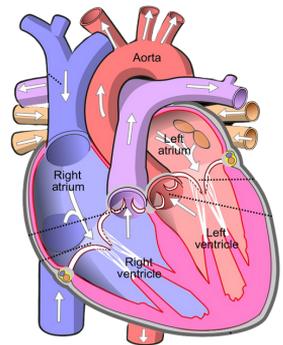
CIRCULATION

Blood circulation helps tissues get oxygen and nutrients and helps get rid of waste products and carbon dioxide.

The circulatory system, also known as the cardiovascular system, is a loop that starts and ends with a four-chamber pump called your heart. There are two separate but linked circuits – the pulmonary and the systemic. In the pulmonary circuit, blood returns from the body through large veins into the right atrium and then into the right ventricle, which pumps the blood into the pulmonary circulation. Blood in the pulmonary circulation system travels through the lungs, where the carbon dioxide in the blood is released and oxygen enters into the blood.

Oxygenated blood returns from the lungs to the heart into the left atrium and then through to the left ventricle, which then pumps blood into the aorta, the largest artery in the body. When blood is pumped into an artery, the artery has muscular and elastic tissue that expands, creating your systolic blood pressure. The arterial wall then contracts and propels blood forward, creating the diastolic blood pressure. These two functions of the arteries are why you have two blood pressures (e.g., 120/80 mm Hg), which is read as systolic blood pressure over diastolic blood pressure.

Your blood travels throughout your body from the aorta through a series of smaller blood vessels until it reaches your capillaries, which are the smallest blood vessels we have in our bodies. As an example, your aorta is around 25 mm at its origin but narrows to about 10 mm when it splits into the common iliac arteries going to the pelvis and legs.



Similarly, the femoral artery going to the leg is about 7mm, while the carotid artery going to the brain is about 6 mm across. The coronary artery serving the heart is 3-4 mm and the penile arteries are only 1-2 mm.

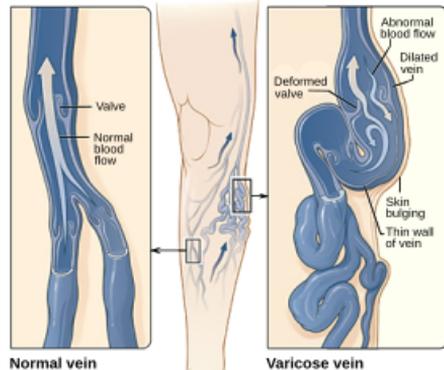
Before reaching your capillaries, however, blood must travel through the arterioles, where its speed and pressure are constantly adjusted as different segments of the arterioles change diameter in response to pressure and chemical sensors positioned nearby. These sensors adjust blood flow via the arterioles in response to changing conditions in your body.

Blood flows slowly and smoothly through the capillaries, unlike arteries where it squirts and pauses as your heart beats because there is a constant exchange of oxygen and nutrients happening in the capillary walls. No cell in the body is far from a life-sustaining capillary.

As blood travels through the capillaries, its supply of oxygen declines, and its waste product content increases as the blood picks up waste along the way. From the capillaries, blood enters the venules and the veins, which bring blood back to the heart to be refreshed with oxygen and sent out once again.

Remember that arteries have muscular walls that propel blood forward - veins have thin walls with no muscles and passively bring blood back to the heart at low pressures (eg 5-10 mm Hg). There are muscular pumps in your legs

like the soleus pump and the popliteal pump that push blood back to your heart, and valves that prevent the backflow of blood. People who are inactive and have faulty valves end up with venous congestion and varicose veins as the mechanisms to return the blood to the heart fail and the blood ends up collecting in the affected veins.



CIRCULATORY FACTS

- The heart beats 2.5 billion times during the life of a 75-year-old.
- The heart expels 2 ounces of blood with each beat, five quarts of blood each minute, 220 million quarts in 70 years.
- Blood is a liquid tissue. Your hematocrit number (usually 40 to 50) is the percent of blood by volume of red blood cells, with fluid making up more than half and plasma, white, and platelets making up the remainder.
- Red blood cells carry oxygen to every cell and remove carbon dioxide.
- If the red blood cells from one person were to be stacked side-by-side, they would reach 31,000 miles.
- Each red blood cell has 270,000,000 hemoglobin molecules, and each hemoglobin molecule can carry four oxygen molecules.
- Each second we lose about 3 million red blood cells. Those red blood cells are consistently replaced with new red blood cells produced in the bone marrow.
- Venous blood that delivers carbon dioxide back to the lungs makes up 75 percent of blood flow at any given moment.

WHAT'S IN YOUR BLOOD

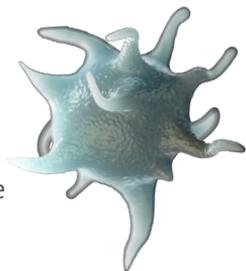
RED BLOOD CELLS

- Red blood cells take up about 40 percent of your blood.
- They carry oxygen from the lungs to tissue and carry carbon dioxide from tissue back to the lungs.
- They contain the molecule hemoglobin which binds to oxygen and gives blood its red color.
- They live about 120 days before being removed by the spleen and replaced with new red blood cells.



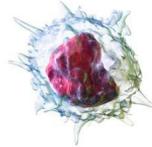
PLATELETS

- They are the sticky cells that clump together to form clots that control bleeding by sticking to the lining of blood vessels.
- They contain growth factors that start the healing process
- They survive in the circulatory system for about 10 days before being removed by the spleen.



WHITE BLOOD CELLS

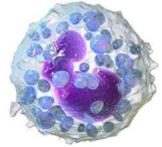
- Multiple different type of cells that fight infection
- They make up less than 1% of your total blood volume.



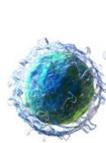
monocyte



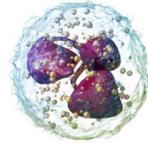
eosinophil



basophil



lymphocytes



neutrophil



PLASMA

- Plasma is a pale-yellow mixture of water, proteins, and salts.
- One of the functions of plasma is to act as a carrier for blood cells, nutrients, enzymes, and hormones.
- Plasma is the liquid portion of the blood. Plasma is 90 percent water and makes up more than half of total blood volume.
- The other 10 percent is protein molecules, including enzymes, clotting agents, immune system components, plus other body essentials such as vitamins and hormones.
- Plasma helps to maintain blood pressure and keeps everything moving through the circulatory system, supplying critical proteins, and serving as an exchange system for vital minerals.

HOW TO IMPROVE CIRCULATION

MONITOR YOUR BLOOD PRESSURE

Blood pressure is the result of pressure created by your heart pumping blood through your circulatory system and the resistance of the arteries as your blood flows through them.



Your heart pumps blood through the larger arteries into smaller blood vessels called arterioles. As arterioles constrict or expand, the resistance of the blood flow is affected. Arteries that become scarred and hardened constrict the flow and raise blood pressure.

When high blood pressure goes untreated for a long time, your heart is forced to pump harder to get the blood to flow, and so your heart muscle may become enlarged and then weakened.



Home blood pressure monitors are inexpensive and accurate. Check your blood pressure in the morning and evening every day to make sure it is in the normal range and does not rise over time.

GET HYDRATED

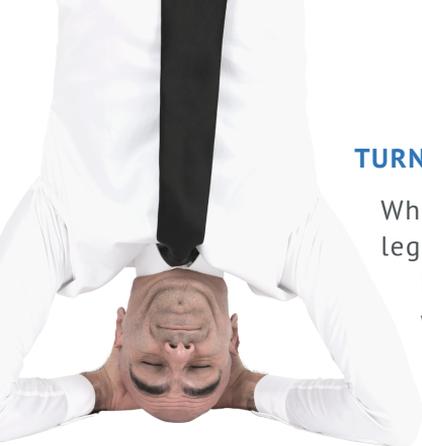
Circulation is optimized when your tank is full. Your kidneys have blood pressure and electrolyte sensors that allow it to adjust levels when you are under or over-hydrated. Keeping your body properly hydrated helps your heart pump blood more easily and allows oxygen to reach your muscles, which helps the muscles work efficiently. Dehydration causes strain on your heart, and the amount of blood circulating through your body, or blood volume, decreases when you are dehydrated. To keep you blood delivery adequate, your heart beats faster and your less essential blood vessels constrict. Dehydration affects mood, brain function, athletic performance, sugar metabolism, and body temperature among other things.



The color of your urine is an excellent indicator of hydration. Aim to keep your urine a light straw yellow color. If it is clear, you are drinking too much and if it is dark yellow, drink more.

STAND UP FOR YOUR HEALTH

Sitting for hours at a time is bad for your circulation since it weakens leg muscles and slows the blood flow in your legs, which leads to varicose veins and could cause a clot in you leg called a deep venous thrombosis. Remember that the muscle in your legs act like a second pump pushing blood back to the heart. If you spend most of your day behind a desk, consider a standing desk instead or leg exercises or walking during breaks. Almost half of our blood volume resides in our legs, and it takes effort to keep it circulating. Additionally, compression socks squeeze the blood out of your legs and prevents varicose veins.



TURN IT UPSIDE DOWN

When your ankles or feet swell, try the legs-up-the-wall yoga pose to return blood to the heart. Lie on the floor with your buttock against the wall and elevate your legs and rest them against the wall. Stretch your arms out on the floor with palms down for balance.

EAT MORE PLANTS AND LESS MEAT

Just accept that there's no downside to a balanced diet. Try to eat lots of fruits and vegetables. Stay away from saturated fats that can be found in red meat, chicken, cheese, and other animal sources. Steer clear of too much salt. That will help keep your weight in a healthy range and your cholesterol and blood pressure in check -- and your arteries clear.

Besides reducing your sugar and fatty food intake to steer clear of high blood pressure, plaque formation, and diabetes, adding more fruits and veggies helps to create nitric oxide which relaxes blood vessels and naturally decreases blood pressure.

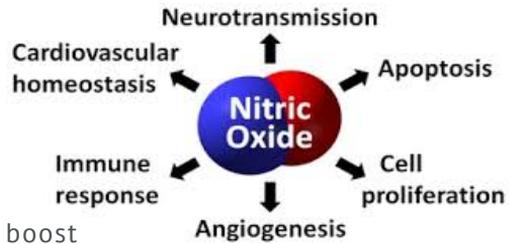
Foods that are high in nitric oxide converters include leafy green vegetables (spinach, kale, swiss chard, bok choy, arugula), beets, cauliflower, carrots, broccoli, citrus fruits, watermelon, and pomegranates. The more colorful your plate looks, the better off you will be.



BOOST NITRIC OXIDE

There are two pathways in your body that create Nitric Oxide, the molecule that dilates blood vessels and improves circulation and blood pressure. One pathway involves the conversion of the amino acid L-Citrulline into L-arginine which then combines with oxygen to create a molecule of Nitric Oxide. The other pathway is Nitrate (NO_3) which your saliva converts to Nitrite (NO_2) which your stomach converts to Nitric Oxide (NO).

If you don't feel like eating 4 pounds of fresh watermelon or a half a dozen beets a day, you can take a supplement like AFFIRM from affirmscience.com which utilizes both pathways to boost Nitric Oxide in your body.



PRIME THE PUMP

Aerobic exercise like running, biking, fast walking, and swimming force you take in more oxygen and move it to your muscles. This gets your blood pumping, makes your heart stronger, and lowers your blood pressure. Set a goal to exercise for 40 minutes, four to six days a week at a heart rate of 220 minus your age multiplied by 0.75.



CONTROL SUGAR



Elevated glucose levels can cause damage to the lining of your small blood vessels, and this can reduce your arterial blood circulation. Diabetes also promotes the formation of plaque in the body,

increasing your risk of peripheral artery disease. The fatty deposits resulting from high sugar levels narrow the blood vessels (especially in your legs, feet, and genitals). Your hemoglobin A1C needs to be less than 6.5 to reduce the risk of harm to your blood vessels.

GET A MASSAGE

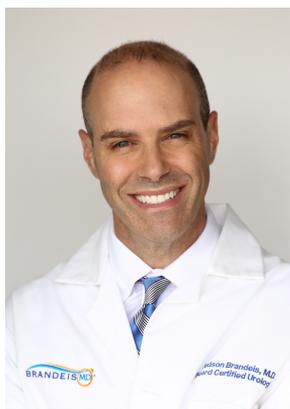
Many people associate getting a massage with pampering rather than medical care. However, massage is a good way to combat poor circulation. The pressure applied and released by the masseuse helps get blood moving and flushes out lactic acid. Another alternative is a warm bath which causes your veins and arteries to expand and provides more room for blood to flow throughout your body.

STOP SMOKING

It is incomprehensible that anyone smokes these days. It is like bungee jumping without tying down the cord. Nicotine, the active ingredient in cigarettes, electronic cigarettes, and smokeless tobacco, constricts blood vessels which reduces blood flow and increases blood pressure. As a result, your heart must pump harder which causes high blood pressure which harms the walls of your arteries and thickens your blood. As mentioned before, the chemicals you inhale when you smoke cause damage to the inner lining of your blood vessels, which makes you more likely to develop plaque buildup in the arteries. And, obviously, lung cancer is a huge risk as well with smoking.



MEET DR. BRANDEIS



Judson Brandeis, MD, is a board-certified urologist who currently practices men's health and sexual medicine in Northern California. His book, *The 21st Century Man*, is the most comprehensive guide to men's health and has won multiple awards.

Dr. Brandeis attended Brown University, Vanderbilt Medical School, and received a Howard Hughes Medical Institute Research Award for

his year of transplantation immunology research at Harvard Medical School. He completed two years of general surgical training and four years of urology residency at UCLA Medical Center and served as Chief of Urology at John Muir Hospital and at Hill Physicians from 2012 to 2018.

At BrandeisMD, he performs clinical research using shockwave therapy, platelet-rich plasma, high-intensity focused electromagnetic waves, microvascular ultrasound, and nutritional supplements for conditions such as sexual dysfunction and Peyronie's disease. Dr. Brandeis is on the Board of Advisors for BioTE, GAINSWave, and BTL. He is the CEO of AFFIRM Science, which creates nutritional supplements based on current scientific data, formulating products that include AFFIRM, PreLONG, SupportT, and SPUNK. He has been voted Top Urologist in the Bay Area by San Francisco Magazine for eight consecutive years, 2014 to 2021, and has appeared on *The Doctors* TV show and numerous podcasts, including Ben Greenfield Fitness and Dr. Drew.

