Causes and natural remedies of Hypertension

1. Hypertension is a lifestyle disorder;
2. Hypertension is the main cause of stroke and heart attack;
3. Causes of hypertension-dehydration, high sodium, low potassium, low magnesium diets and stress
4. Naturals remedies to reverse hypertension.

A blood pressure reading under 120/80mmHg is considered optimal

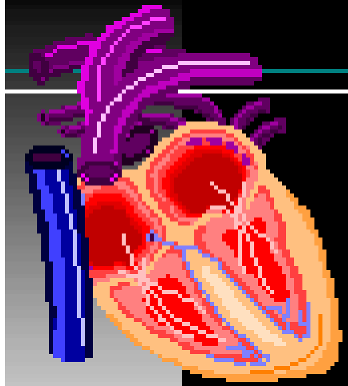
Blood pressure is the pressure of your blood on the walls of your arteries as your heart pumps it around your body. It's a vital part of how your heart and circulation works.

Your blood pressure naturally goes up and down all the time, adjusting to your heart's needs depending on what you are doing. High blood pressure is when your blood pressure is persistently higher than normal.

A blood pressure reading under 120/80mmHg is considered optimal. Readings over 120/80mmHg and up to 139/89mmHg are in the normal to high normal range.

Blood pressure that's high over a long time is one of the main risk factors for heart disease. As you get older, the chances of having persistently high blood pressure increases.

It's very important to get your blood pressure checked regularly, and if it's persistently high it needs to be controlled. Uncontrolled high blood pressure can lead to a heart attack or stroke. It may also affect your kidneys.



Blood Flow

$$F = \frac{\Delta P}{R}$$

Blood flow (F) depends on:

① Pressure Gradient (ΔP) - *heart*

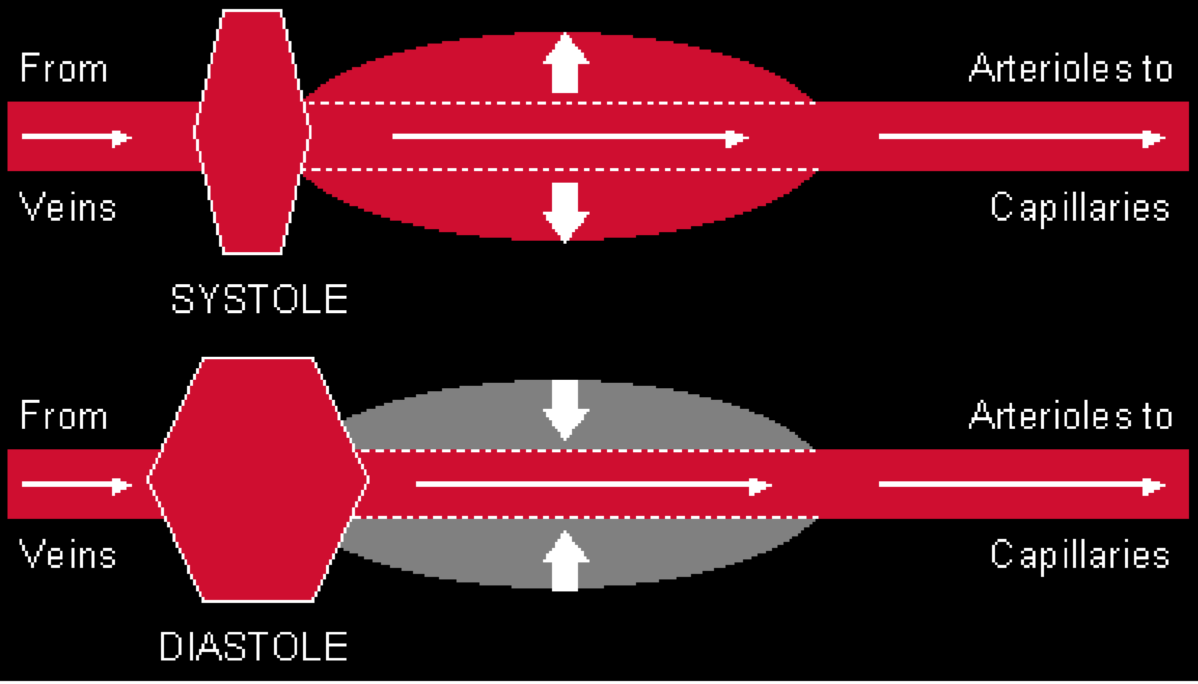
② Resistance (R) - *blood vessels*

- viscosity
- vessel length
- vessel diameter

Vessel <u>diameter</u> is the main determinant of vascular resistance.

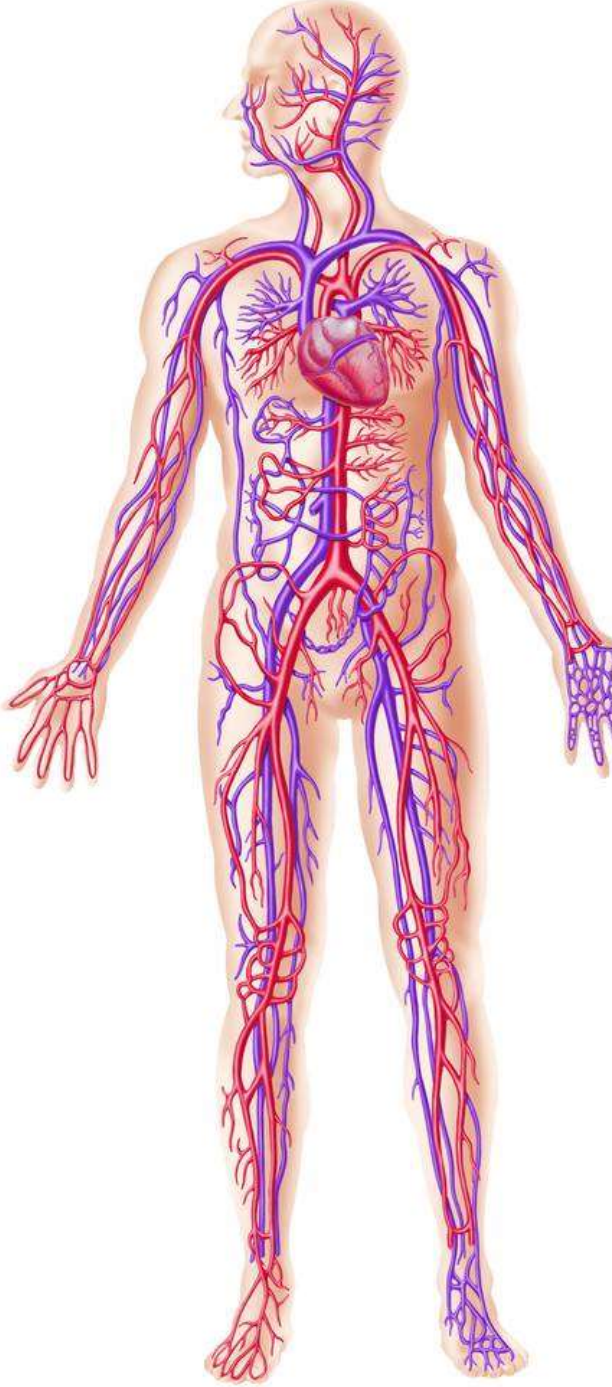
Arteries

- Low resistance, rapid transit passageways
- Muscle & elastic connective tissue in walls
  - *elastic recoil*



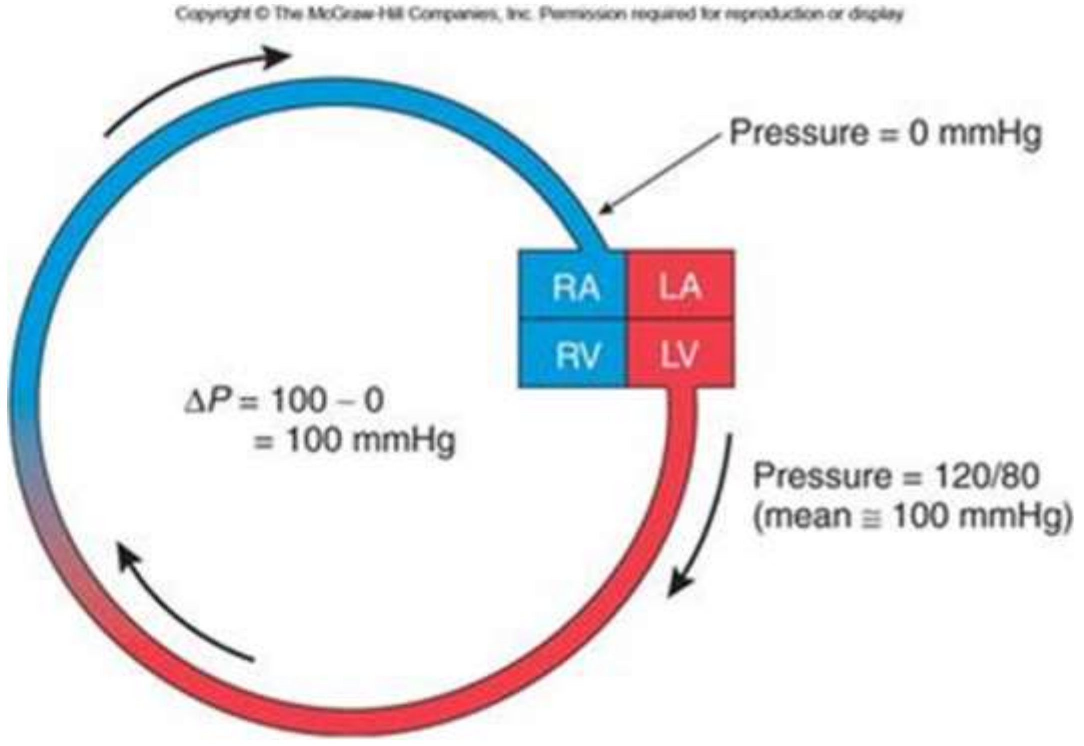
Volume of Blood Flow

- Cardiac output = stroke volume x heart rate
- Other factors that influence cardiac output
  - blood pressure
  - resistance due to friction between blood cells and blood vessel walls
    - blood flows from areas of higher pressure to areas of lower pressure

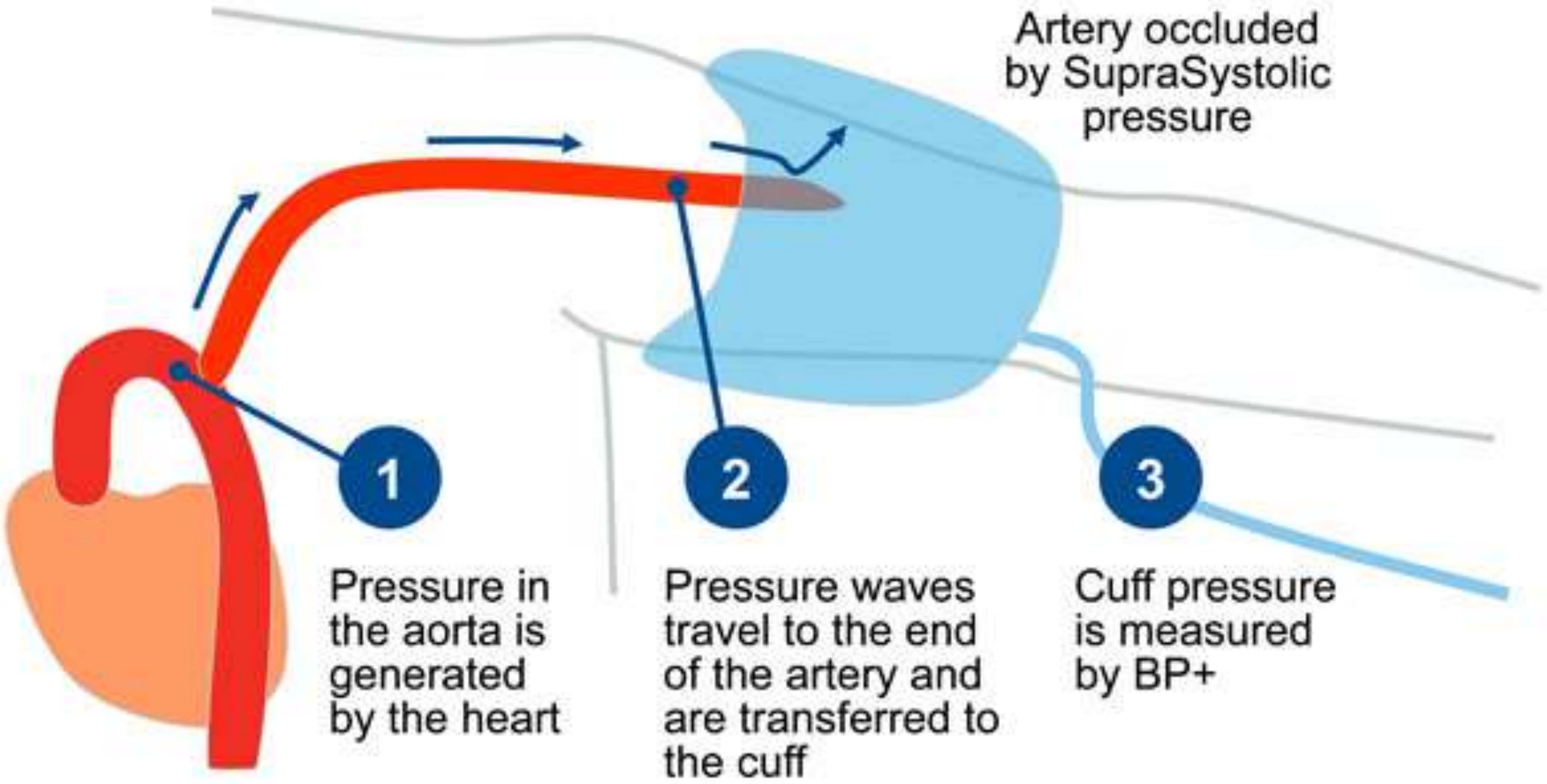


Dynamics of Blood Flow

The heart is the driver of the circulatory system, pumping blood through rhythmic contraction and relaxation. The blood pressure in the circulation is principally due to the pumping action of the heart.
Blood Flow will only occur when a **Pressure** difference exists-blood flows from higher pressure to lower pressure areas.



F(血流量）=P血压/R(阻力）
Flow =Heart's Pressure/Blood's resistance+Vessel's Resistance

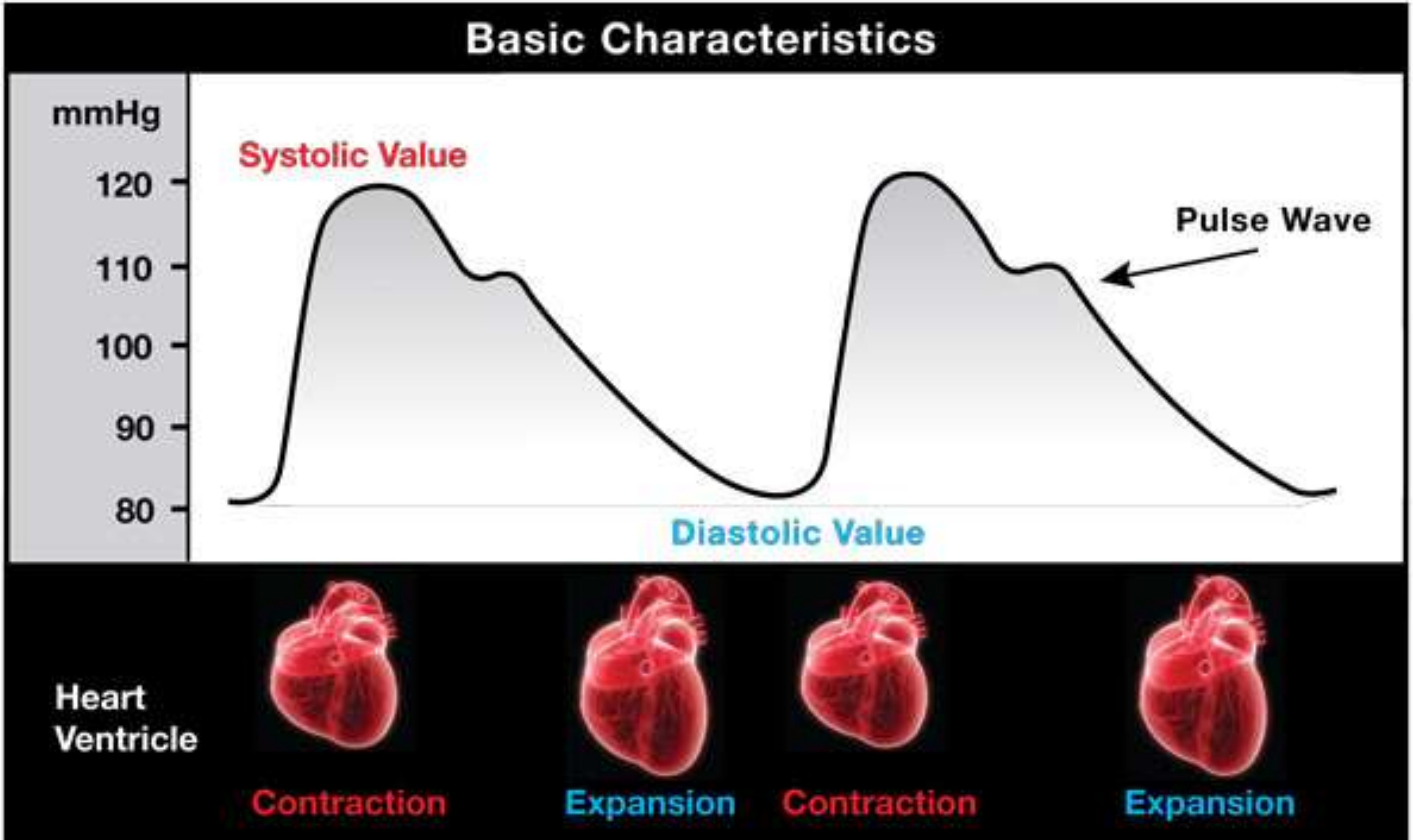

Artery occluded by SupraSystolic pressure
1
2
3
Pressure in the aorta is generated by the heart
Pressure waves travel to the end of the artery and are transferred to the cuff
Cuff pressure is measured by BP+

SYSTOLIC PRESSURE → Is measured between when the heart contracts

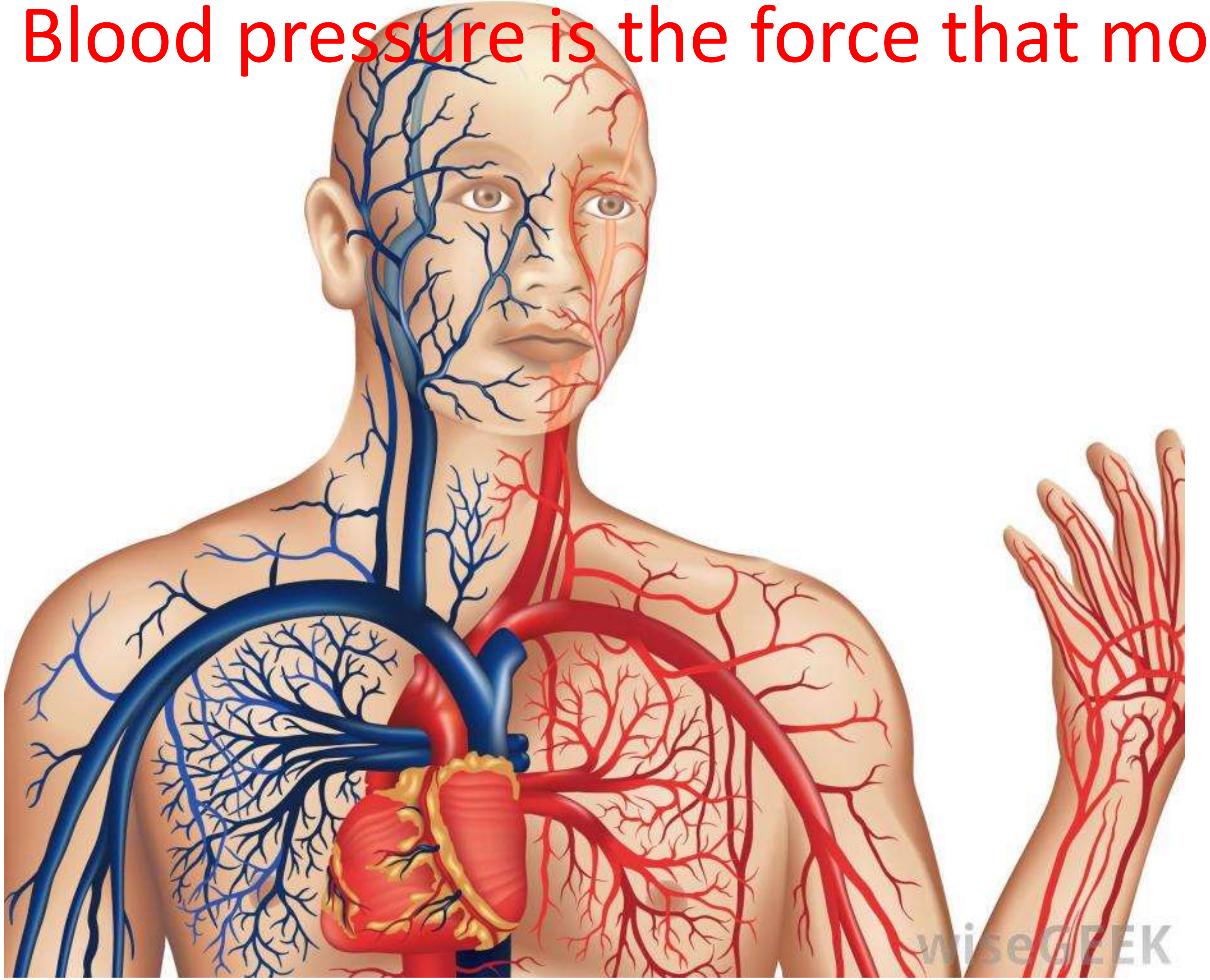
DIASTOLIC PRESSURE → Is measured between beats when the heart relaxes

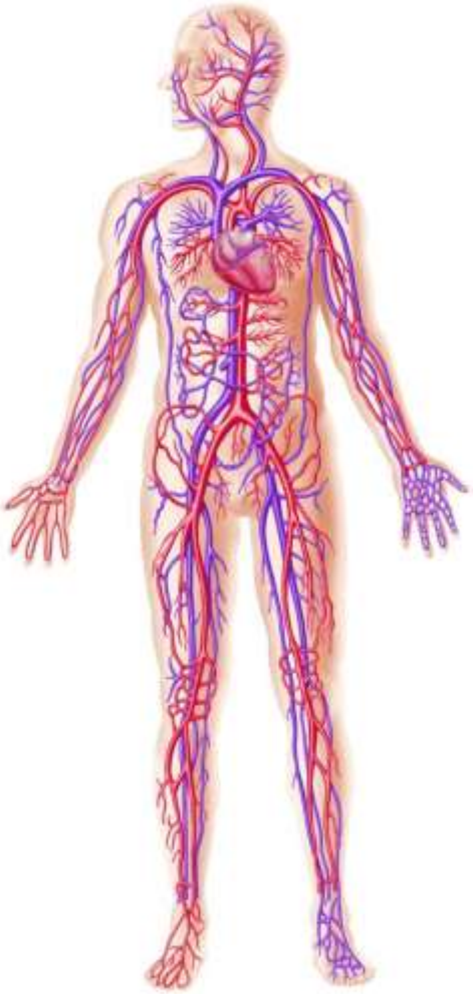
Blood Pressure

Blood Pressure is the pressure exerted by circulating blood upon the walls of blood vessels.

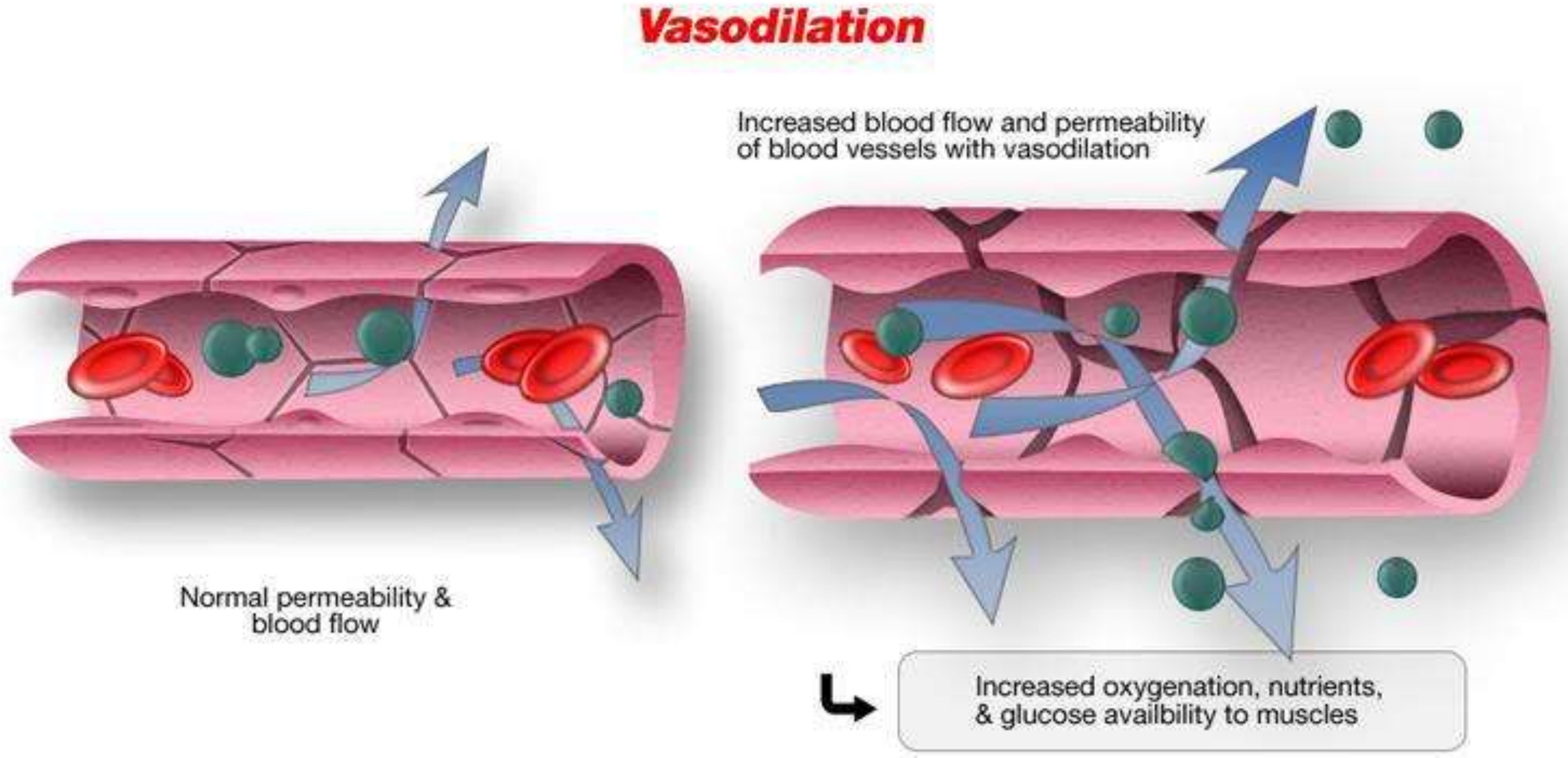

Basic Characteristics
mmHg
120
110
100
90
80
Systolic Value
Pulse Wave
Diastolic Value
Heart Ventricle
Contraction
Expansion
Contraction
Expansion

Blood vessel is the life River powered by the Heart；
Blood pressure is the force that moves the blood flow.

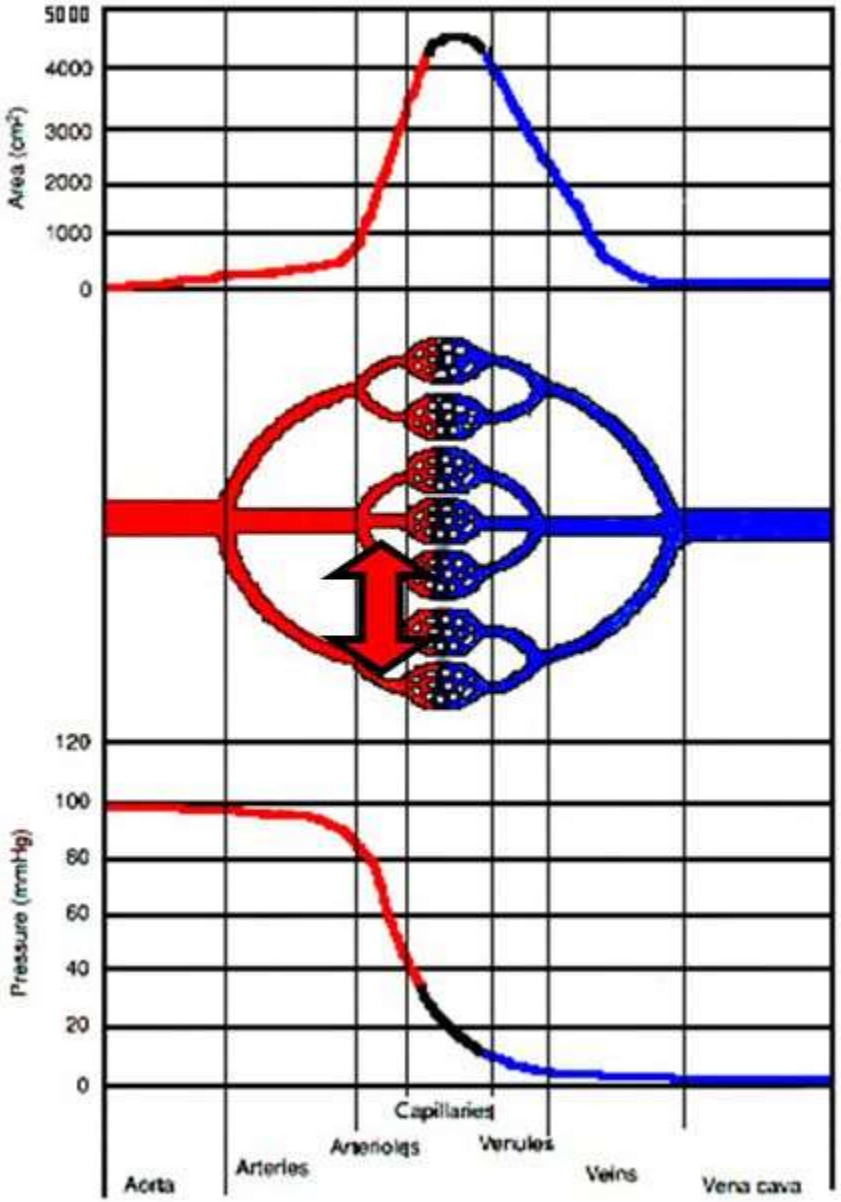




Oxygenation, Nutrient exchange and Detoxification can only occur thru vasodilation of the capillary beds



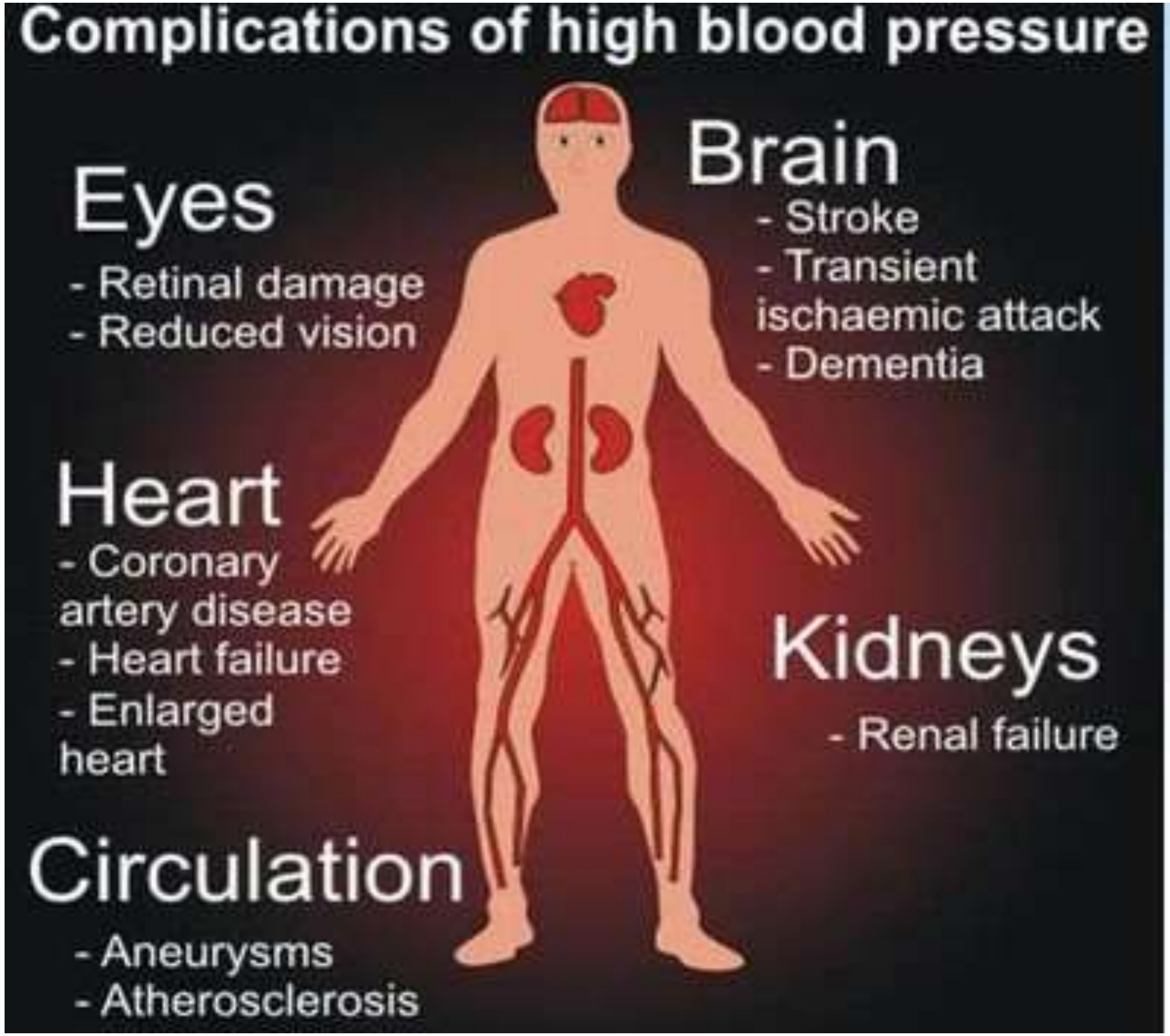
Physiology of Circulation

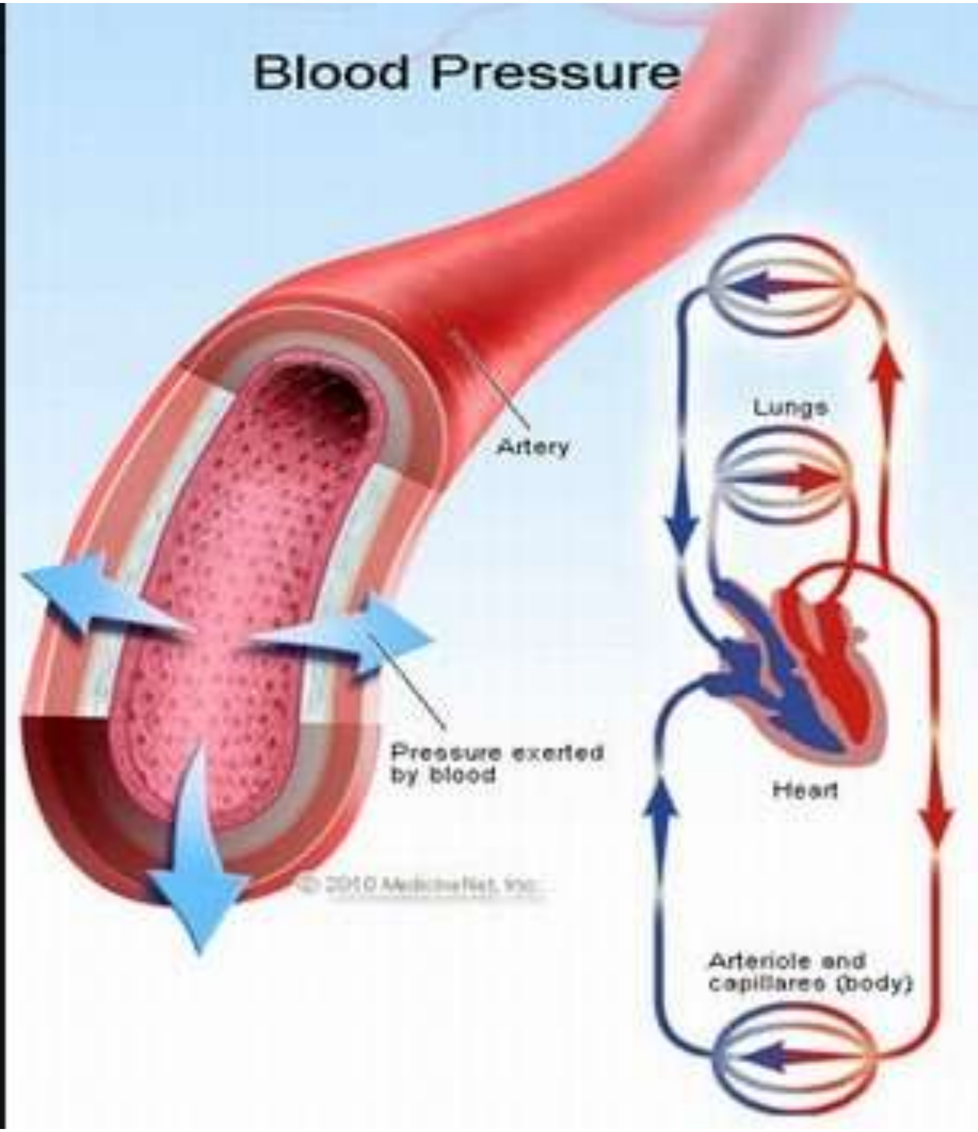


- Systemic Vascular Resistance (SVR) =Total Peripheral Resistance (TPR)
  - all vascular resistance is offered by the systemic vessels
  - which vessels change size?
  - resistance is highest in arterioles
  - largest pressure drop is in the arterioles
- Relationship of the radius to resistance in the arterioles is due to smooth muscle contraction/relaxation

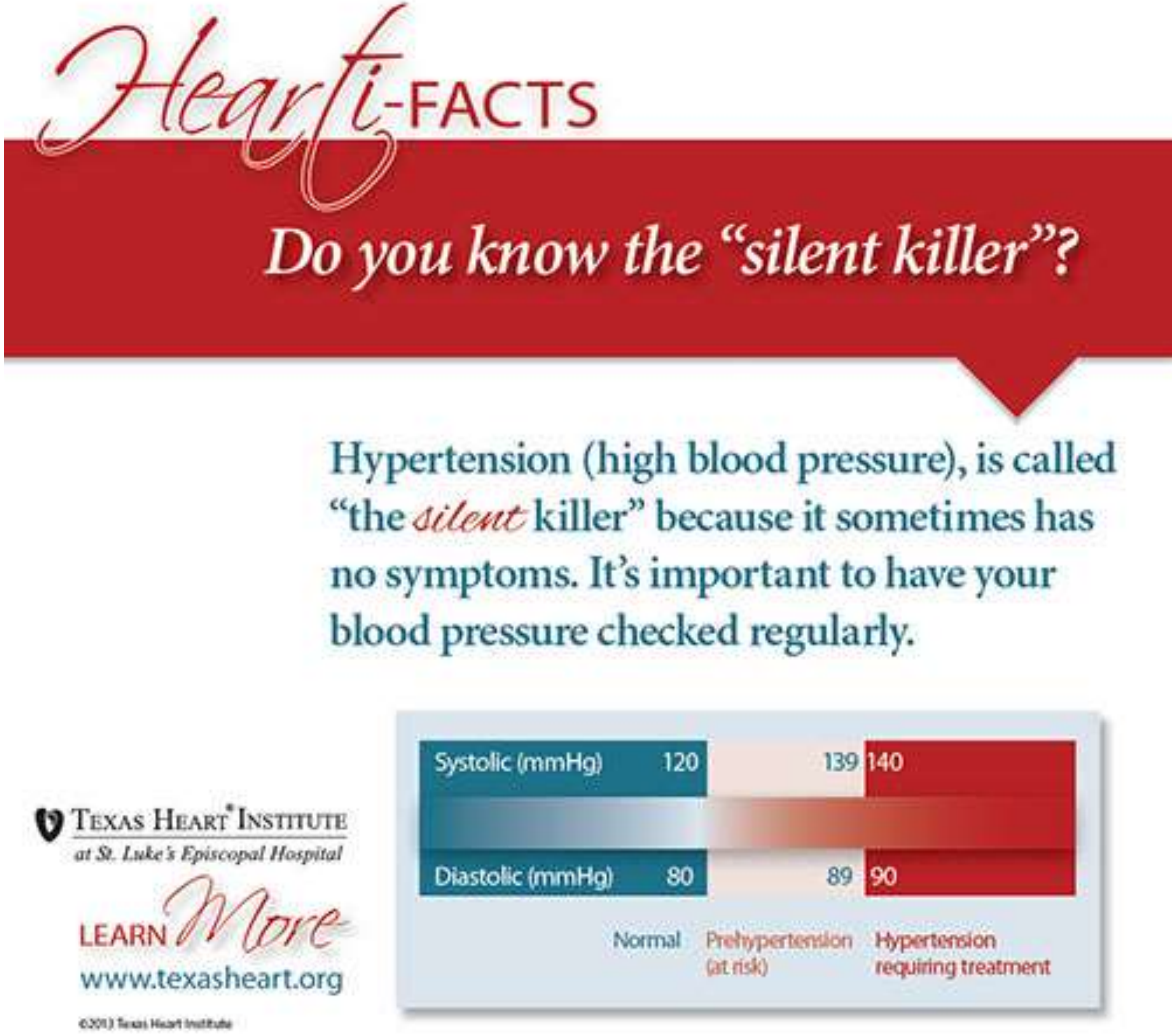
Measuring Pressure

- Blood pressure (BP):
  - arterial pressure (mm Hg)
  - Pressure required to move blood
- Capillary hydrostatic pressure (CHP):
  - pressure within the capillary beds
  - pressure where diffusion and osmosis occur
- Venous pressure:
  - pressure in the venous system
- Circulatory Pressure: ΔP across the systemic circuit (about 100 mm Hg)



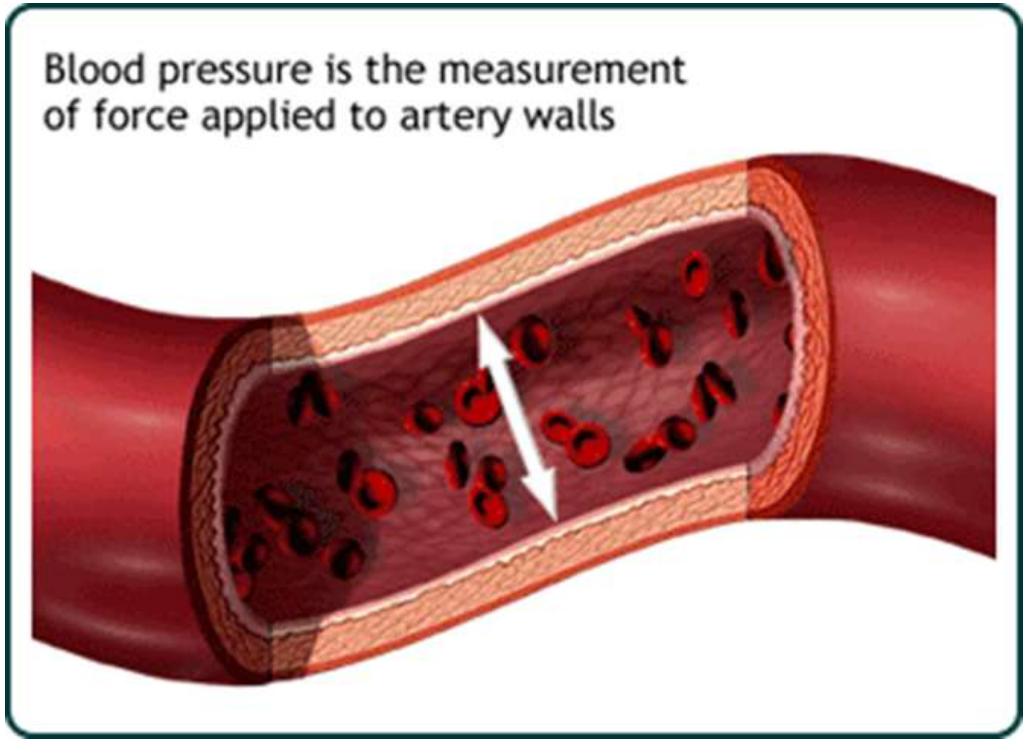


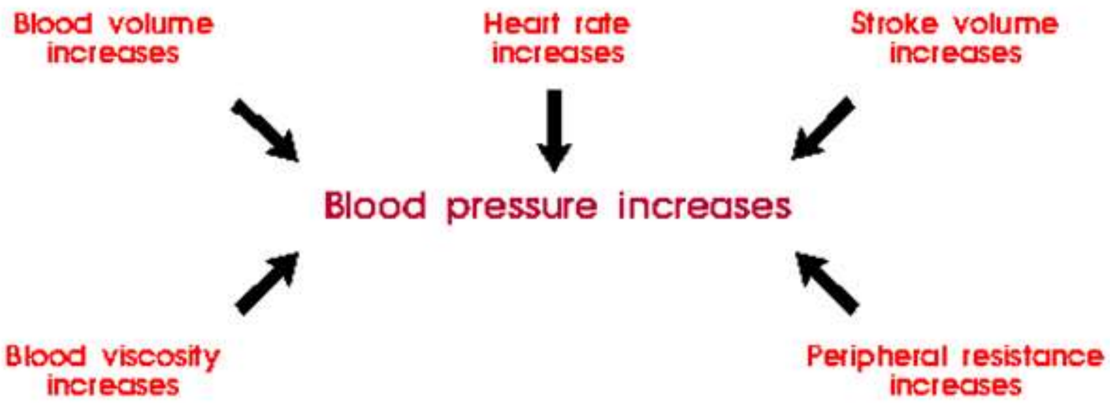
About one in three American adults, some 67 million people, have high blood pressure, one of the most dangerous risk factors for stroke. If you're age 65 years or older, the odds are even greater that you have hypertension: 64% of men and 69% of women ages 65 and up have high blood pressure, according to the US Centers for Disease Control and Prevention.



Hypertension affects a quarter of the British adult population and accounts for 60% of all strokes in the UK and half of all heart attack.

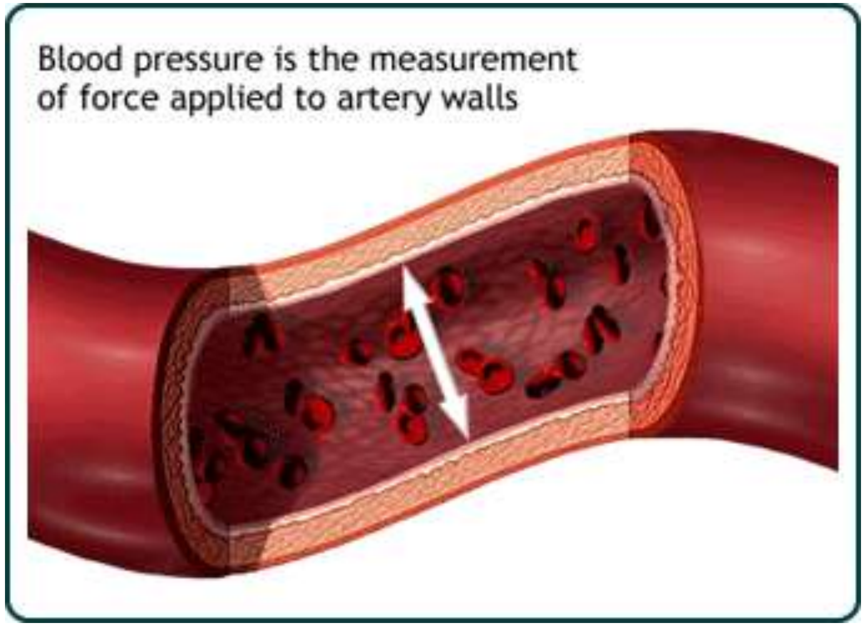
Hypertension affects a 25% of the British adult population and accounts for 60% of all strokes in the UK and 50% of all heart attacks, but because the condition is usually symptomless most people have no idea they are at risk until it is too late. "Hypertension is a silent killer," says MacGregor. "You're bloody lucky to have discovered it at an early age and been given the opportunity to do something about it."

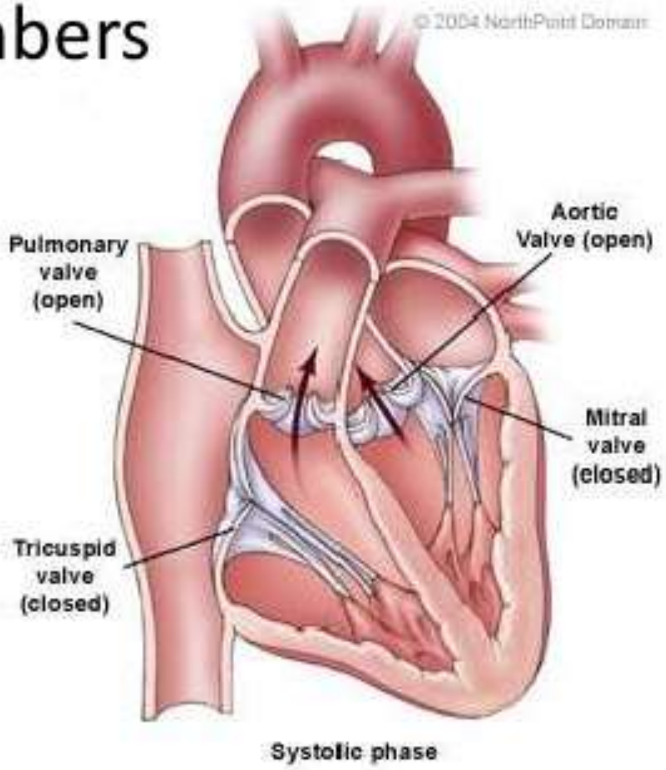




What is blood pressure?

- The force of blood against artery walls
- Recorded as two numbers
    1. systolic pressure
        - heart contracts
    2. diastolic pressure
        - heart relaxes



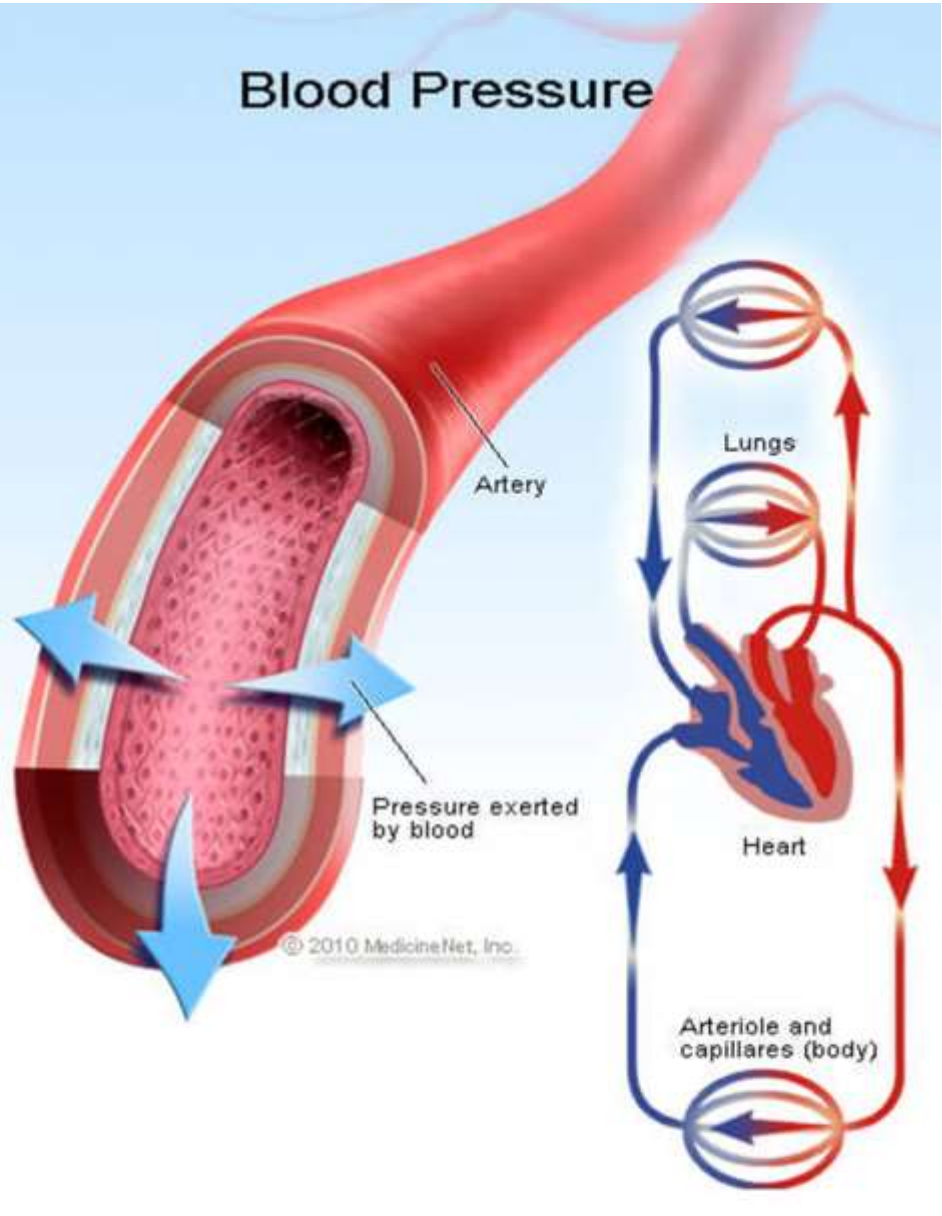


Key Points

Definition of Blood Pressure

A. The measurement of the force of blood against artery walls.

1. Force comes from the pumping of the heart
2. If arteries are hardened or narrowed, this force might be increased to pump the blood throughout the body



HEARTBEAT=the driving Force of life

The average heartbeat is 72 times per minute.
In the course of one day it beats over 100,000 times.
In one year the heart beats almost 38 million times,
and by the time you are 70 years old, on average, it's made it to 2.5 billion beats.

Normal Blood Pressure

The pressure of blood in the vessels when the heart beats: **systolic pressure**

The pressure between beats when the heart relaxes: **diastolic pressure**

less than

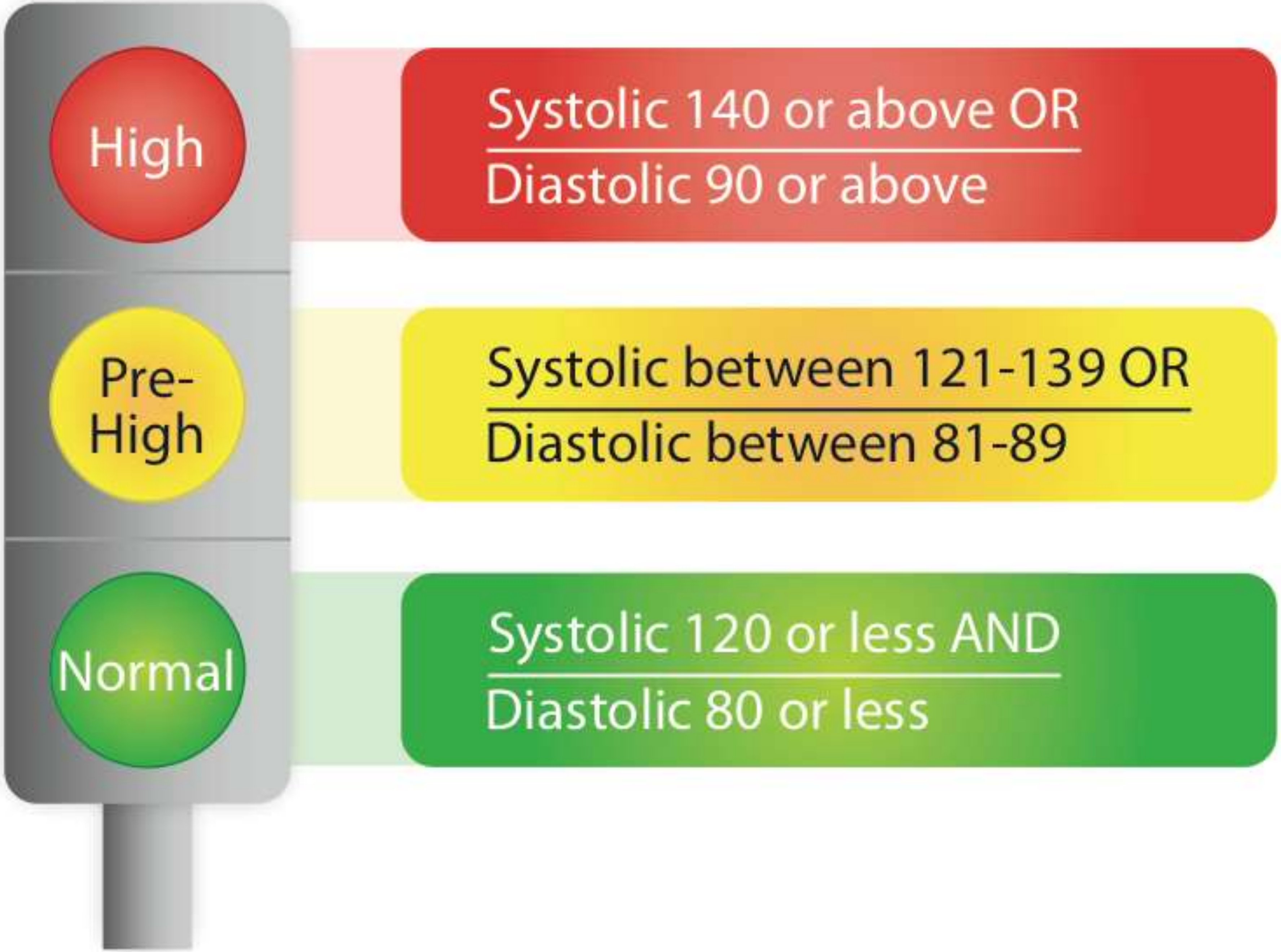
120/80 mmHg

millimeters of mercury

High blood pressure
140/90 mmHg or higher

Prehypertension
between 120-139 mmHg and/or 80-89 mmHg

Normal blood pressure
less than 120/80 mmHg


High
Systolic 140 or above OR
Diastolic 90 or above
Pre-High
Systolic between 121-139 OR
Diastolic between 81-89
Normal
Systolic 120 or less AND
Diastolic 80 or less

Systemic Blood Pressure

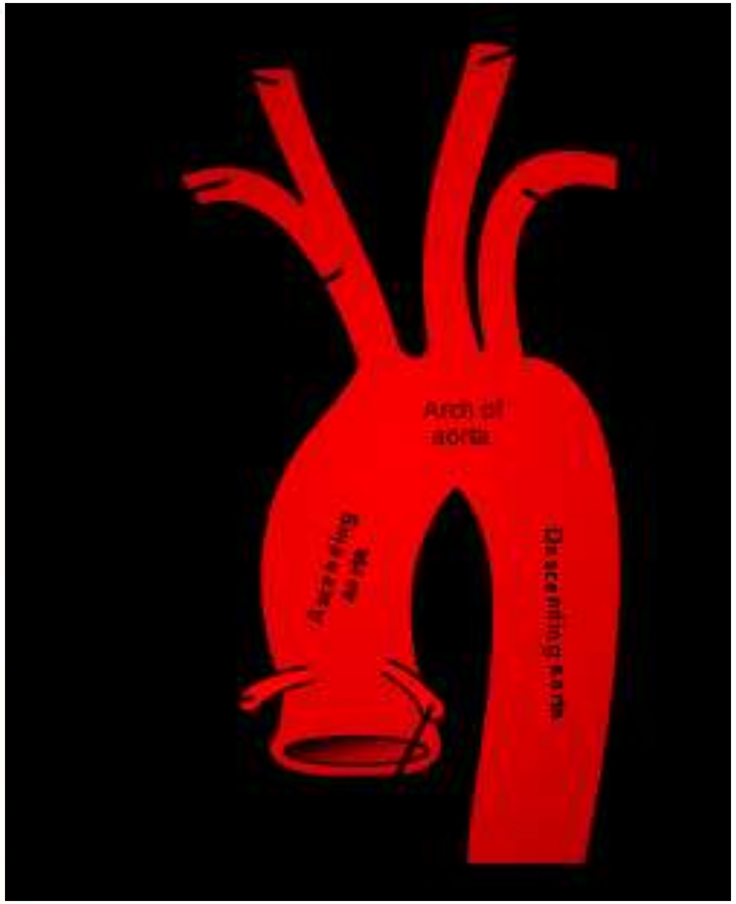
- The pumping action of the heart generates blood flow through the vessels along a pressure gradient, always moving from higher- to lower-pressure areas
- Pressure results when flow is opposed by resistance
- Systemic pressure:
  - Is highest in the aorta
  - Declines throughout the length of the pathway
  - Is 0 mm Hg in the right atrium
- The steepest change in blood pressure occurs in the arterioles

Physiology of Circulation: Definition of Terms

- **Blood flow**
  - Volume of blood flowing through vessel, organ, or entire circulation in given period
    - Measured as ml/min
    - Equivalent to cardiac output (CO) for entire vascular system
    - Relatively constant when at rest
    - Varies widely through individual organs, based on needs

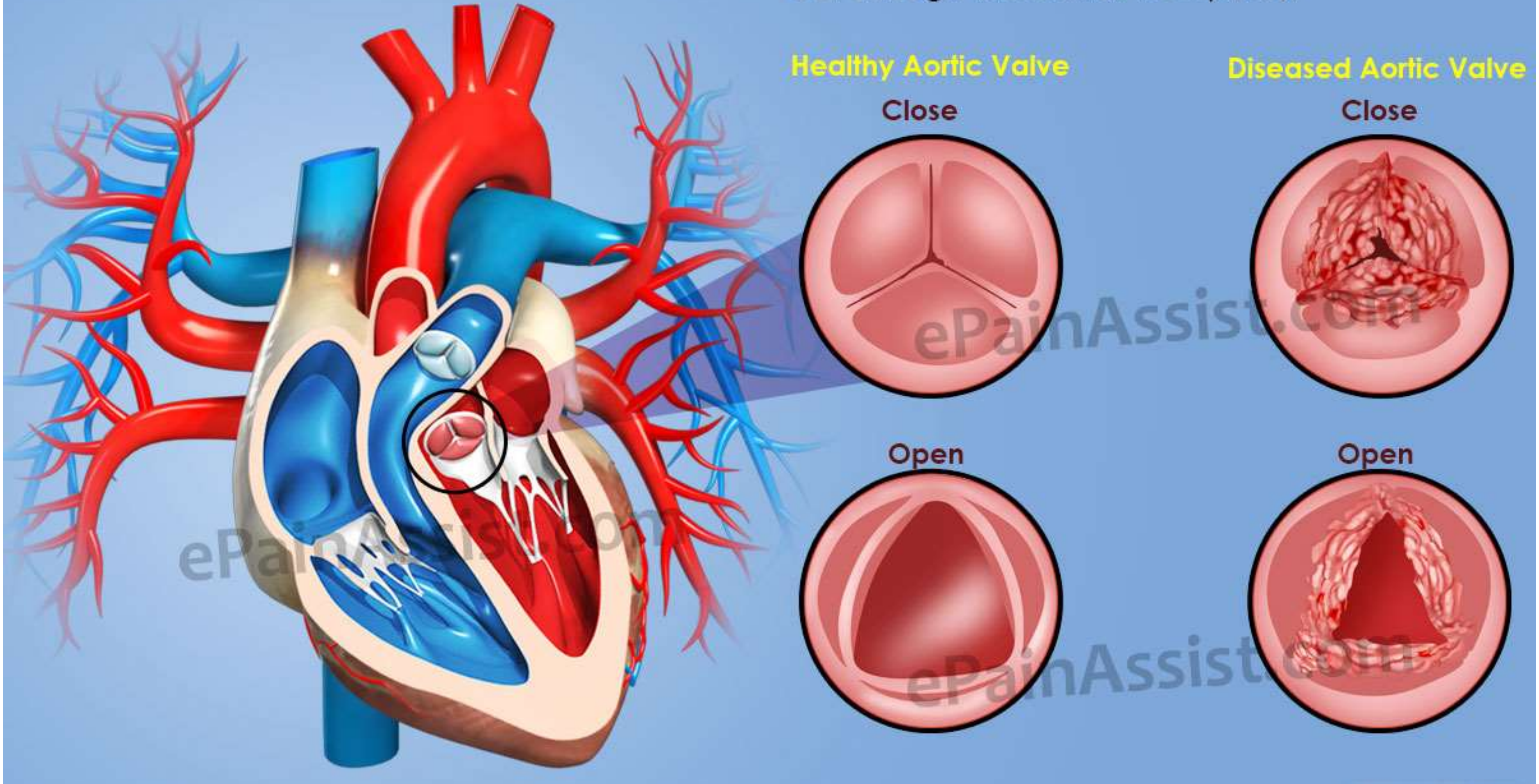
Coronary circulation

- myocardial blood flow is characterized by almost complete oxygen extraction (70-80%) from the blood across the coronary capillaries
- therefore, blood flow must increase to increase oxygen delivery to the heart
- myocardial oxygen delivery is FLOW LIMITED
- aortic pressure provides driving force for coronary blood flow

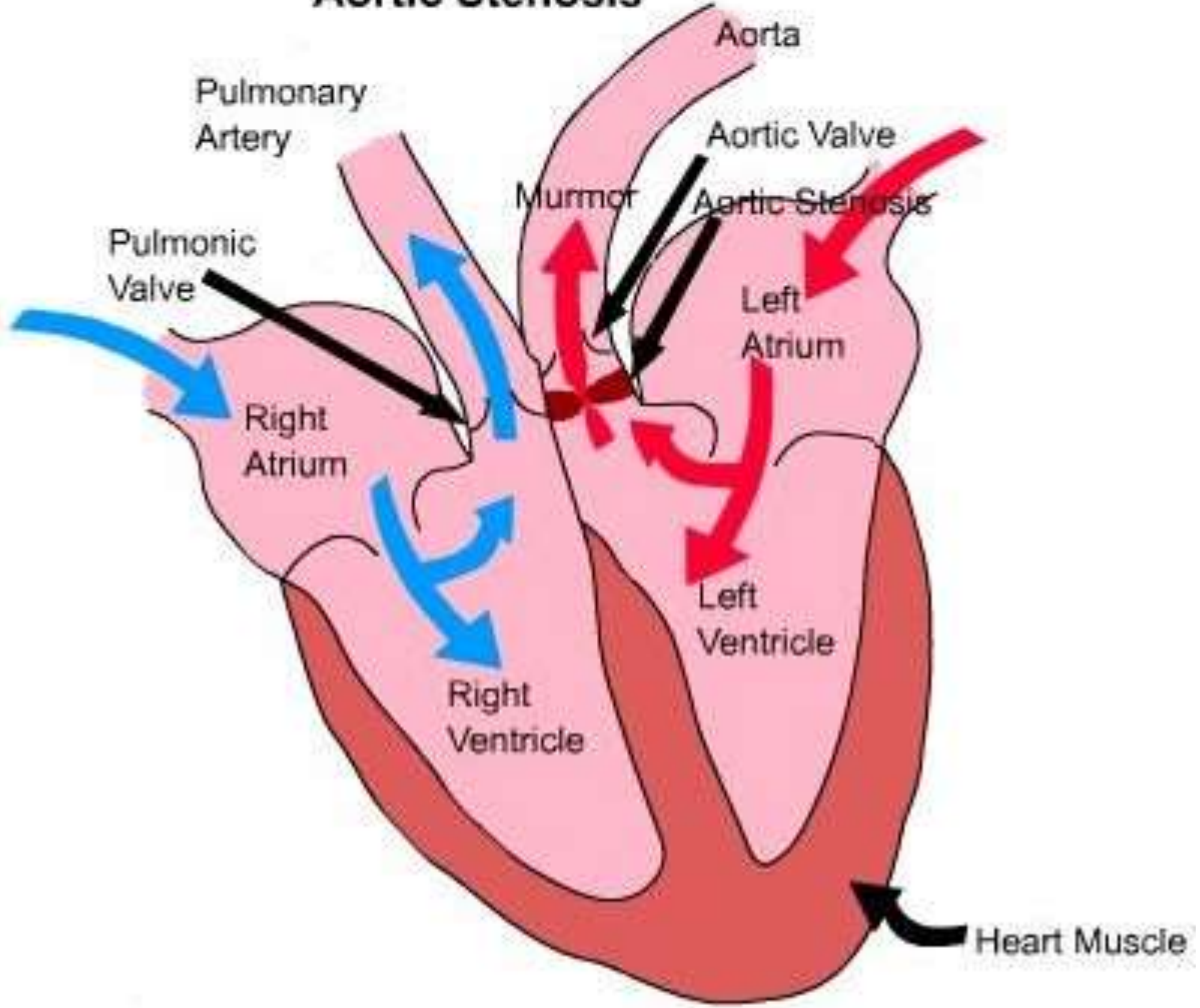


Aortic Stenosis

It is a heart condition where due to the narrowing of the aortic valve the heart is unable to pump out enough blood that is required.



Aortic Stenosis



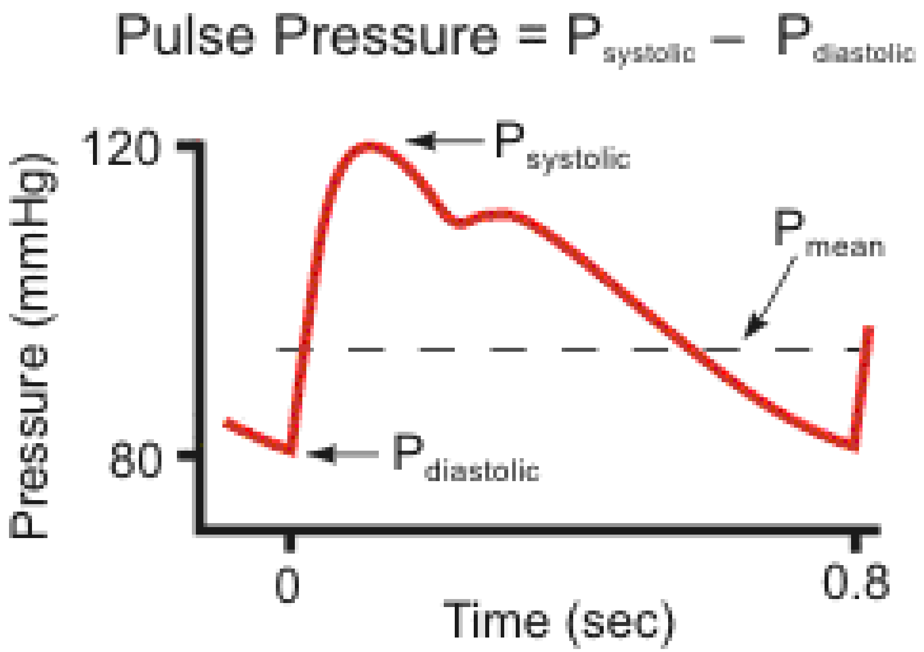
What is pulse pressure? How important is pulse pressure to your overall health?
Answers from Sheldon G. Sheps, M.D.

Blood pressure readings are given in two numbers. The top number is the maximum pressure your heart exerts while beating (systolic pressure), and the bottom number is the amount of pressure in your arteries between beats (diastolic pressure).

The numeric difference between your systolic and diastolic blood pressure is called your pulse pressure. For example, if your resting blood pressure is 120/80 millimeters of mercury (mm Hg), your pulse pressure is 40.

For adults older than age 60, a pulse pressure greater than 60 can be a useful predictor of heart attacks or other cardiovascular disease; this is especially true for men.

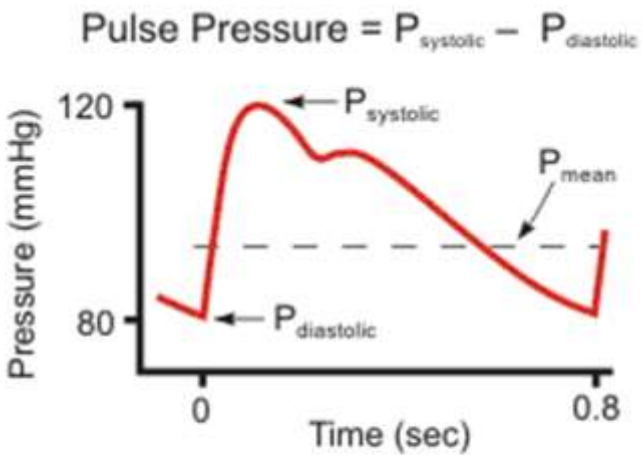
In some cases a low pulse pressure (less than 40) may indicate poor heart function. A higher pulse pressure (greater than 60) may reflect leaky heart valves (valve regurgitation), often due to age-related losses in aortic elasticity.



http://www.mayoclinic.org/diseases-conditions/high-blood-pressure/expert-answers/pulse-pressure/faq-20058189

What is pulse pressure? How important is pulse pressure to your overall health?

However, systolic and diastolic pressure should also be considered alongside pulse pressure values. Higher systolic and diastolic pairs imply higher risk than lower pairs with the same pulse pressure: 160/120 millimeters of mercury (mm Hg) indicates a higher risk than 110/70 mm Hg even though the pulse pressure in each pair is 40. The most important cause of elevated pulse pressure is stiffness of the aorta, the largest artery in the body. The stiffness may be due to high blood pressure or fatty deposits damaging the walls of the arteries, leaving them less elastic (atherosclerosis). The greater your pulse pressure, the stiffer and more damaged the vessels are thought to be.

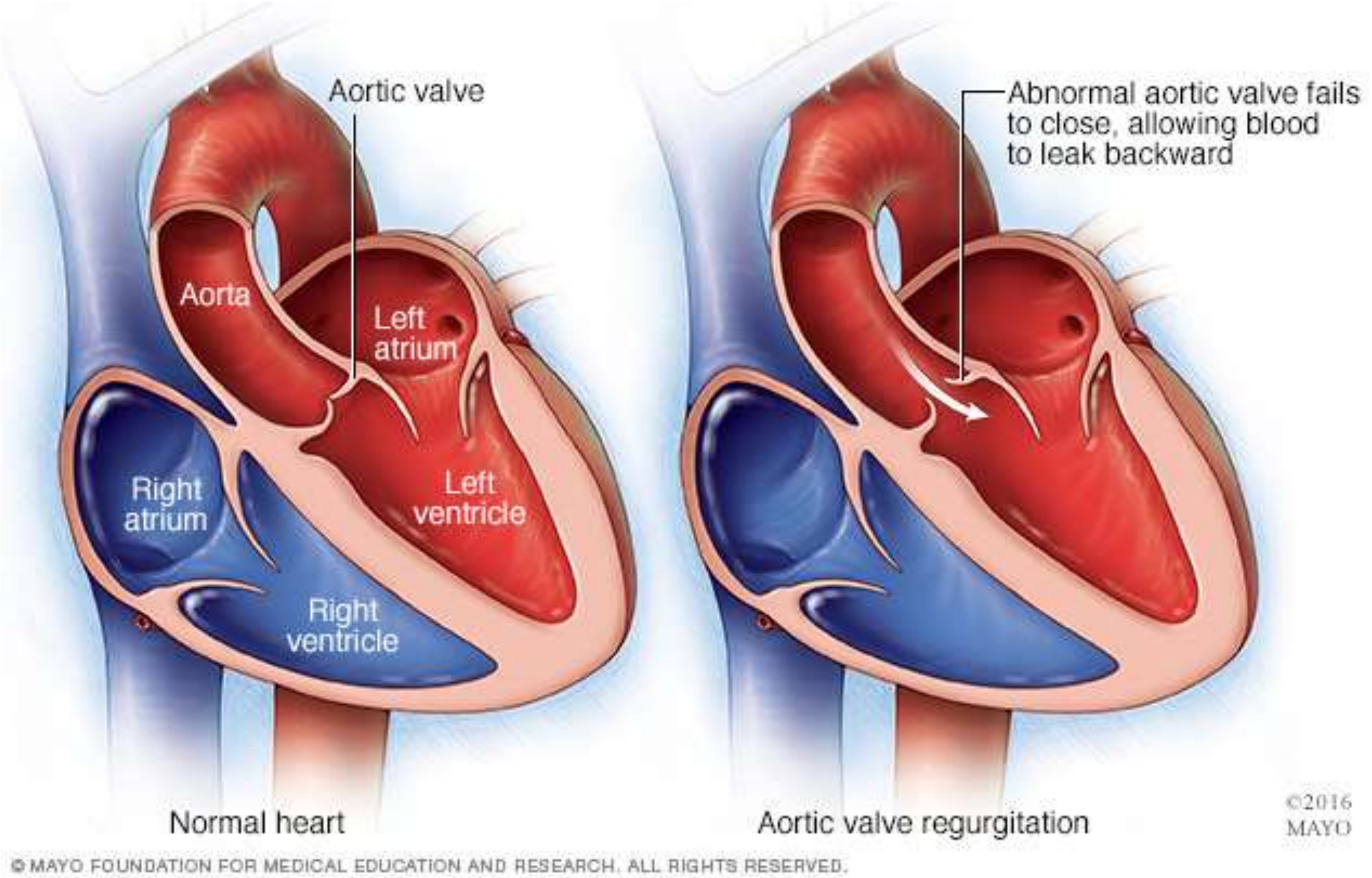


Other conditions — including severe iron deficiency (anemia) and an overactive thyr (hyperthyroidism) — can increase pulse pressure as well.

Treating high blood pressure often reduces pulse pressure, although different medications may have varying impacts.

http://www.mayoclinic.org/diseases-conditions/high-blood-pressure/expert-answers/pulse-pressure/faq-20058189

A higher pulse pressure (greater than 60) may reflect **leaky heart valves** (valve regurgitation), often due to age-related losses in aortic elasticity.

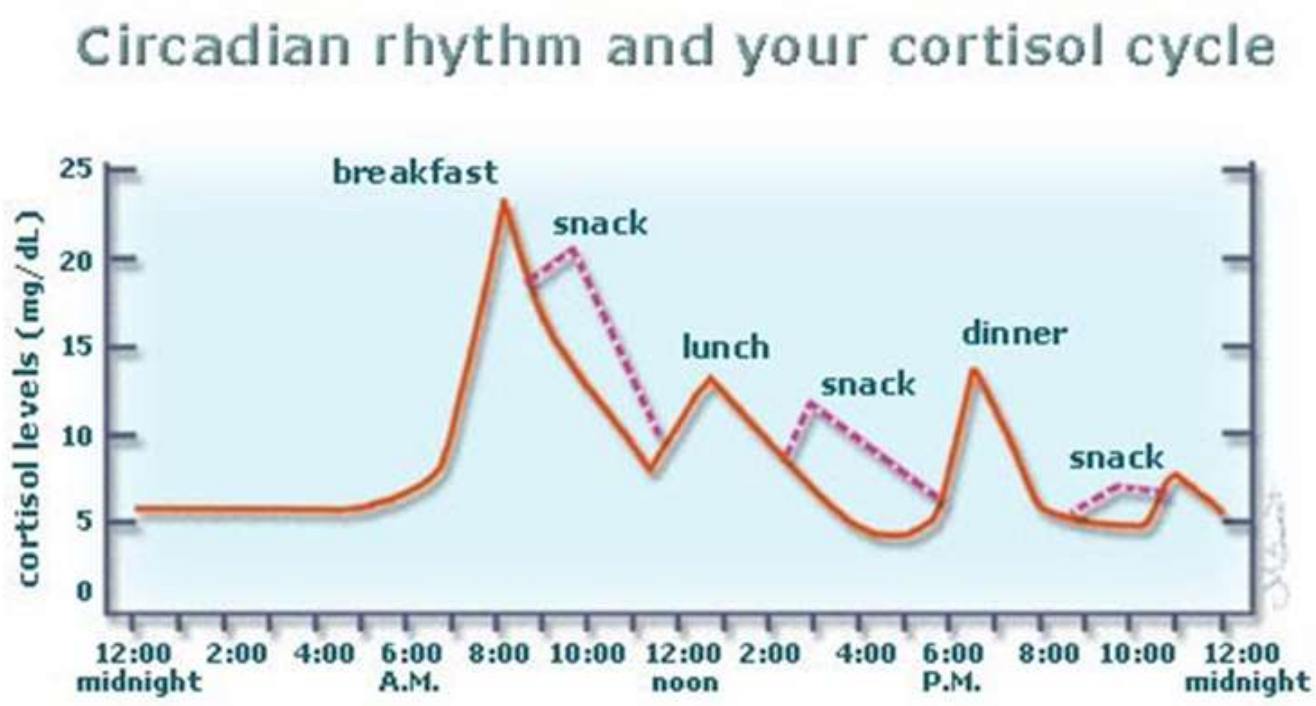


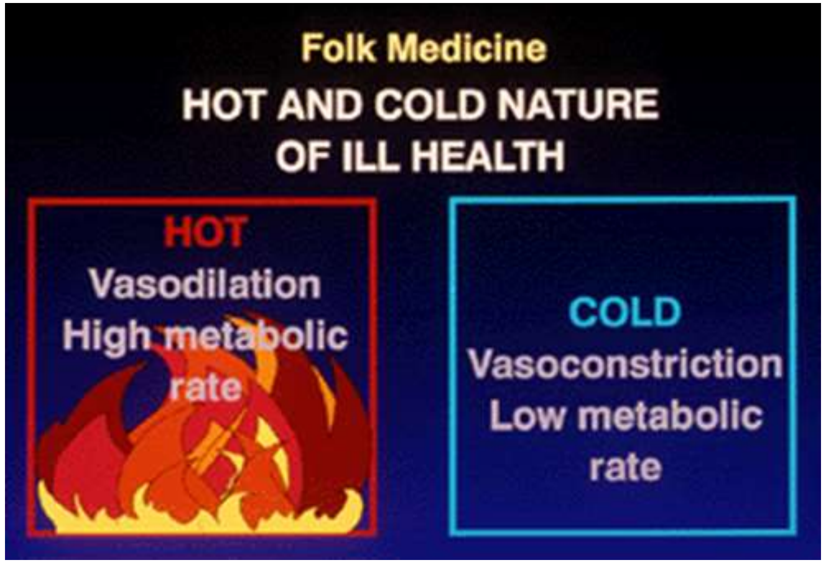
Daily Fluctuations in Blood Pressure

Changes in blood pressure reflect the body ability to adapt. An increase in blood pressure can be a normal part of daily physiology. Blood pressure can go up in a split second depending on situation.

Changes of 25 to 30% during the day are not abnormal — they reflect the fact the body is a dynamic, changeable organism. Many normal things can have large effects on blood pressure.

Walking 20 feet can raise systolic blood pressure by 10 to 15 points. Your stress level, how tight your shoelaces are, what you had for breakfast, and how well you slept last night can all change your blood pressure, too.





The Effects Of Eating on Blood Pressure

For fifteen to forty-five minutes following a meal, blood pressure normally rises. This response is temporary. A pressure of 130/80 may climb 10 to 30 mm. of mercury by virtue of a full stomach.

The Effect of the Environment on Blood Pressure

People in hot climates average lower pressures than inhabitants of cooler locales. In temperate zones where temperature fluctuates, blood pressures are lower in summer and higher in winter. Moving from one climate to another has an effect. If an Egyptian moves to Britain, his blood pressure rises, but not to the same level as the average Briton. And if a Londoner moves to Cairo, his pressure falls, but it still is slightly higher than that of the average Egyptian.

The Posture and Blood Pressure

Blood pressure is widest when observed in the reclining subject. It closes slightly on sitting, and is narrowest when standing. A pressure of 130/70 while lying down might become 120/80 on standing. This change varies greatly from person to person and is most exaggerated in obese persons.

The Effect of the Bladder on Blood Pressure

Curiously enough and for no good reason, the urinary bladder influences blood pressure. Pressure is lowest when the bladder is empty. As the bladder gradually fills, blood pressure rises. Thus a pressure of 130/80 on an empty bladder may reach 160/90 when the bladder is full enough to send messages of “Please empty.”

During urination, the blood pressure then precipitously drops back to 130/80. People whose bladders are never quite empty may carry a pressure which is slightly higher. After treatment and with the resumption o£ complete bladder emptying the pressure falls to normal levels.

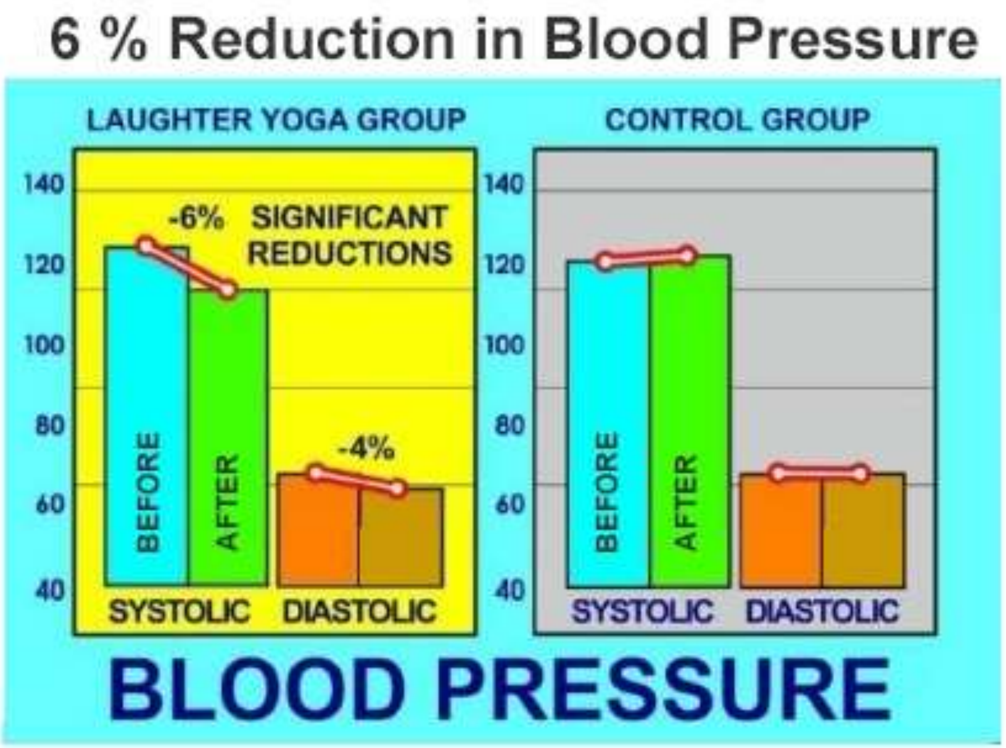
Sitting on a full bladder is not only uncomfortable but bad for the blood pressure.

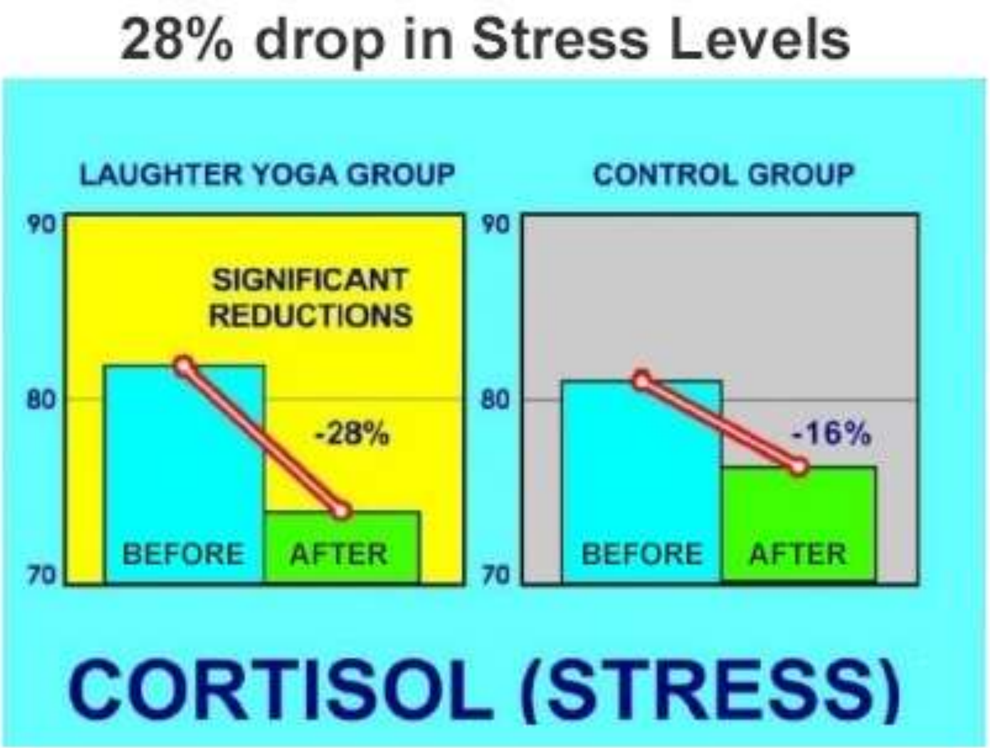
http://www.fitnesstipsforlife.com/why-does-blood-pressure-change-throughout-the-day.html

Effects of laughter on blood pressure

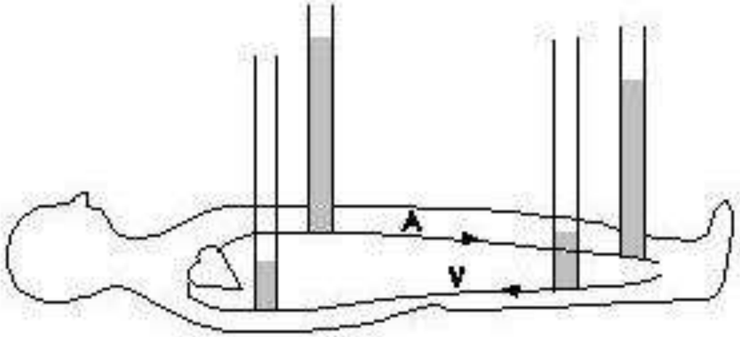
Laughing briefly raises your blood pressure while you're laughing. But if you laugh regularly – we're talking deep belly laughs here, not polite chuckles – it can actually lower your blood pressure in general. In other words, regular laughing lowers blood pressure even when you're not laughing.

Laughter reduces the production of stress hormones, not only during the time of laughter but also for some time after. Laughter also works the muscles, leading to an initial rise in blood pressure followed by a more sustained drop. Blood vessels dilate and an increased amount of oxygen enters the circulation due to deeper breathing. The 'heartier' the laugh, the better – laughing 15-20 minutes a day is good for heart health.

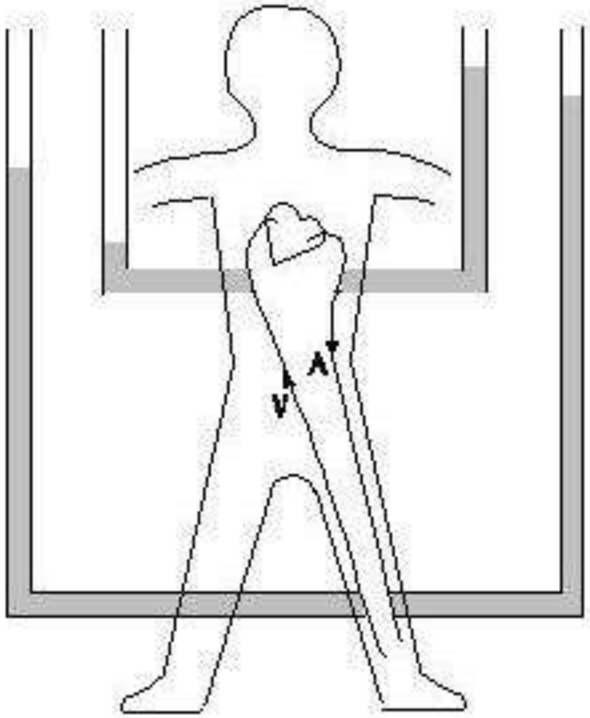




Effect of Gravity on Cardiovascular Pressures



Supine Position

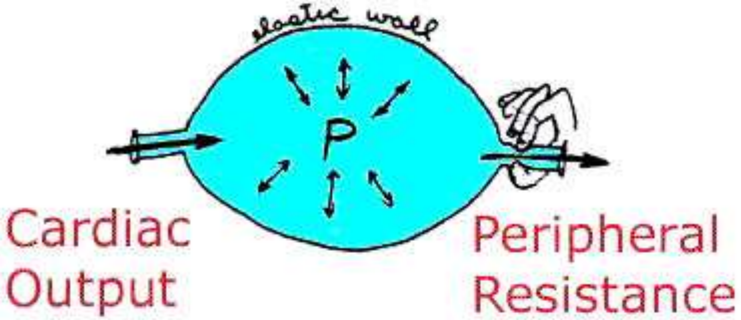


Standing Position

Anything that increases cardiac output will increase blood pressure

$$CO = SV \times HR$$

- Stroke Volume depends on
  1. Preload (=**Venous Return**)
  2. Contractility
  3. Afterload



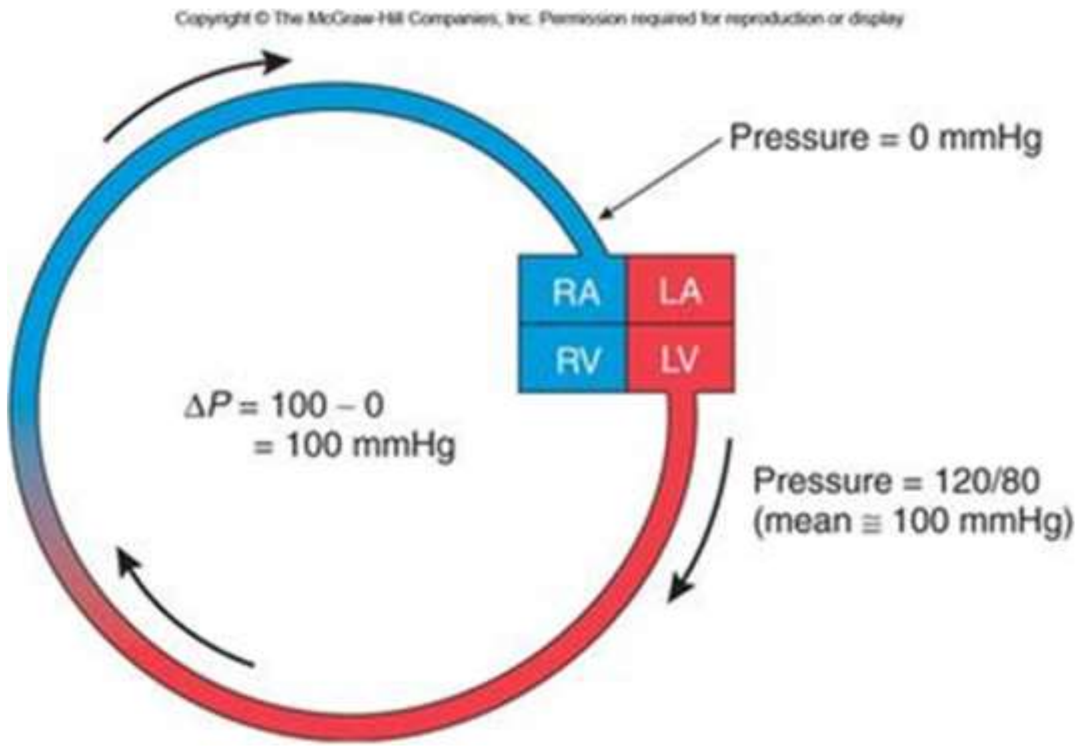
Hemodynamics of Blood Flow

The blood vessels are a closed system of conduits that carry blood from the heart to the tissues and back to the heart. Blood flows thru the vessels is mainly driven by the pumping of the heart and The blood pressure in the circulation is principally due to the pumping action of the heart.

Blood Flow will only occur when a **Pressure** difference exists-blood flows from higher pressure areas to lower pressure areas.

F(血流量）=P血压/R(阻力）

Flow =Heart's Pressure/Blood's resistance+Vessel's Resistance

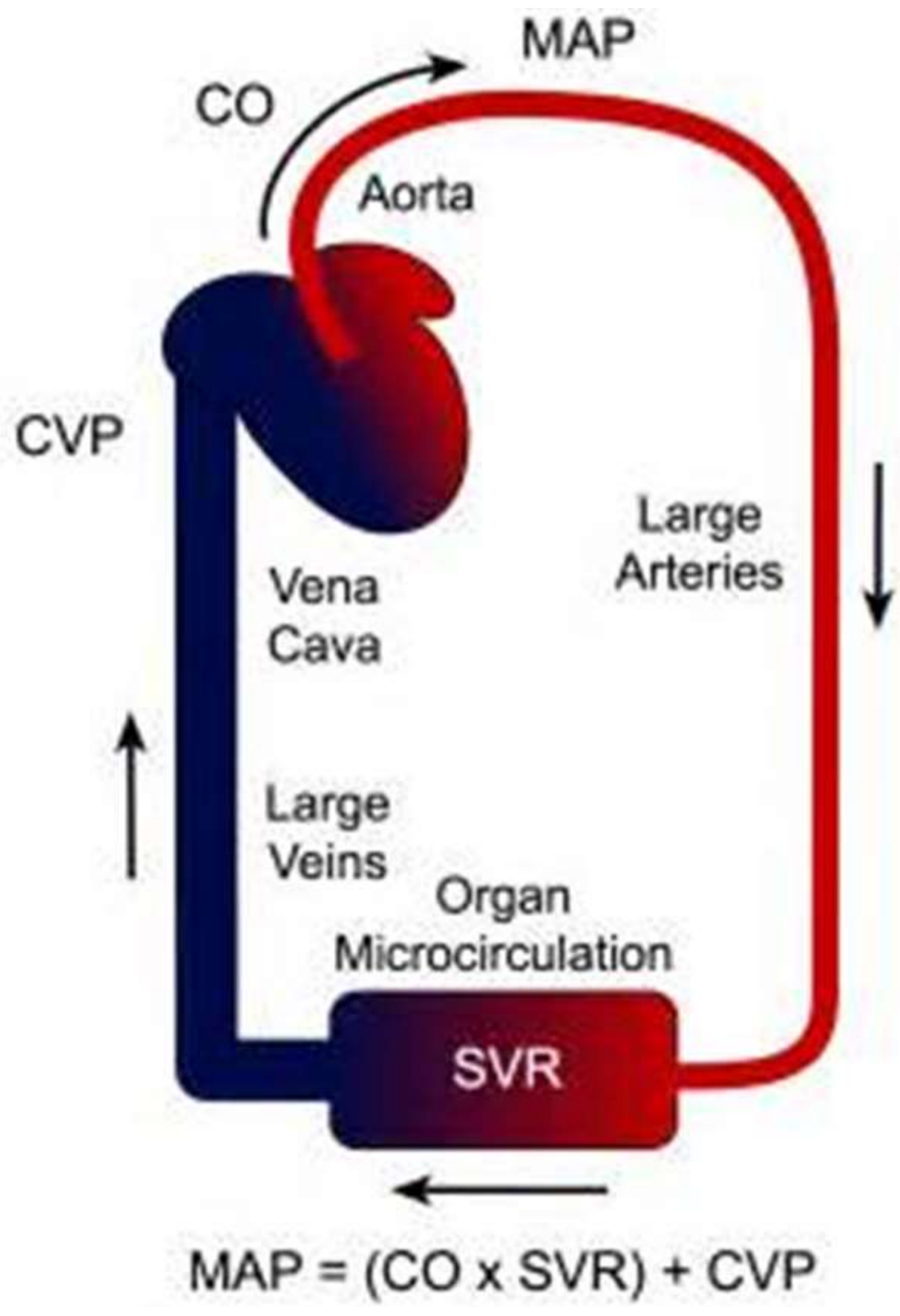


Physiology of Circulation: Definition of Terms

- **Resistance** (peripheral resistance)
  - Opposition to flow
  - Measure of amount of friction blood encounters with vessel walls, generally in peripheral (systemic) circulation
- Three important sources of resistance
  - Blood viscosity
  - Total blood vessel length
  - Blood vessel diameter

Mean Arterial Pressure

- Calculation of systolic and diastolic blood pressure that indicates the degree of tissue perfusion to vital organs
  - **Equation**:
  - Mean Arterial Pressure ~= 1/3 * SBP + 2/3 * DBP
  - Usual range: 70-110
- Should exceed 70 to ensure cerebral tissue perfusion



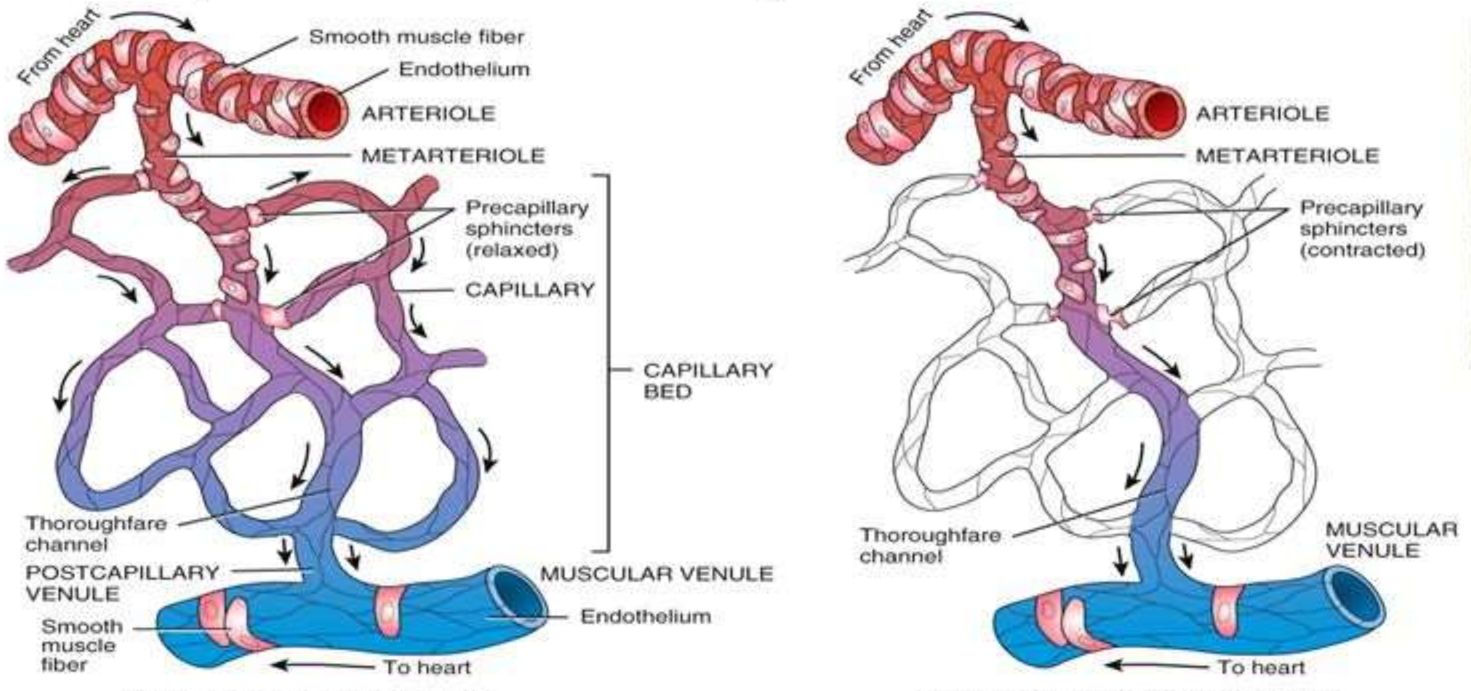
Systemic Vascular Resistance

- SVR is affected by humoral and local factors.
- Humoral factors
  - Balance of vasoconstrictors and vasodilators
  - Angiotensin II and norepinephrine are two of the mo important
- Local factors
  - Some arterioles are able to auto-regulate flow to thei capillary beds, constricting at times of high blood pressure and dilating at times of low blood pressure
  - This is common in the brain and the kidney, and mediated by EDRF (NO)

Systemic Vascular Resistance (SVR)

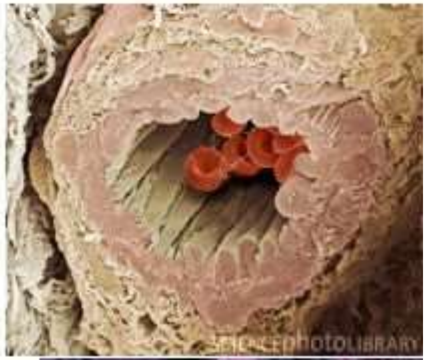
- Key Components
  - Highest Pressure – MAP
  - Lowest Pressure – RAP or CVP
  - Flow – Cardiac Output
- Formula
  - SVR = (MAP-CVP)/CO x 80

(RESISTANCE) ARTERIOLES: Friction



(a) Sphincters relaxed: blood flowing through capillaries

(b) Sphincters contracted: blood flowing through thoroughfare channel



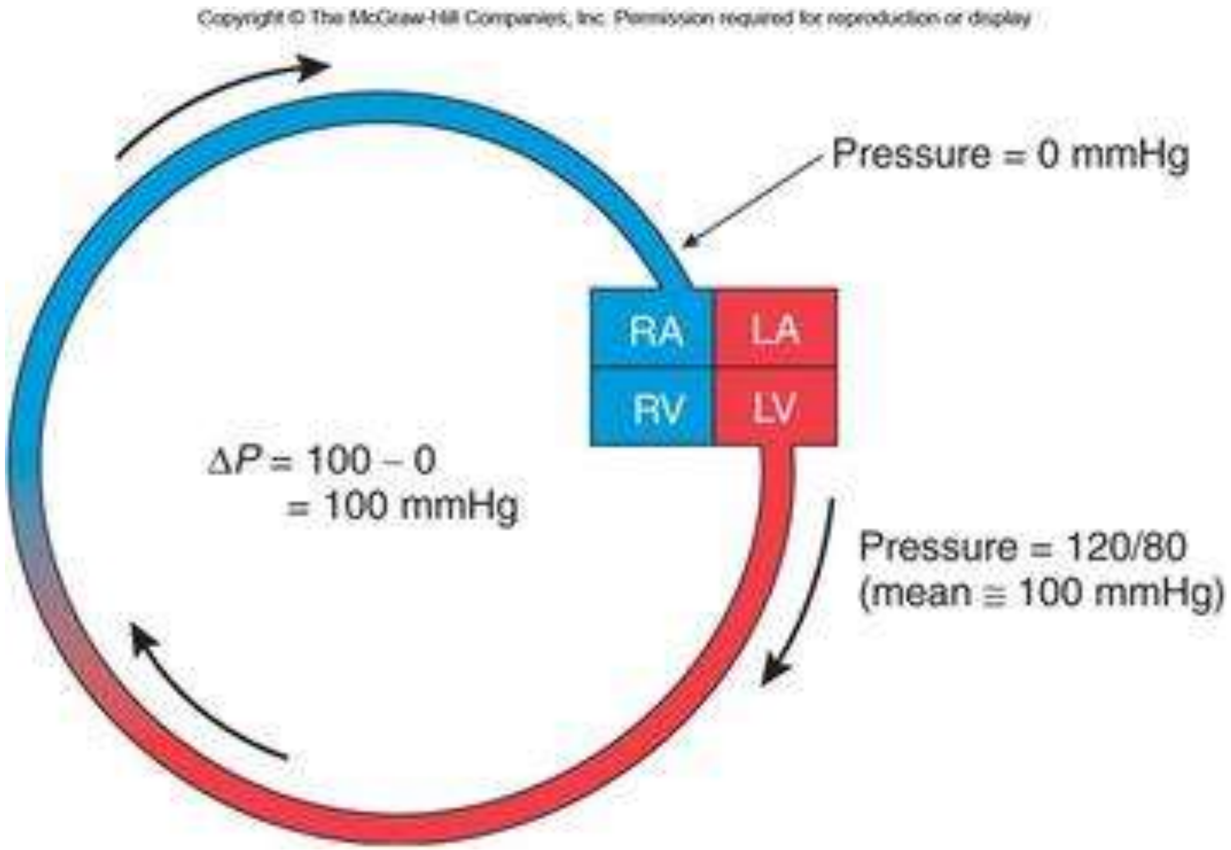
1. Arterioles Regulate **RESISTANCE TO BLOOD FLOW**
   - Resistance is due to **friction** between blood & blood vessel wall
   - **Sympathetic nerves** in the tunica externa **constrict vessels**
   - More sympathetic constriction, more friction, more resistance to flow
2. Arterioles Regulate blood **flow into capillaries**
   - The terminal portion of an arteriole is called the "***metarteriole***"
   - Each metarteriole has various **precapillary sphincters** which control blood flow into capillaries

Hemodynamics is the dynamics of blood flow. The circulatory system is controlled by homeostatic mechanisms, much as hydraulic circuits are controlled by control systems. Hemodynamic response continuously monitors and adjusts to conditions in the body and its environment. Thus hemodynamics explains the physical laws that govern the flow of blood in the blood vessels.

Blood flow ensures the transportation of nutrients, hormones, metabolic wastes, O2 and CO2 throughout the body to maintain cell-level metabolism, the regulation of the pH, osmotic pressure and temperature of the whole body, and the protection from microbial and mechanical harms.[1]

Blood is a non-Newtonian fluid, best studied using rheology rather than hydrodynamics. Blood vessels are not rigid tubes, so classic hydrodynamics and fluids mechanics based on the use of classical viscometers are not capable of explaining hemodynamics.[2]

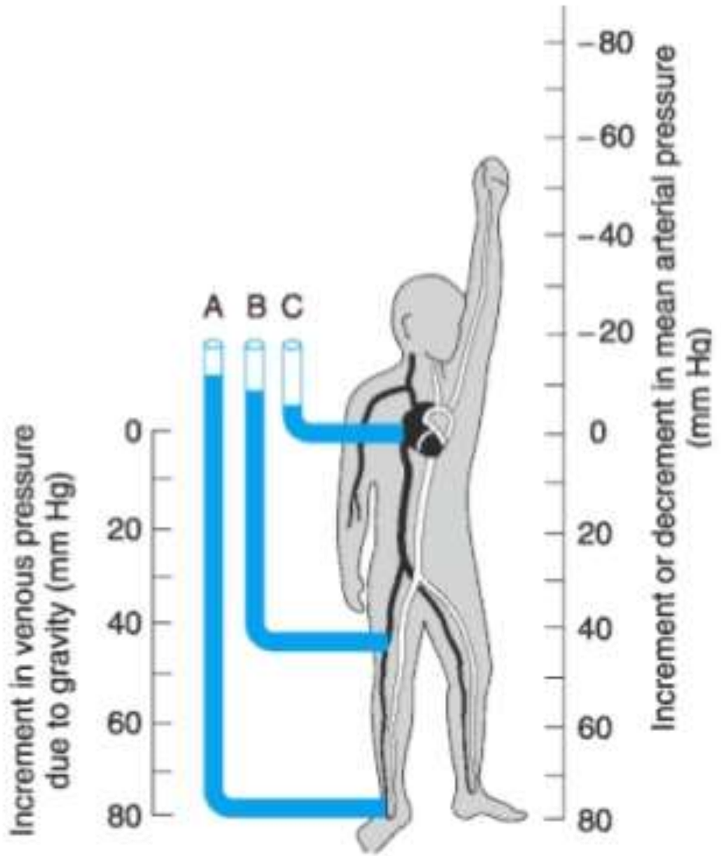
Poiseuille's law of Blood Flow



Blood Flow

- From high pressure → low pressure
  - Greater gradient = greater flow
- BP – pressure exerted by blood on the walls of a blood vessel

F(血流量）=P血压/R(阻力）
Flow =Heart’s Pressure/Blood’s resistance+Vessel’s Resistance



Source: Ganong WF: *Review of Medical Physiology*, 22nd Edition: http://www.accessmedicine.com

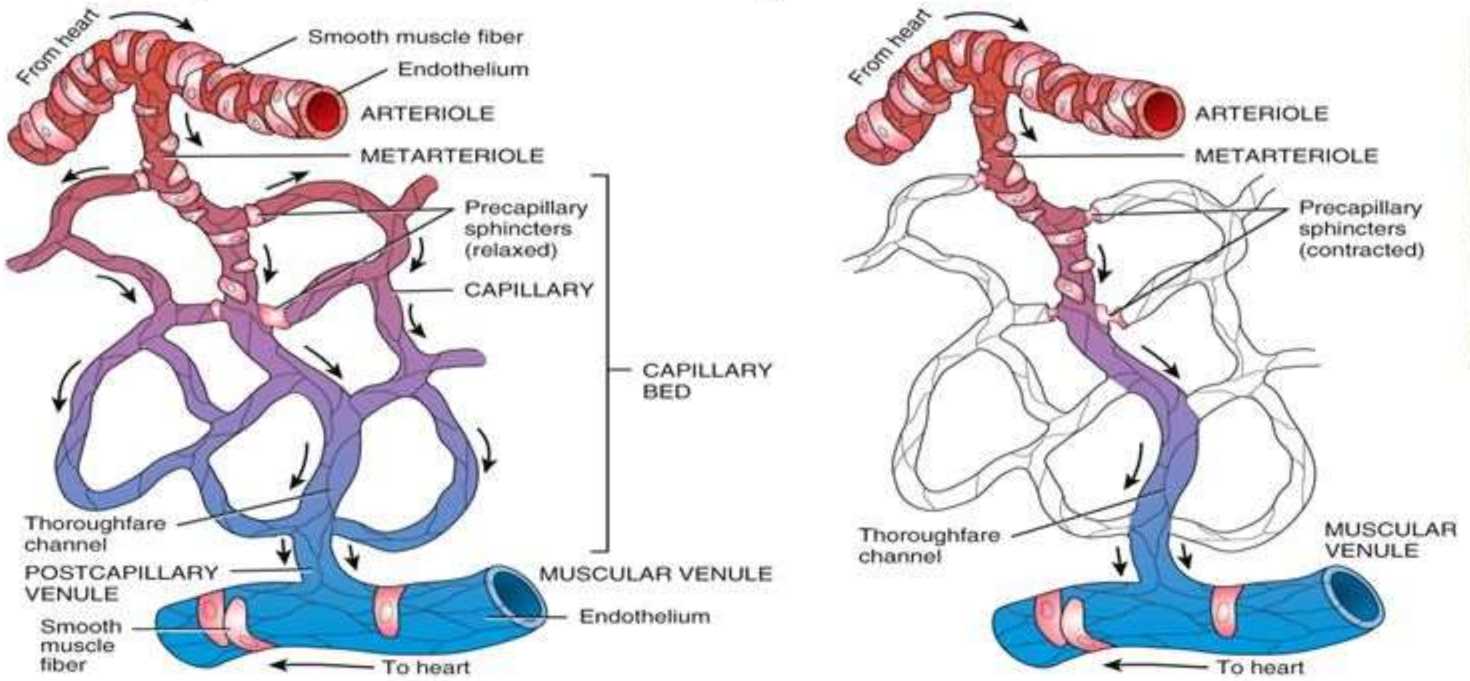
Effect of Gravity

- Pressure in large artery in the foot 105 cm below the heart = [0.77 mmHg/cm x 105 cm = 80 mm Hg)] +
- 100 mm Hg (Mean ABP at heart level)
- = 180 mm Hg
- Pressure in vein in the foot 105 cm below the heart = [0.77 mmHg/cm x 105 cm = 80 mm Hg)] +
- 4 mm Hg (right atrial pressure)
- = 84 mm Hg

Effect of Gravity The pressure in any vessel below heart level is increased and that in any vessel above heart level is decreased by the effect of gravity. The magnitude of the gravitational effect—the product of the density of the blood, the acceleration due to gravity (980 cm/s/s), and the vertical distance above or below the heart—is 0.77 mm Hg/cm at the density of normal blood.

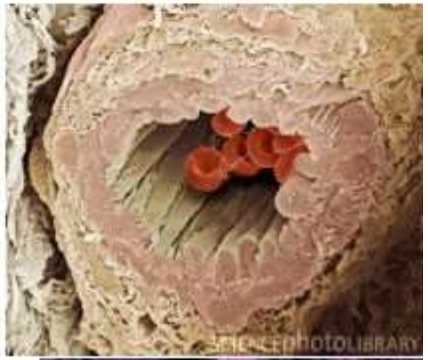
Thus, in an adult human in the upright position, when the mean arterial pressure at heart level is 100 mm Hg, the mean pressure in a large artery in the head (50 cm above the heart) is 62 mm Hg (100 - [0.77 × 50]) and the pressure in a large artery in the foot (105 cm below the heart) is 180 mm Hg (100 + [0.77 × 105]). The effect of gravity on venous pressure is similar (see below).

(RESISTANCE) ARTERIOLES: Friction



(a) Sphincters relaxed: blood flowing through capillaries

(b) Sphincters contracted: blood flowing through thoroughfare channel



1. Arterioles Regulate **RESISTANCE TO BLOOD FLOW**
   - Resistance is due to **friction** between blood & blood vessel wall
   - **Sympathetic nerves** in the tunica externa **constrict vessels**
   - More sympathetic constriction, more friction, more resistance to flow
2. Arterioles Regulate blood **flow into capillaries**
   - The terminal portion of an arteriole is called the "***metarteriole***"
   - Each metarteriole has various **precapillary sphincters** which control blood flow into capillaries

Diversity in Mechanisms of Endothelium-Dependent Vasodilation in Health and Disease

Small arterioles (40–150 µm) contribute to the majority of vascular resistance within organs and tissues. Under resting conditions, the basal tone of these vessels is determined by a delicate balance between vasodilator and vasoconstrictor influences. Cardiovascular homeostasis and regional tissue perfusion is largely a function of the ability of these small blood vessels to constrict or dilate in response to the changing metabolic demands of specific tissues. The endothelial cell layer of these microvessels is a key modulator of vasodilation through the synthesis and release of vasoactive substances. Beyond their vasomotor properties, these compounds importantly modulate vascular cell proliferation, inflammation, and thrombosis. Thus the balance between local regulation of vascular tone and vascular pathophysiology can vary depending upon which factors are released from the endothelium. This review will focus on the dynamic nature of the endothelial released dilator factors depending on species, anatomic site, and presence of disease, with a focus on the human coronary microcirculation. Knowledge how endothelial signaling changes with disease may provide insights into the early stages of developing vascular inflammation and atherosclerosis, or related vascular pathologies.

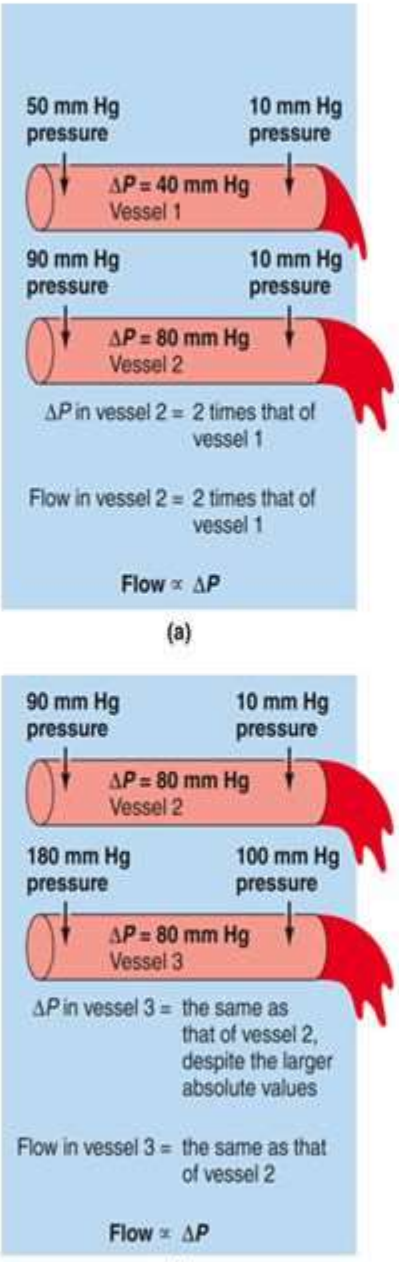
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3625248/

There are a number of vasoactive substances produced by endothelial cells that elicit vasodilation. The prototype is nitric oxide (NO), made by the constitutively expressed enzyme nitric oxide synthase (NOS). NO is synthesized in the endothelial cell layer and signals to underlying vascular smooth muscle cells (VSMCs), where it elicits hyperpolarization and relaxation primarily in a cyclic GMP-dependent manner (Figure 1). A second major family of endothelial derived vasodilator substances are prostaglandins, with the classic example being prostacyclin. Prostaglandins are also constitutively generated by the action of cyclooxygenase (COX) enzymes on arachidonic acid. They traverse the intercellular space and elicit a cAMP-dependent hyperpolarization of VSMCs (Figure 1). The third family of vasoactive substances is generally referred to as endothelial-derived hyperpolarizing factors (EDHFs). EDHFs ultimately cause vasodilation by hyperpolarizing VSMCs via stimulation of K+ channels or Na+/K+- ATPase. Multiple EDHFs have been described, including hydrogen peroxide (H2O2), epoxyeicosatrienoic acids (EETs), carbon monoxide (CO), hydrogen sulfide (H2S), C-natriuretic peptide (CNP), anandamide, and the potassium ion itself [17].

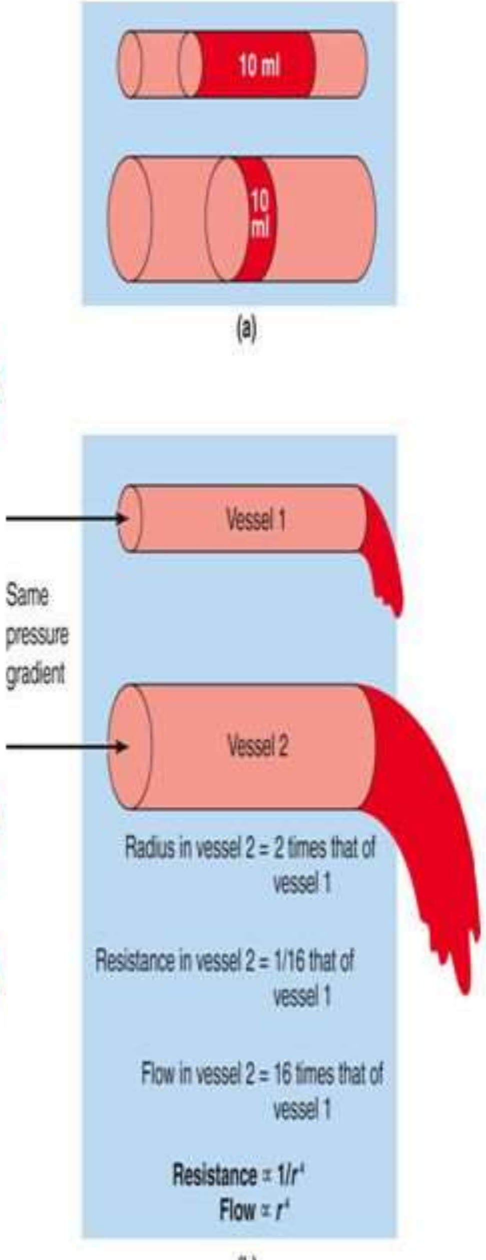
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3625248/

Blood flow & Pressure gradients

- frictional losses (**resistance**) causes a drop in P as the blood travels through a section of vessel
  - caused by friction between the moving fluid and the stationary wall
  - if pressure gradient is unchanged – then increasing R will inhibit blood flow and decrease F
  - R depends on three factors
    - **1. blood viscosity (η) -** # of circulating RBCs
    - **2. vessel length (L)**
    - **3. vessel radius (r)** – major determinant of R
      - $R = 1/r^4$

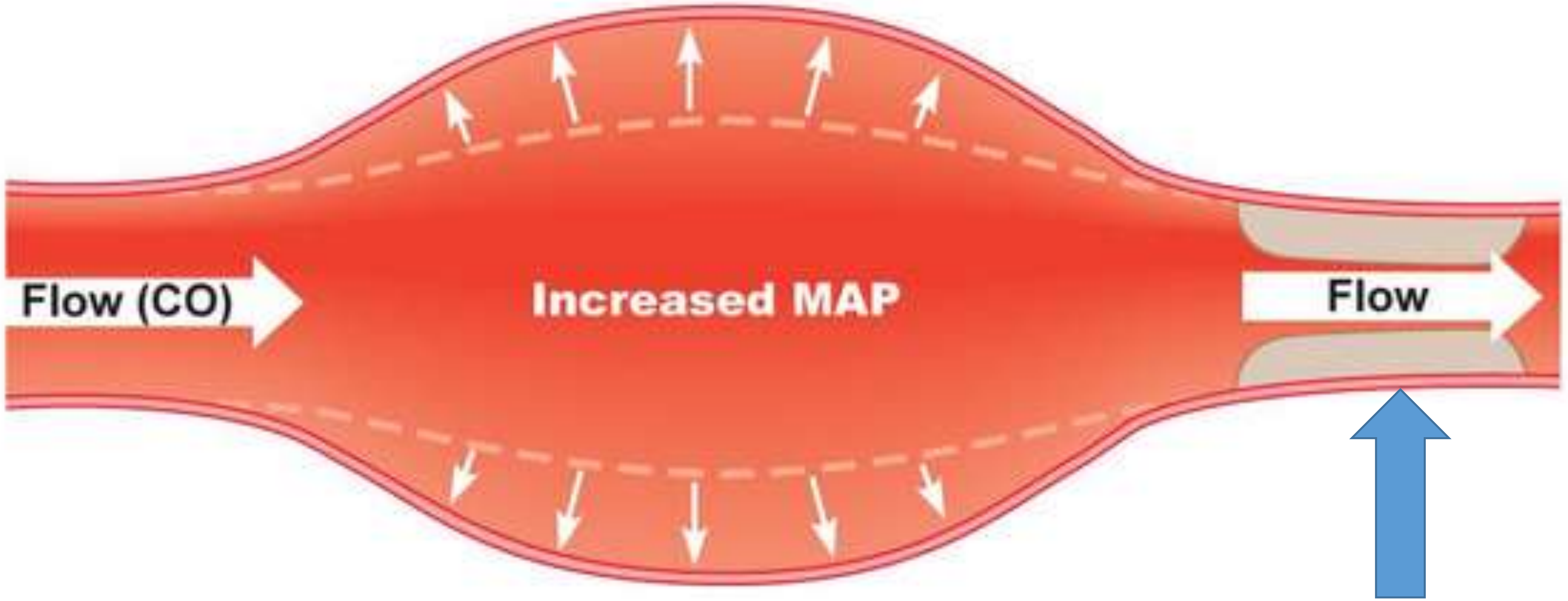


(b)



(b)

$$\text{blood flow rate} = \frac{\text{pressure difference}}{\text{resistance}}$$



A constant cardiac output . . .

. . . leads to an increase in the volume of blood contained in the aorta and an increase in mean arterial pressure . . .

. . . when total peripheral resistance increases.

Relationship of Pressure and Blood Flow

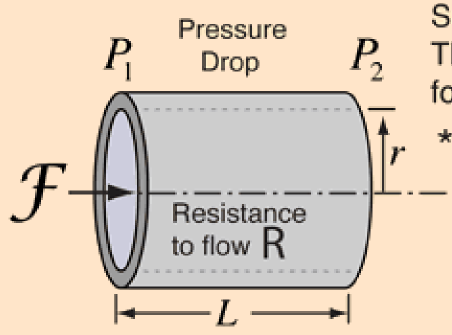
$$\text{blood flow rate} = \frac{\text{pressure difference}}{\text{resistance}}$$

Poiseuille's Law of Blood Flow

The laws of nature state that blood flow (F) to a given organ is directly related to the pressure (P) of the blood as it enters its capillaries and inversely related to the vascular resistance (R) applied by its arterioles. This natural relationship can be expressed as F = P/R. The higher the pressure, the more blood flow and the lower the pressure, the less blood flow. And the higher the vascular resistance, the less blood flow, and the lower the vascular resistance, the more blood flow. The arterioles can increase or decrease the amount of resistance they apply to the blood trying to enter an organ by increasing or decreasing the contraction of the muscle surrounding them. An increase in muscle contraction closes down the opening in the arteriole, making the passageway (lumen) smaller. This increases the resistance and lowers the blood flow. And a decrease in muscle contraction opens up the lumen, decreasing the resistance and increasing the blood flow.

Poiseuille's Law

The biggest surprise in the application of Poiseuille's law to fluid flow is the dramatic effect of changing the radius.



Suppose the original flowrate is 100 cm^3/sec. The effect of changes in the parameters is as follows:

*Double length	⇒ 50	cm^3/sec
Double viscosity	⇒ 50	cm^3/sec
Double pressure	⇒ 200	cm^3/sec
Double radius	➡ 1600	cm^3/sec

$$\mathcal{R} = \frac{8\eta L}{\pi r^4}$$ where η = viscosity

* With other parameters held at original values

$$\text{Volume Flowrate} = \mathcal{F} = \frac{P_1 - P_2}{\mathcal{R}} = \frac{\pi(\text{Pressure difference})(\text{radius})^4}{8(\text{viscosity})(\text{length})}$$

A 19% increase in radius will double the volume flowrate!

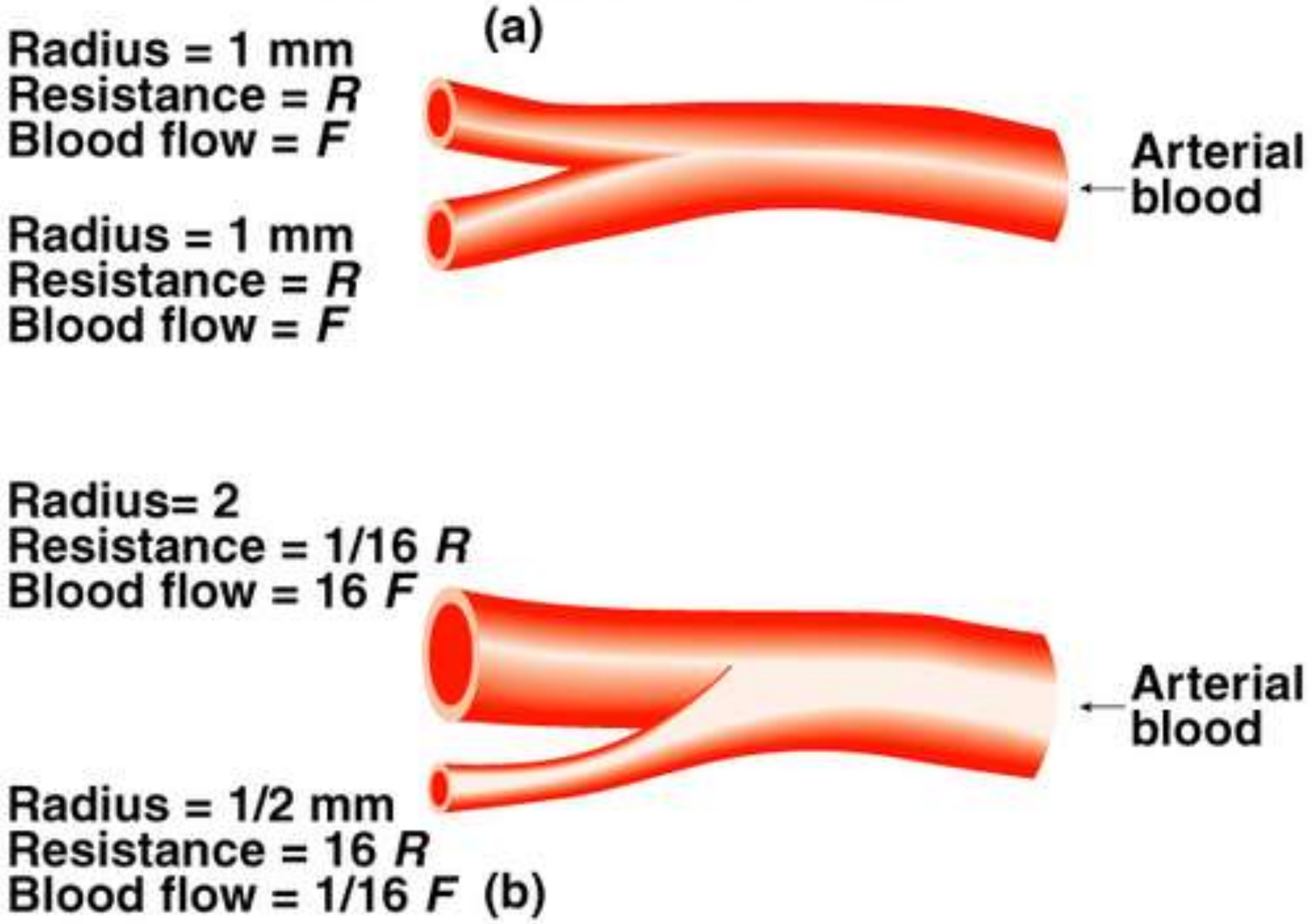
A decrease in radius has an equally dramatic effect, as shown in blood flow examples.

Poiseuille's Law calculation

Index

Poiseuille's law concepts

Implications: any factors-emotion, drinks, food and drug that dilate the blood vessel can increase blood flow while reduce heart's burden; Any drinks and foods that reduce blood viscosity have the same protective effects to the heart.



$$\text{blood flow rate} = \frac{\text{pressure difference}}{\text{resistance}}$$

Poiseuille's Law

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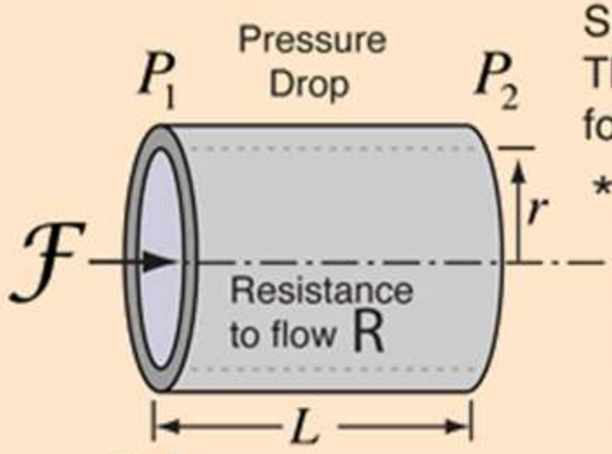

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* With other parameters held at original values

$$\mathcal{R} = \frac{8\eta L}{\pi r^4} \quad \text{where } \eta = \text{viscosity}$$

$$\text{Volume Flowrate} = \mathcal{F} = \frac{P_1 - P_2}{\mathcal{R}} = \frac{\pi(\text{Pressure difference})(\text{radius})^4}{8(\text{viscosity})(\text{length})}$$

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Poiseuille's Law calculation

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Poiseuille's law concepts

Poiseuille's Law of Blood Flow

Blood Flow Examples

A small amount of arterial occlusion can have a surprisingly large effect!

healthy artery

Occlusion*	If pressure is 120 mmHg, Flowrate =	Pressure to restore normal Flowrate:
0%	100 cm^3/min	120 mmHg
20%	41 cm^3/min	293 mmHg
50%	6.3 cm^3/min	1920 mmHg
80%	0.16 cm^3/min	75,000 mmHg

*20% occlusion here is taken to mean a reduction of the inside radius by 20%, to 80% of its original radius.

A 19% decrease in radius will halve the volume flowrate!

Calculation of effects of vasodilation or vasoconstriction

Index

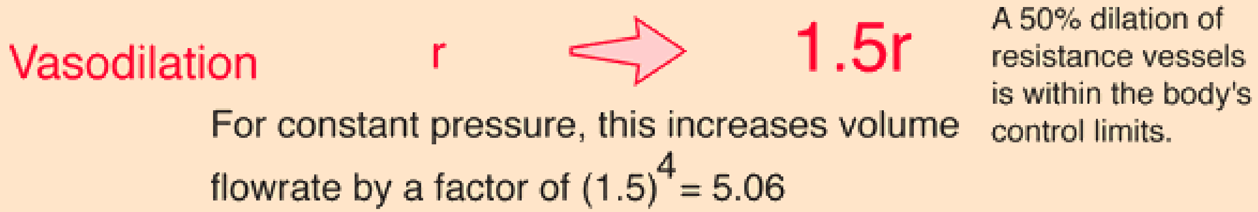
Poiseuille's law concepts

Blood Flow Examples

Suppose you have an emergency requirement for a five-fold increase in blood volume flowrate (like being chased by a big dog)? How does your body supply it?

According to Poiseuille's law, a five-fold increase in blood pressure would be required if the increase were supplied by blood pressure alone!

But the body has a much more potent method for increasing volume flowrate in the vasodilation of the small vessels called arterioles.



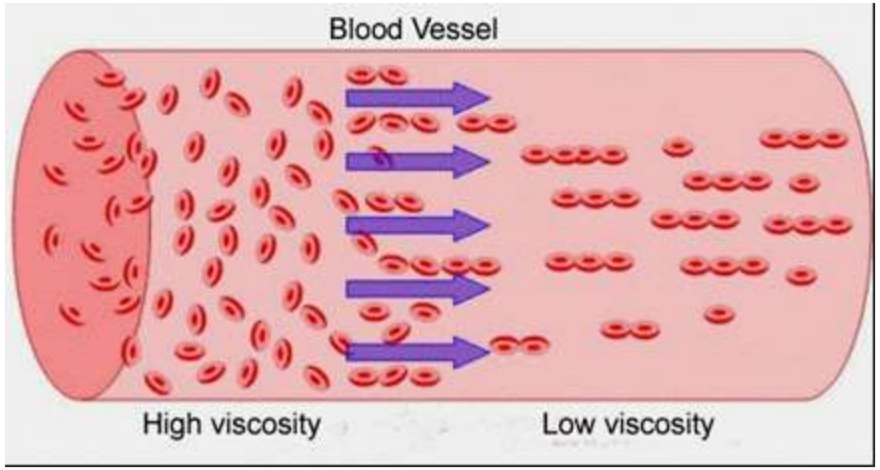
Since the smaller vessels provide most of the resistance to flow, the arterioles in their position just prior to the capillaries can provide a major controlling influence on the volume flowrate. This system of small vessels can constrict flow to one part of the body while enhancing the flow to another to meet changing demands for oxygen and nutrients.

Calculation of effects of vasodilation or vasoconstriction

Index

Poiseuille's law concepts

Higher Blood Viscosity =greater friction between blood and blood vessel =higher the load for the heart to pump the blood



The relationship between BP and viscosity is such that, given a constant systolic BP, if blood viscosity increases, then the total peripheral resistance (TPR) will necessarily increase, thereby reducing blood flow.

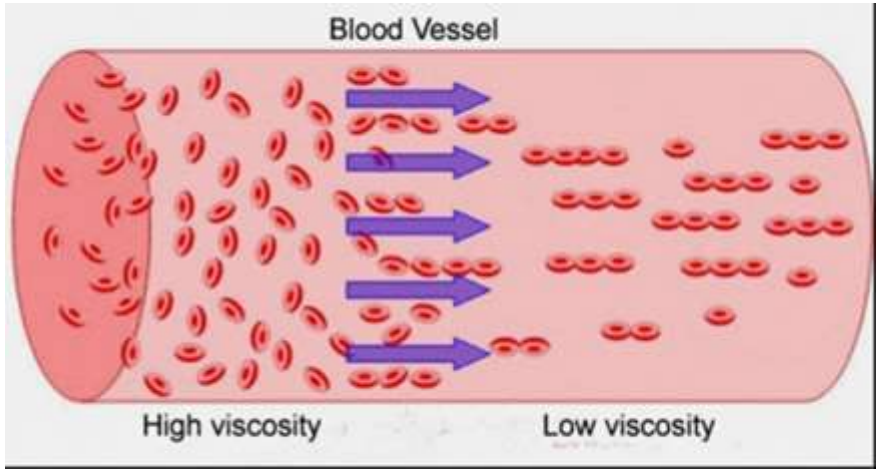
Conversely, when viscosity decreases, blood flow and perfusion will increase. Because of the dependence of systemic arterial BP on cardiac output and TPR, if blood viscosity and TPR rise, systolic BP must then increase for cardiac output to be maintained.

Since increased viscosity requires a higher BP to ensure the same circulating volume of blood, both the burden on the heart and the forces acting on the vessel wall are directly modulated by changes in blood viscosity.

blood viscosity has been established as a major determinant of the work of the heart and tissue perfusion.

Viscosity of plasma

Normal blood plasma behaves like a Newtonian fluid at physiological rates of shear. Typical values for the viscosity of normal human plasma at 37 ° C is 1.4 mN·s/m2.



The viscosity of normal plasma varies with temperature in the same way as does that of its solvent water; a 5 ° C increase of temperature in the physiological range reduces plasma viscosity by about 10%.

blood viscosity has been established as a major determinant of the work of the heart and tissue perfusion.

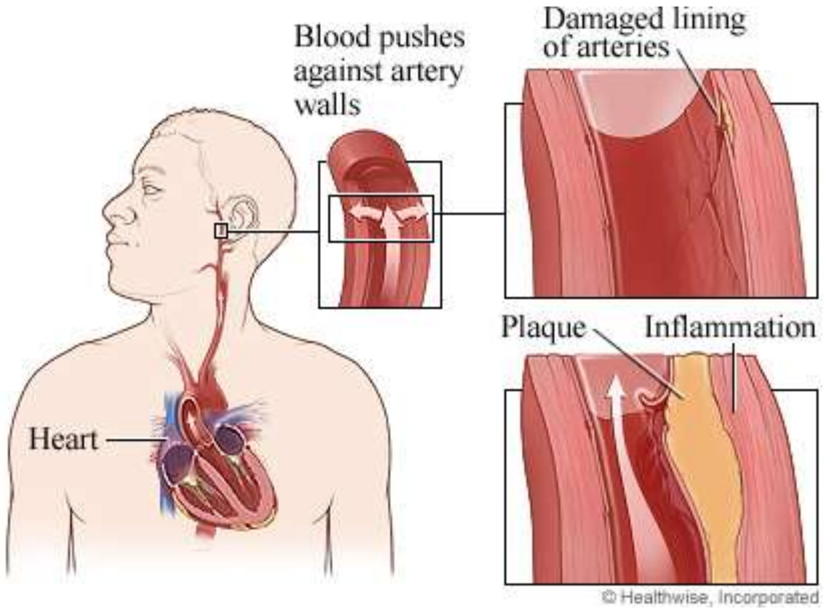
https://en.wikipedia.org/wiki/Hemodynamics

How High Blood Pressure Damages Arteries

High blood pressure means that blood is pushing too hard against artery walls. The force of this blood can damage the delicate inner lining of the artery walls.

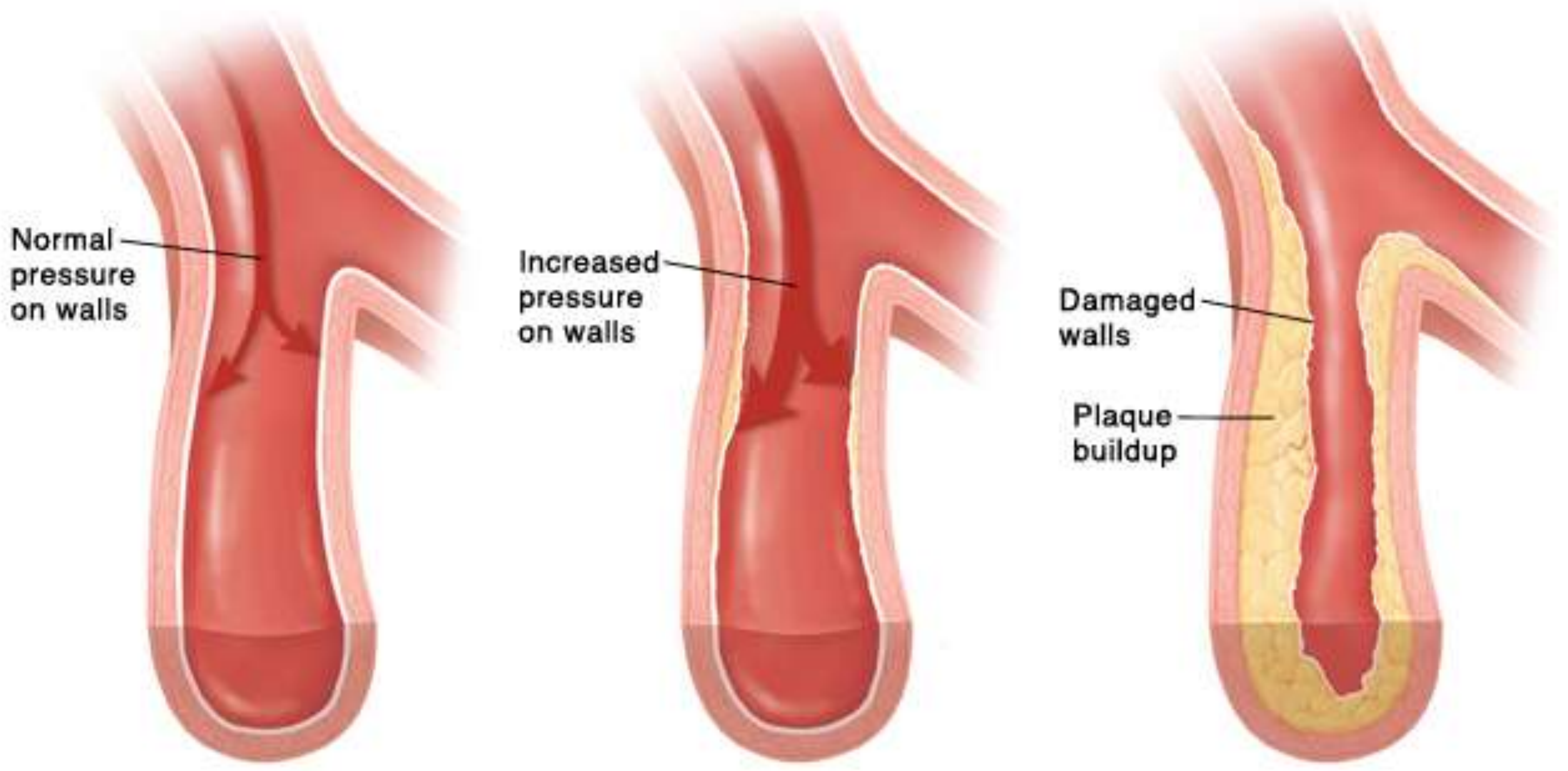
If this inner lining is damaged, fat and calcium can build up in the artery wall, forming a plaque. This plaque makes the artery stiff (atherosclerosis). This is also called "hardening of the arteries." The plaque might narrow the artery. This narrowing could reduce the amount of blood that is flowing through the artery.

Over time, plaque can cause problems throughout the body.
If arteries to the heart are affected, coronary artery disease, a heart attack, or abnormal heartbeats may happen.
If arteries to the brain are affected, a stroke or transient ischemic attack (TIA) may happen.
If arteries to other organs are affected, problems such as kidney failure, peripheral arterial disease, or eye damage may happen.



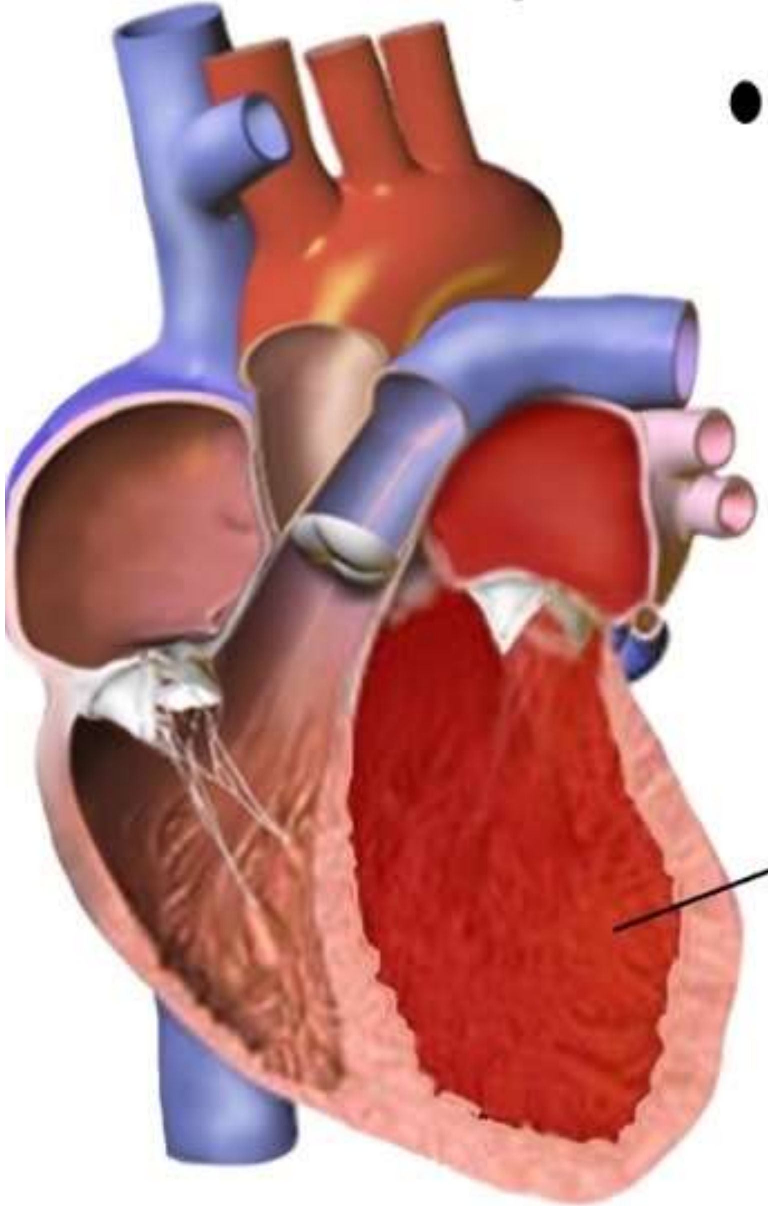
http://www.webmd.com/hypertension-high-blood-pressure/how-high-blood-pressure-damages-arteries

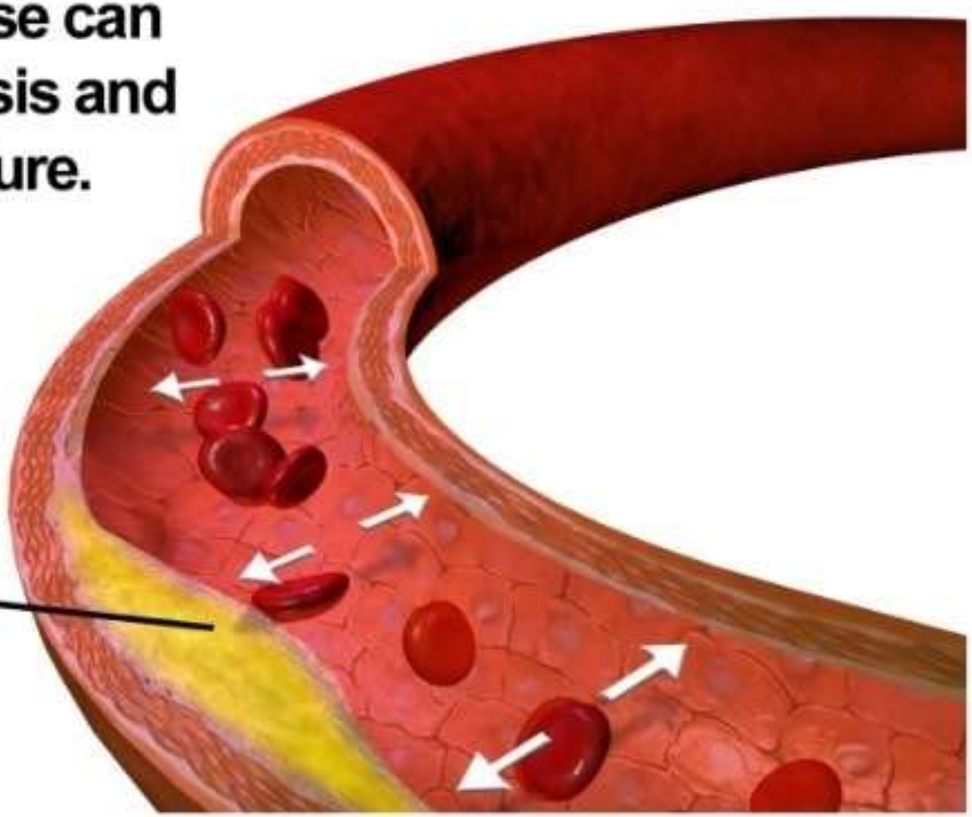
High blood pressure means that blood is pushing too hard against artery walls. The force of this blood can damage the delicate inner lining of the artery walls.

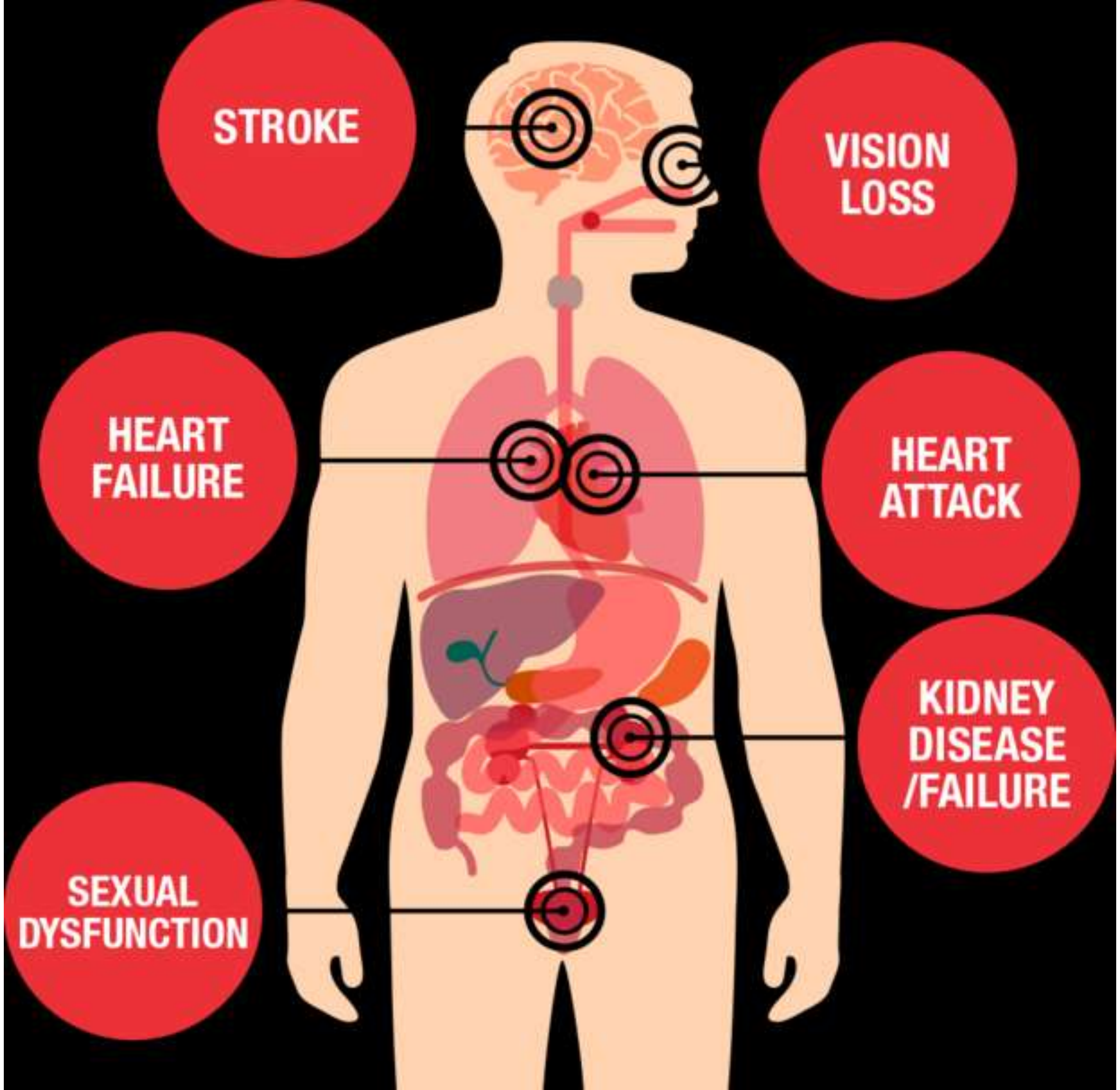


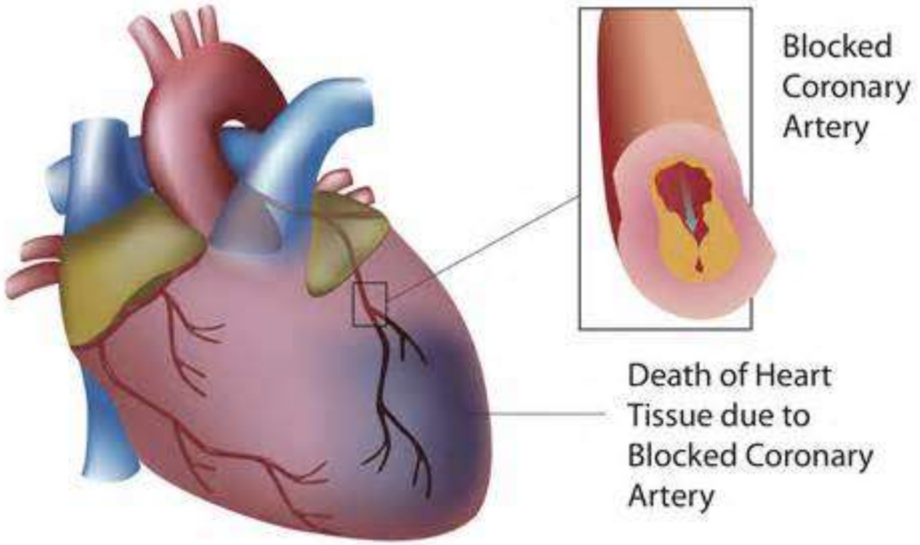
High Blood Pressure

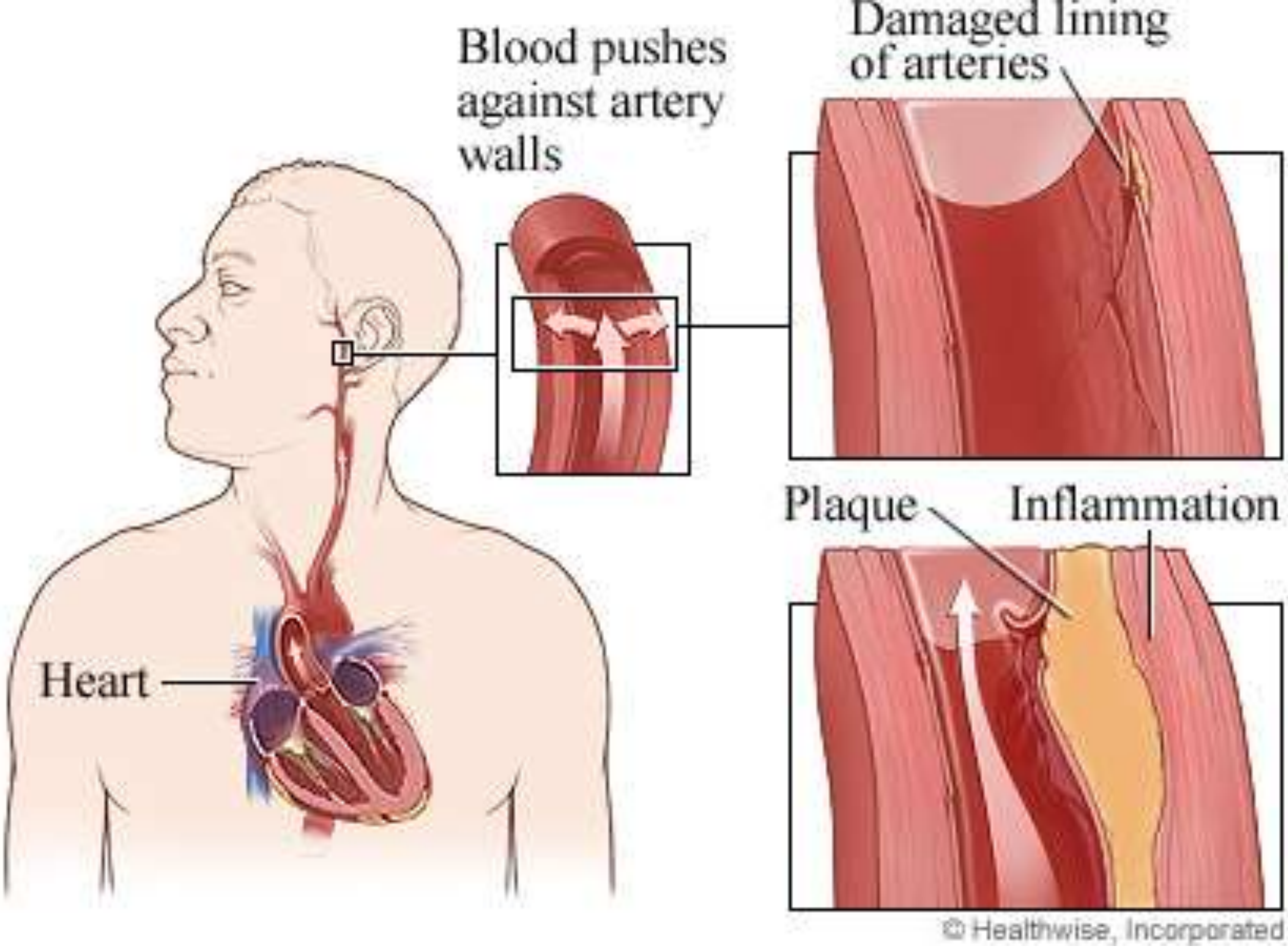
- High blood pressure is a sign that the heart and blood vessels are being overworked
- Untreated, the disease can lead to atherosclerosis and congestive heart failure.





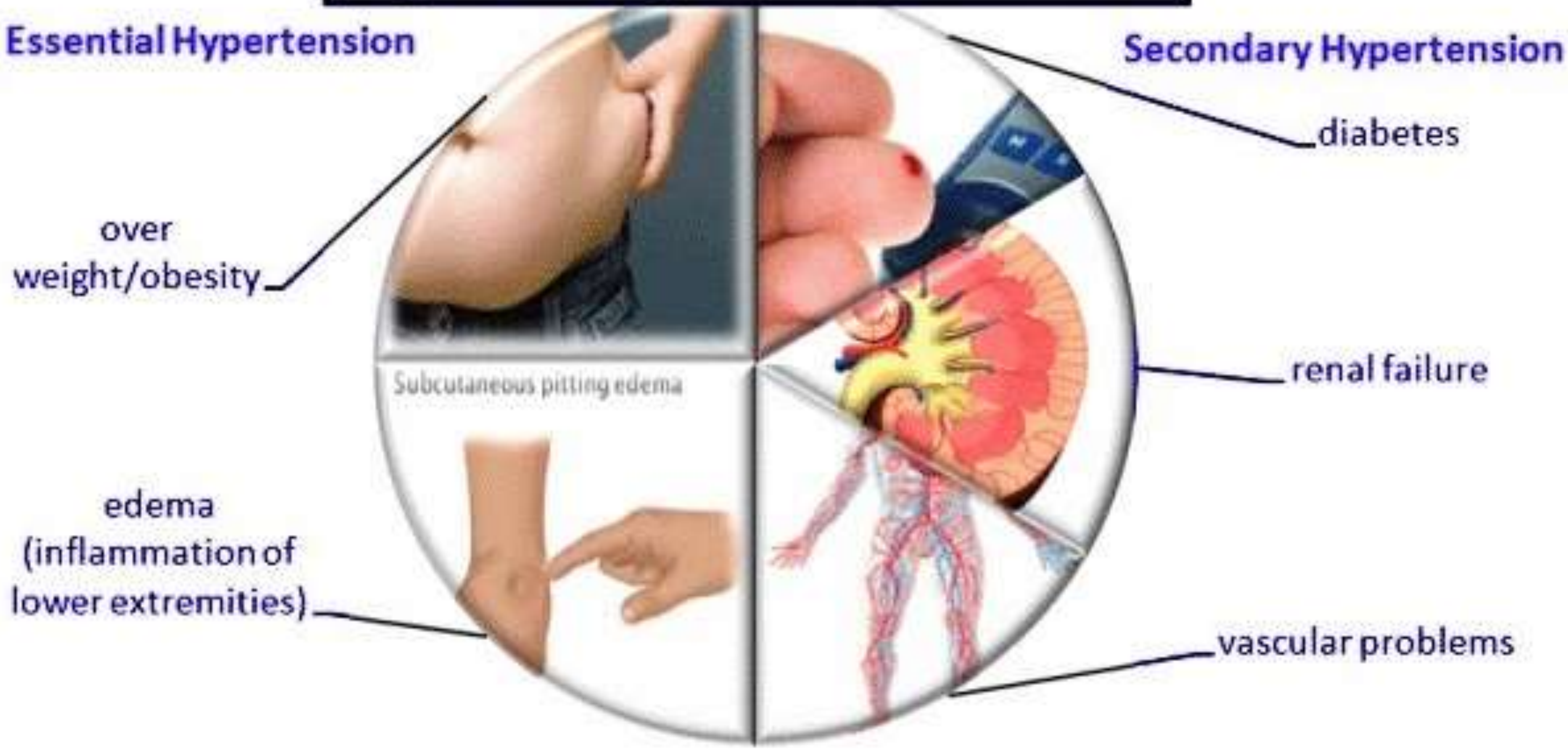

STROKE
VISION LOSS
HEART FAILURE
HEART ATTACK
KIDNEY DISEASE /FAILURE
SEXUAL DYSFUNCTION

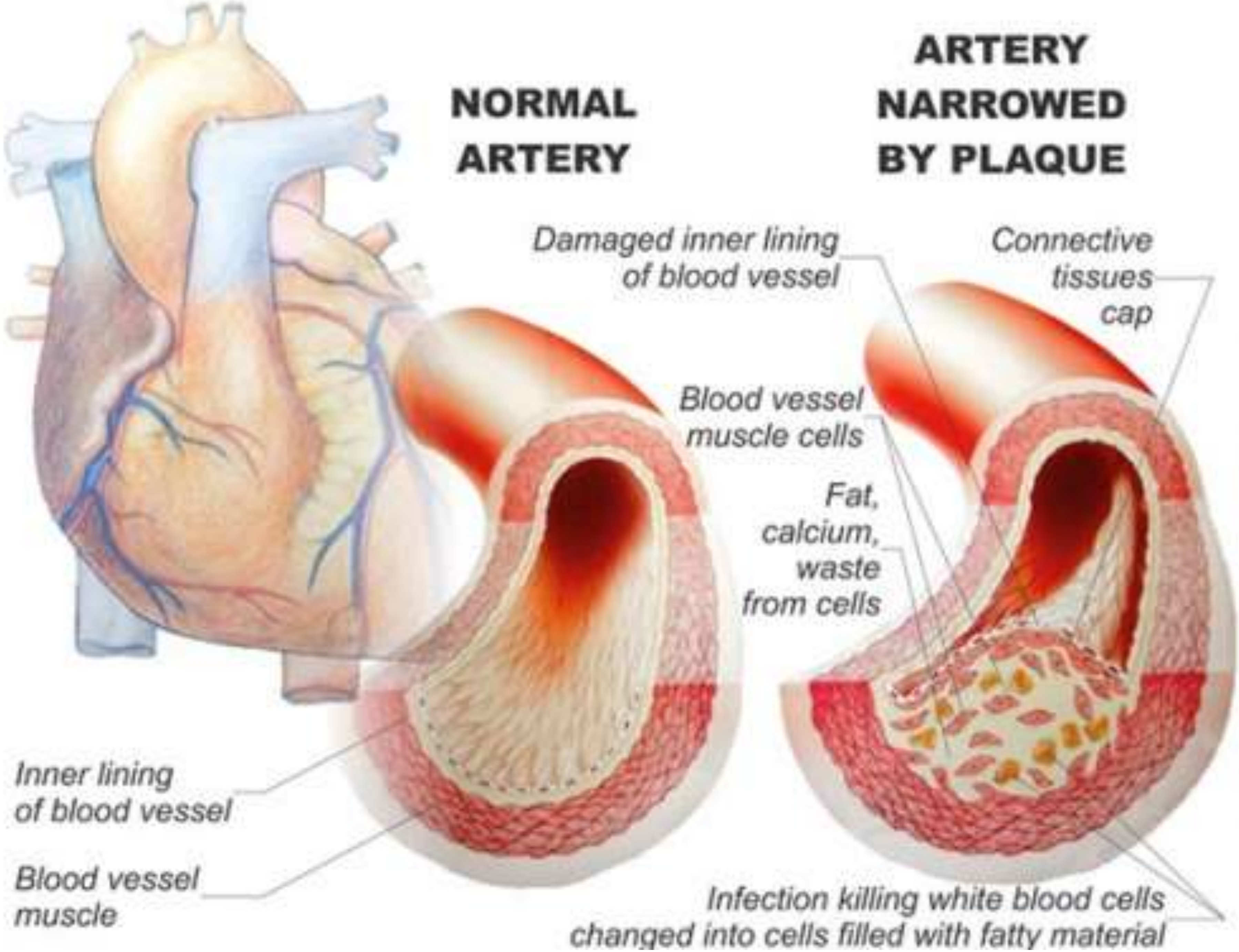

Blocked Coronary Artery
Death of Heart Tissue due to Blocked Coronary Artery

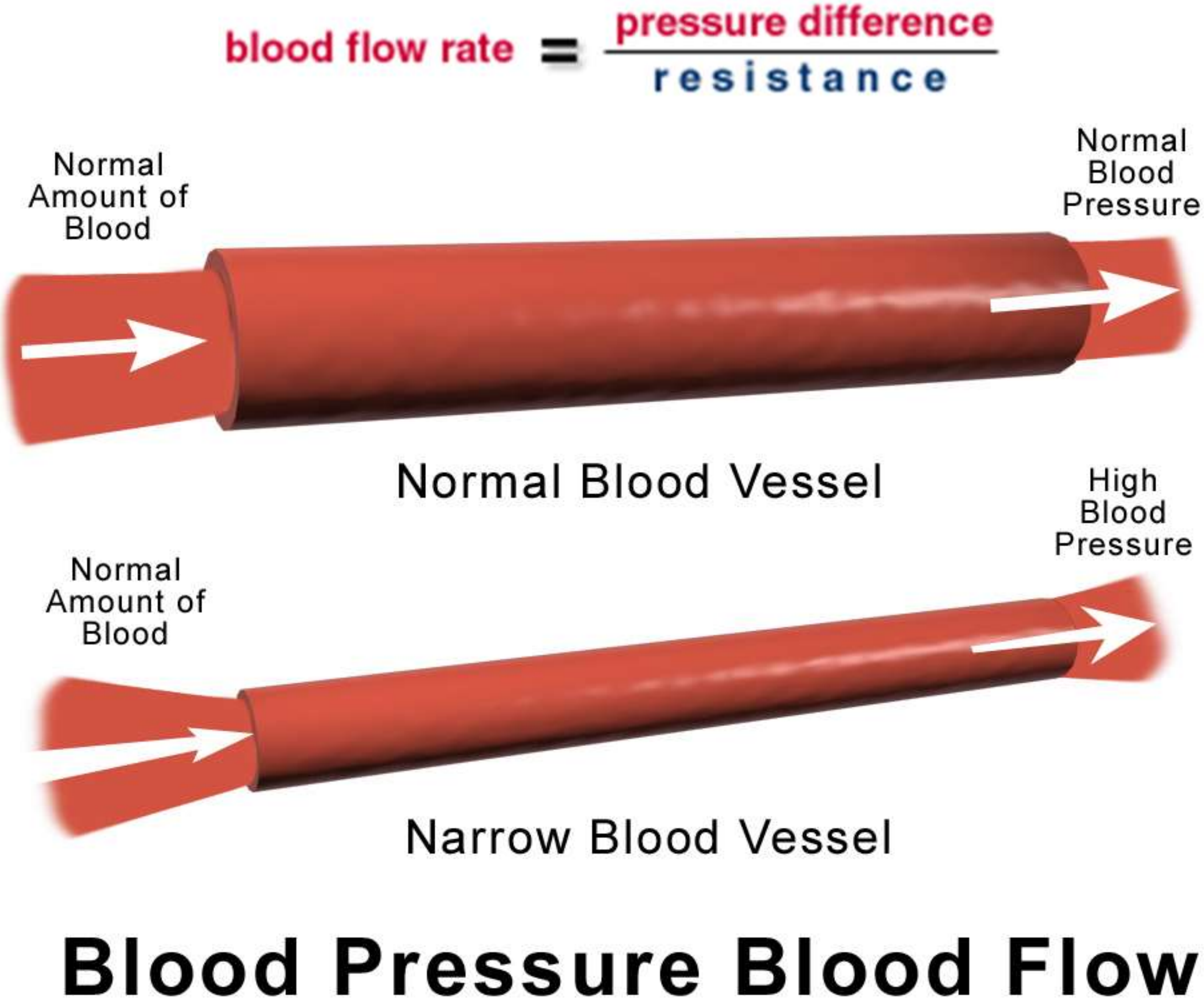


Blood pushes against artery walls
Damaged lining of arteries
Plaque
Inflammation
Heart
© Healthwise, Incorporated

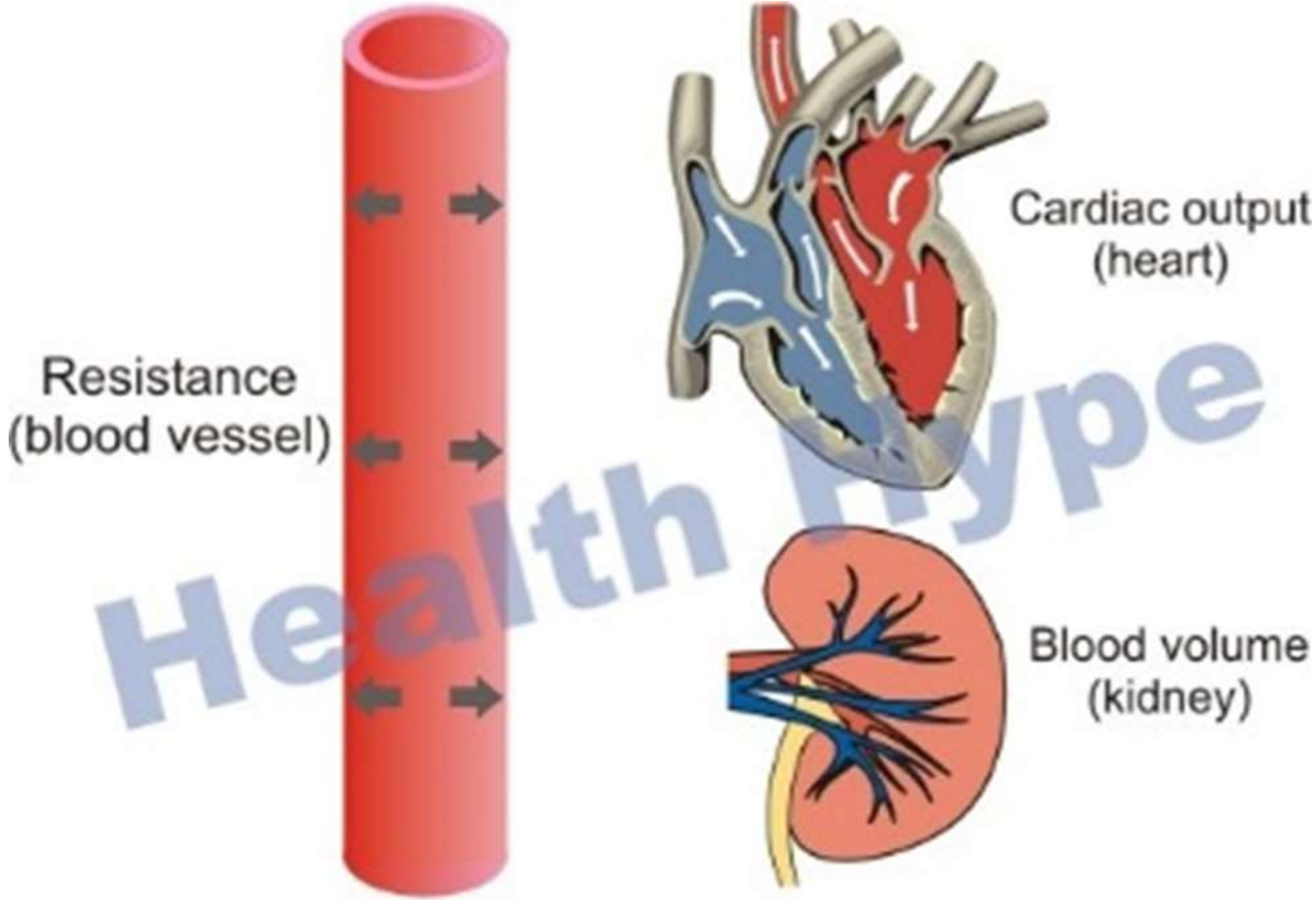
Signs of High Blood Pressure




NORMAL
ARTERY
ARTERY
NARROWED
BY PLAQUE
Damaged inner lining
of blood vessel
Connective
tissues
cap
Blood vessel
muscle cells
Fat,
calcium,
waste
from cells
Inner lining
of blood vessel
Blood vessel
muscle
Infection killing white blood cells
changed into cells filled with fatty material

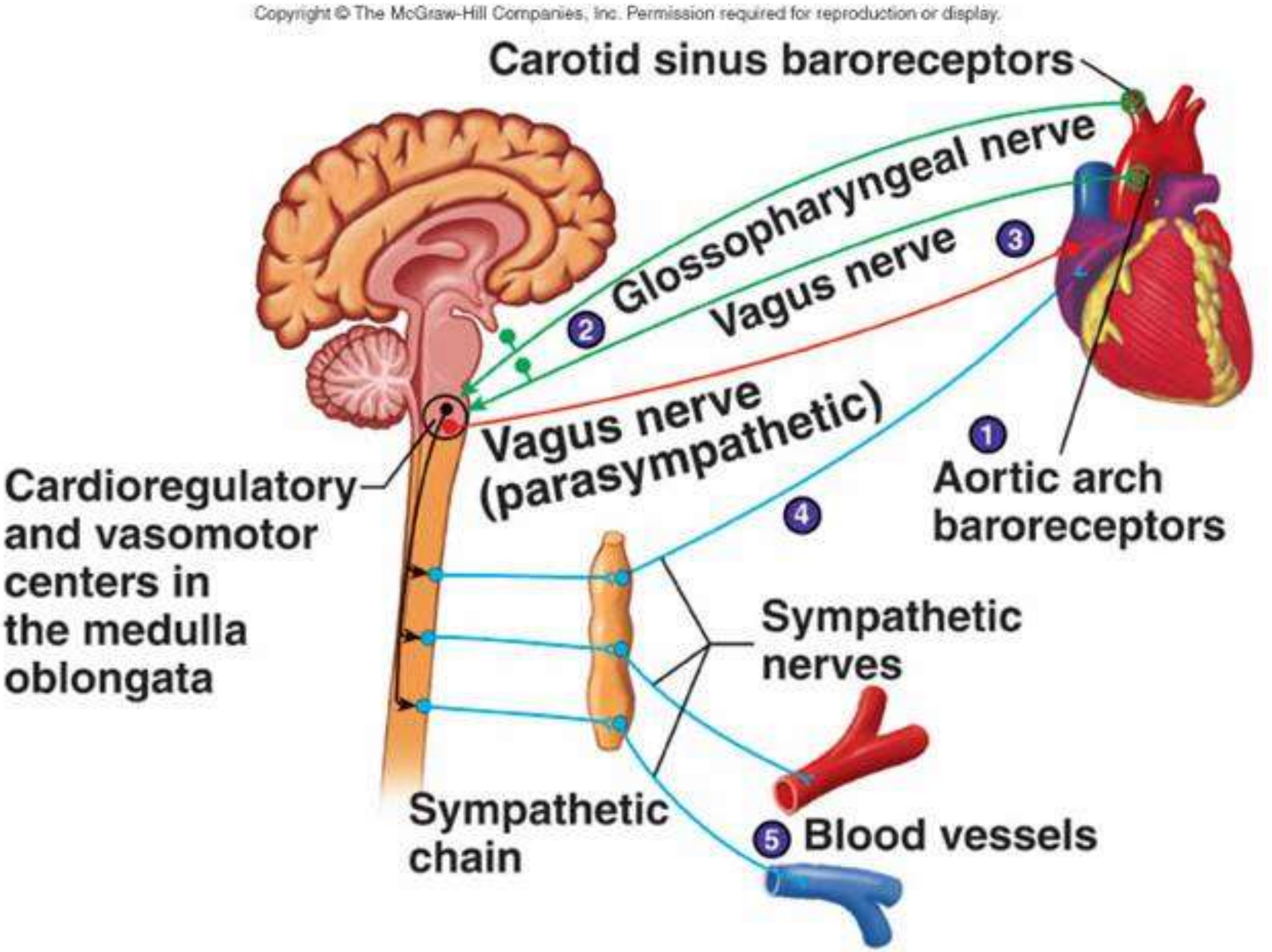


Blood is the river of life, a minimum blood flow is essential for organs and tissue fun to function properly. Thus, reducing the peripheral resistance is the key to normalize the blood pressure.



Regulation of Blood Pressure

$$\text{blood flow rate} = \frac{\text{pressure difference}}{\text{resistance}}$$



There is mounting evidence that many forms of hypertension are initiated and maintained by an elevated sympathetic tone closely related to stressed working and living conditions.

Hypertensive crisis

Hypertensive crisis is the turning point in the course of hypertension in which immediate management of the elevated BP has a decisive role in the eventual outcome.

It is a condition of severe and uncontrolled increase in the BP.

An acute increase in BP can occur in the absence or presence of acute or chronic target organ dysfunction.

Normal

Systolic: <120 mm Hg — Diastolic: <80 mm Hg

Pre-hypertension

Systolic: 120-139 mm Hg — Diastolic: 80-89 mm Hg

Stage 1 Hypertension

Systolic: 140-159 mm Hg — Diastolic: 90-99 mm Hg

Stage 2 Hypertension

Systolic: >=160 mm Hg — Diastolic: >=100 mm Hg

Hypertensive Crisis

Systolic: >180 mm Hg — Diastolic: >110 mm Hg

WHAT IS MICROCIRCULATION?

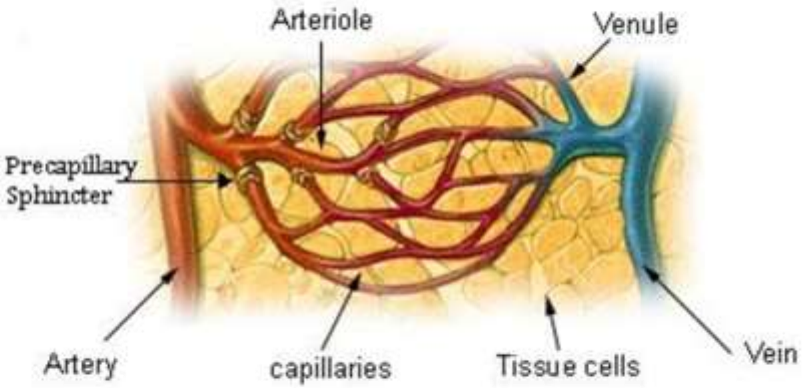
Microcirculation deals with the circulation of blood from the heart to arterioles (small arteries), to capillaries, to venules (small veins), and back to the heart. The liver, spleen, and bone marrow contain vessel structures called sinusoids instead of capillaries. In these structures, blood flows from arterioles to sinusoids to venules. A vessel called a thoroughfare channel allows blood to flow freely between an arteriole and a venule.

Capillaries extend from this channel and structures called precapillary sphincters control the flow of blood between the arteriole and capillaries.

The blood capillaries are where the important functions of the circulation take place: the **exchange** of material between circulation and cells. Capillaries are the smallest of the body's blood vessels. They are only one cell thick, and they are the sites of the transfer of oxygen and other nutrients from the bloodstream to other tissues in the body; they also collect carbon dioxide waste materials and fluids for return to the veins.

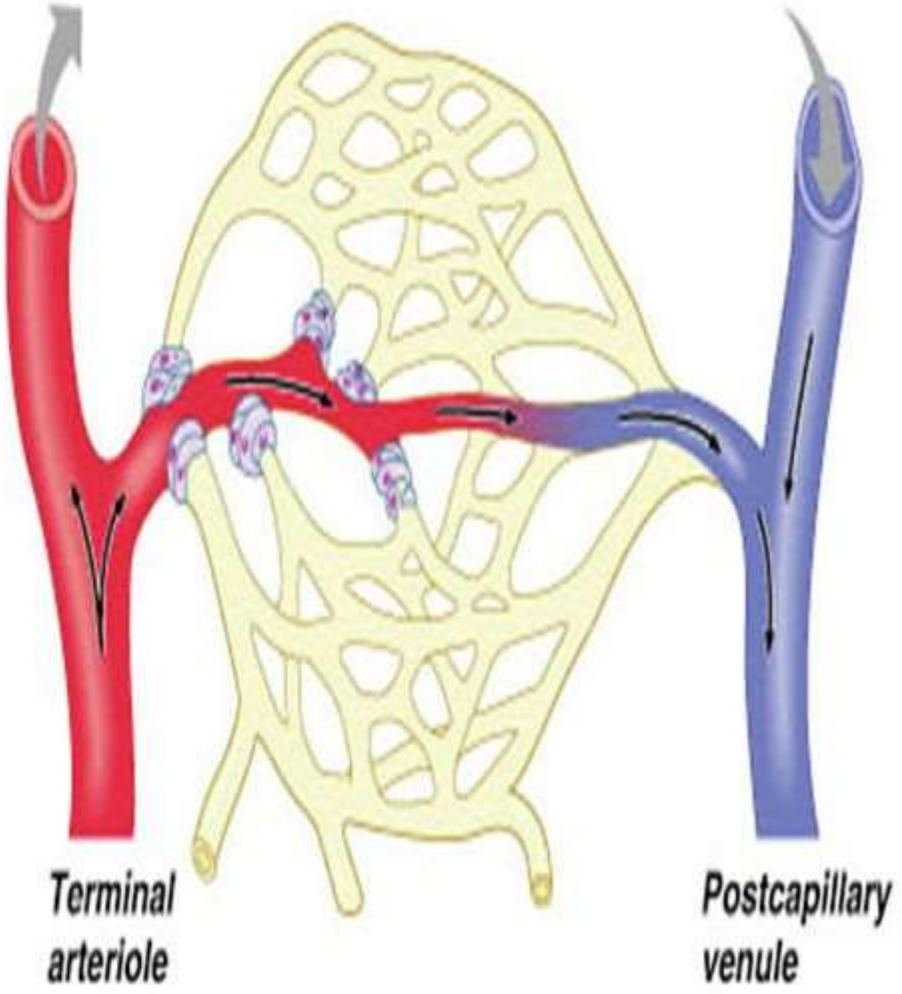
Capillary Beds

- capillaries organized into networks called **capillary beds**
  - usually supplied by a single **metarteriole**
- **thoroughfare channel** - metarteriole that continues through capillary bed to venule
- **precapillary sphincters** control which beds are well perfused
  - **when sphincters open**
  - **when sphincters closed**
    - blood bypasses the capillaries
    - flows through thoroughfare channel to venule
- three-fourths of the bodies capillaries are shut down at a given time



Blood Flow Through Capillary

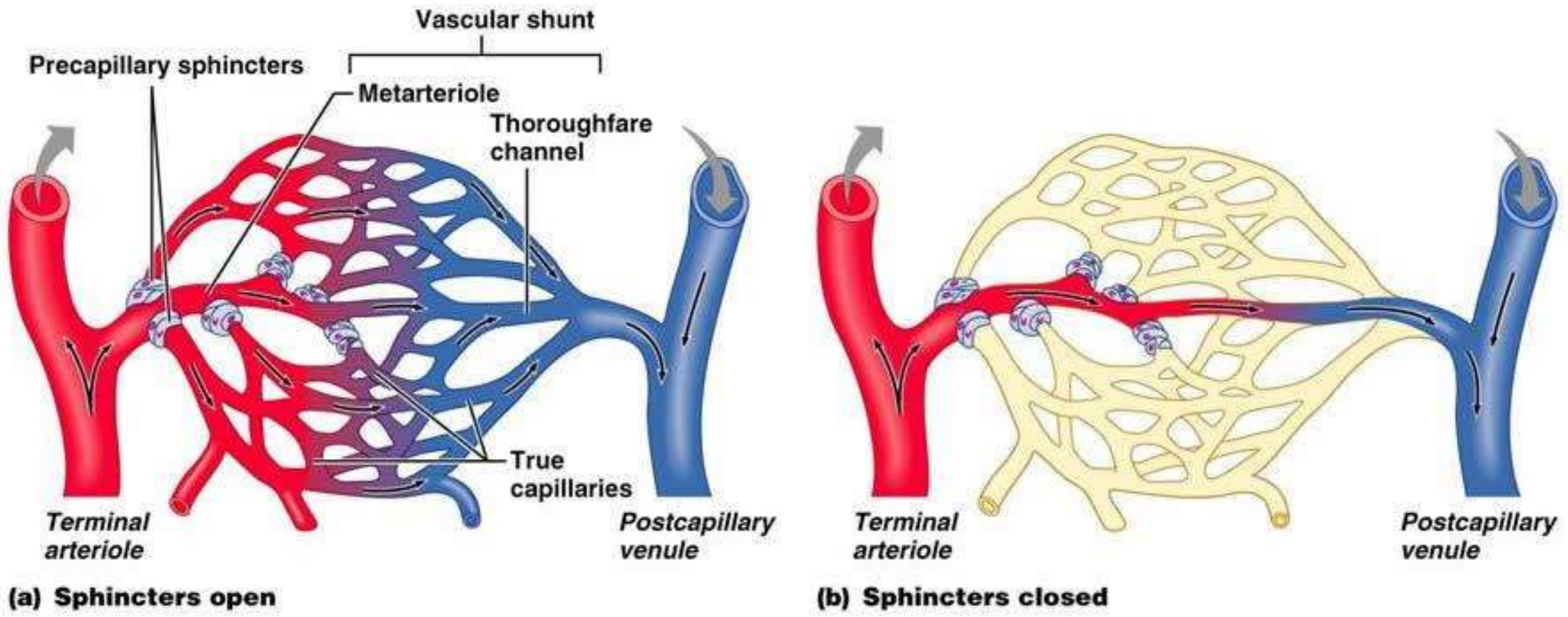
- There are 5-6 liters of blood
- 60 thousand miles of vessels in the circulatory system.
- SNS causes precapillary sphincters to constrict shunting blood to where it is needed.
- If all the precapillary sphincters open the blood pressure will drop dramatically.
  - This is what we call SHOCK.



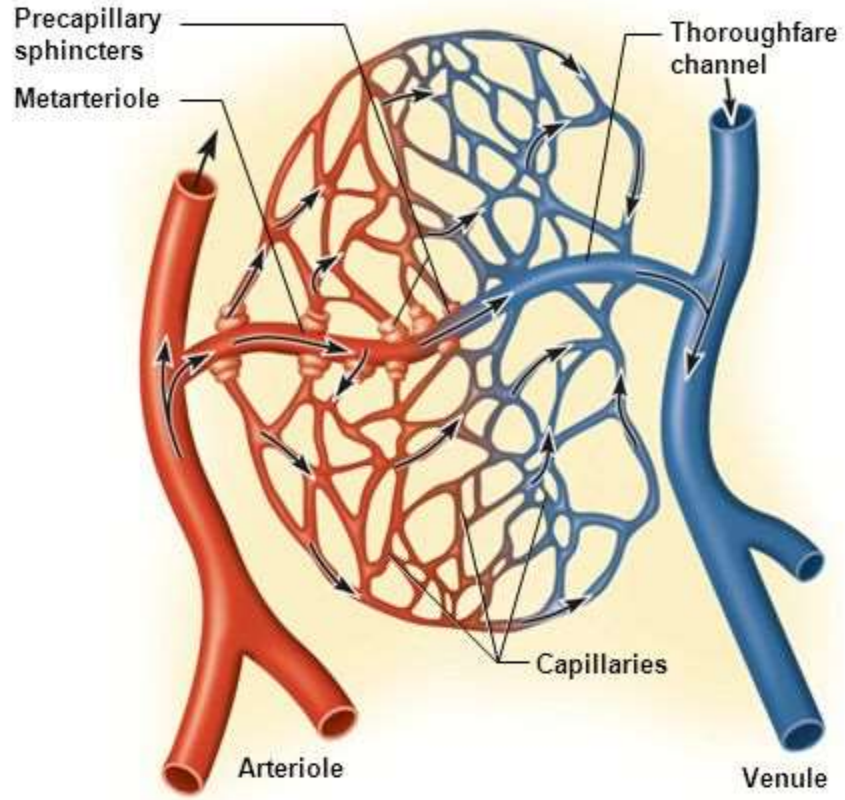
(b) Sphincters closed

SNS=sympathetic nervous system

A vessel called a ***thoroughfare channel*** allows blood to flow freely between an arteriole and a venule. Capillaries extend from this channel and structures called ***precapillary sphincters*** control the flow of blood between the arteriole and capillaries.



Capillary Bed Sphincters Open



(a) Sphincters open

Three-fourth of body's capillaries are shut down at a given time.

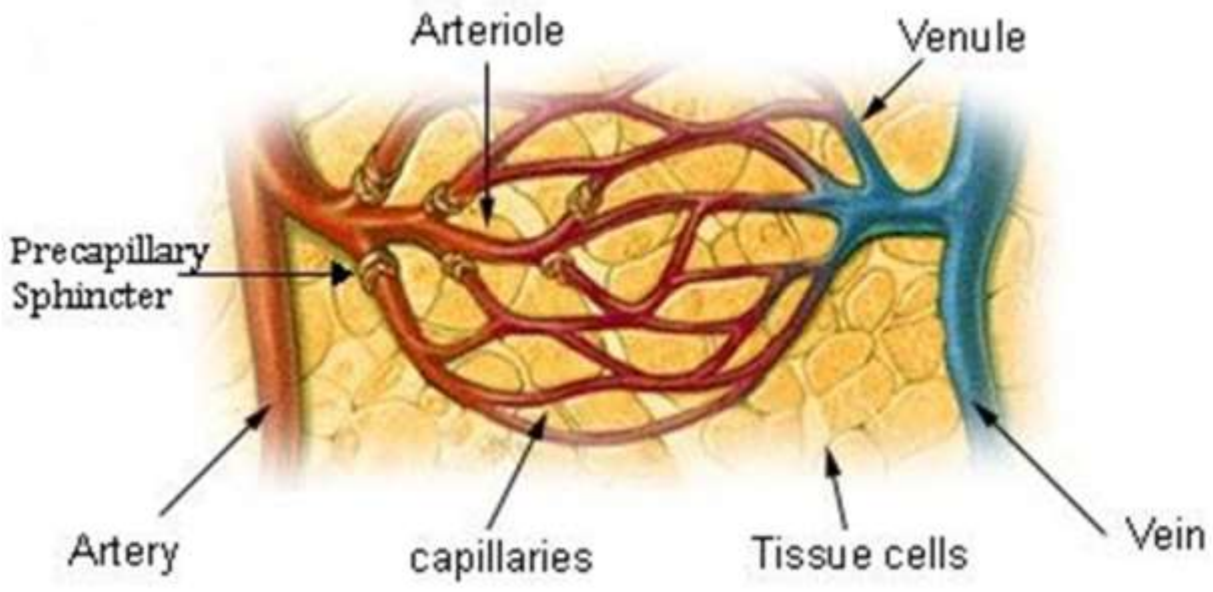
Figure 20.3a

when sphincters are open, the capillaries are well perfused
three-fourths of the capillaries of the body are shut down

HOW IS MICROCIRCULATION REGULATED?

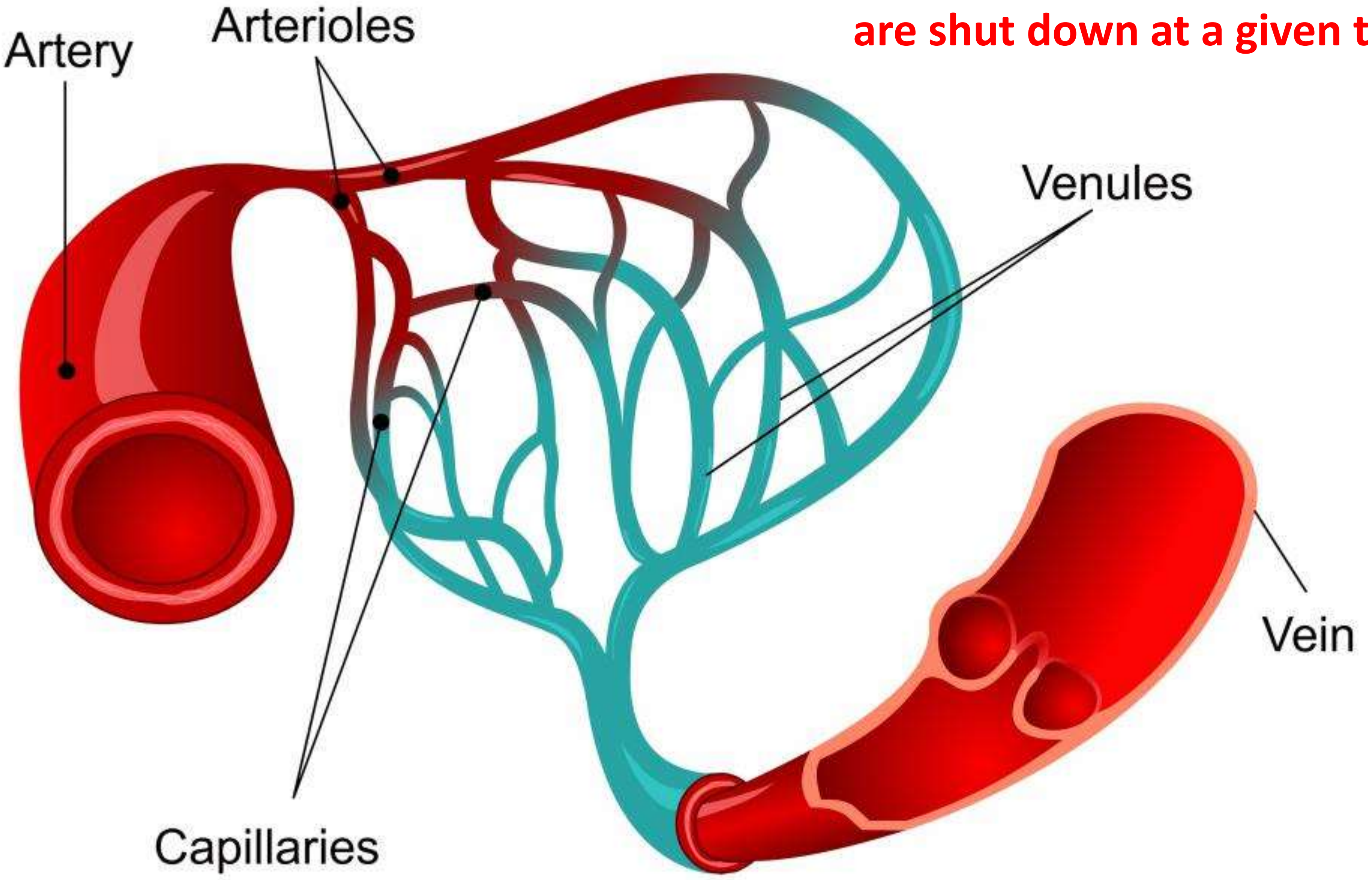
The precapillary sphincters contain muscle fibers that allow them to contract. When the sphincters are open, blood flows freely to the capillary bed where fluids, gasses, nutrients, and wastes are exchanged between the blood and body cells. When the sphincters are closed, blood is not allowed to flow through the capillary bed and must flow directly from the arteriole to the venule through the thoroughfare channel.

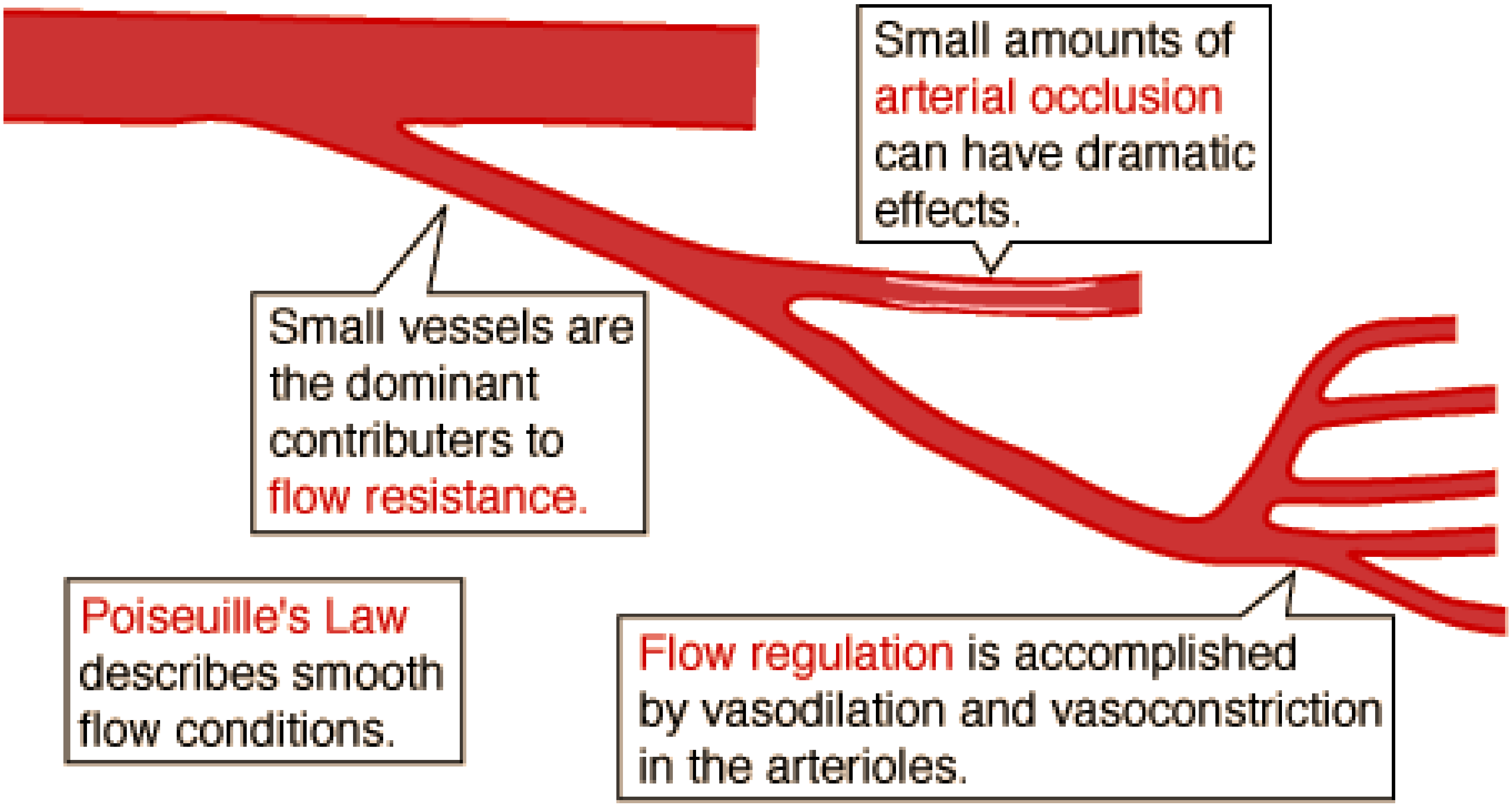
It is important to note that blood is supplied to all parts of the body at all times, but all capillary beds do not contain blood at all times. Blood is diverted to the parts of the body that need it most at a particular time. For instance, when you eat a meal blood is diverted from other parts of your body to the digestive tract to aid in digestion and nutrient absorption.

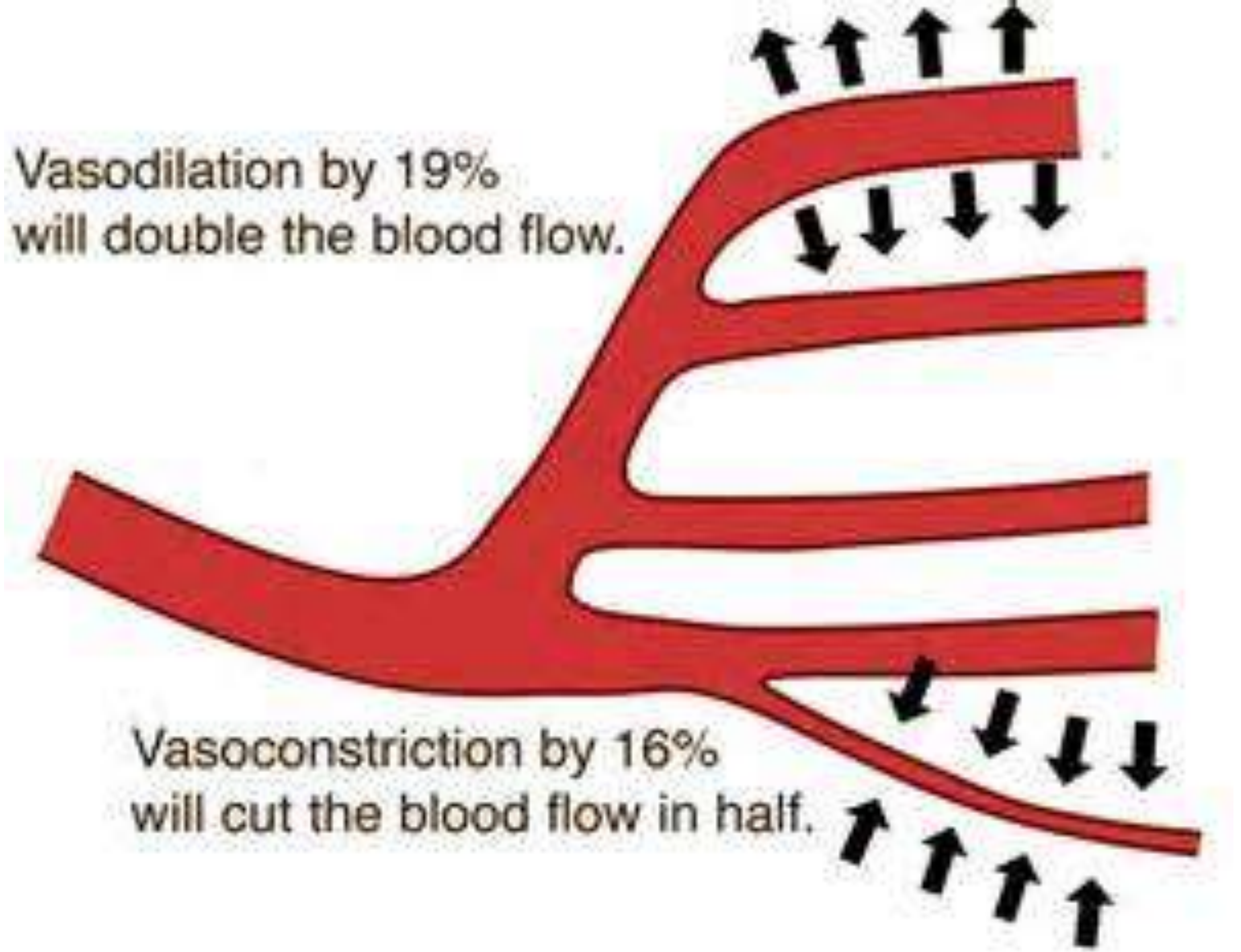


Three-fourth of body's capillaries are shut down at a given time.

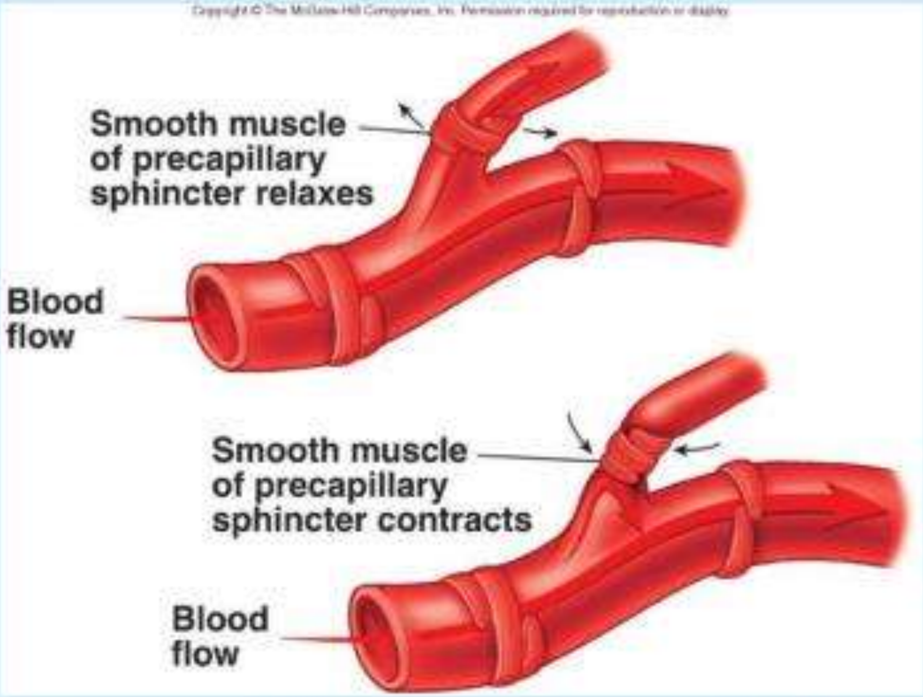
Three-fourth of body’s capillaries are shut down at a given time.




Small amounts of arterial occlusion can have dramatic effects.
Small vessels are the dominant contributers to flow resistance.
Poiseuille's Law describes smooth flow conditions.
Flow regulation is accomplished by vasodilation and vasoconstriction in the arterioles.


Vasodilation by 19%
will double the blood flow.
Vasoconstriction by 16%
will cut the blood flow in half.

Local Control of Blood Flow by Tissues



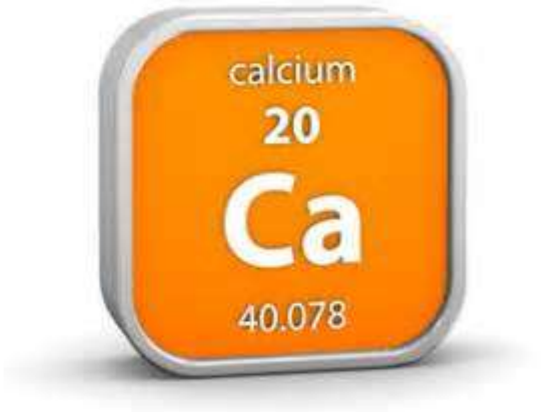
Three-fourth of body's capillaries are shut down at a given time.

- Blood flow can increase 7-8 times as a result of vasodilation of metarterioles and precapillary sphincters in response to increased rate of metabolism
  - Vasodilator substances produced as metabolism increases
  - Vasomotion is periodic contraction and relaxation of precapillary sphincters

Control of Blood Flow

- Precapillary sphincters – circular, valve-like muscle at arteriole-capillary junction
- Vasoconstriction – narrowing blood vessel's lumen ("passageway"
- Vasodilation – explanding blood vessel's lumen

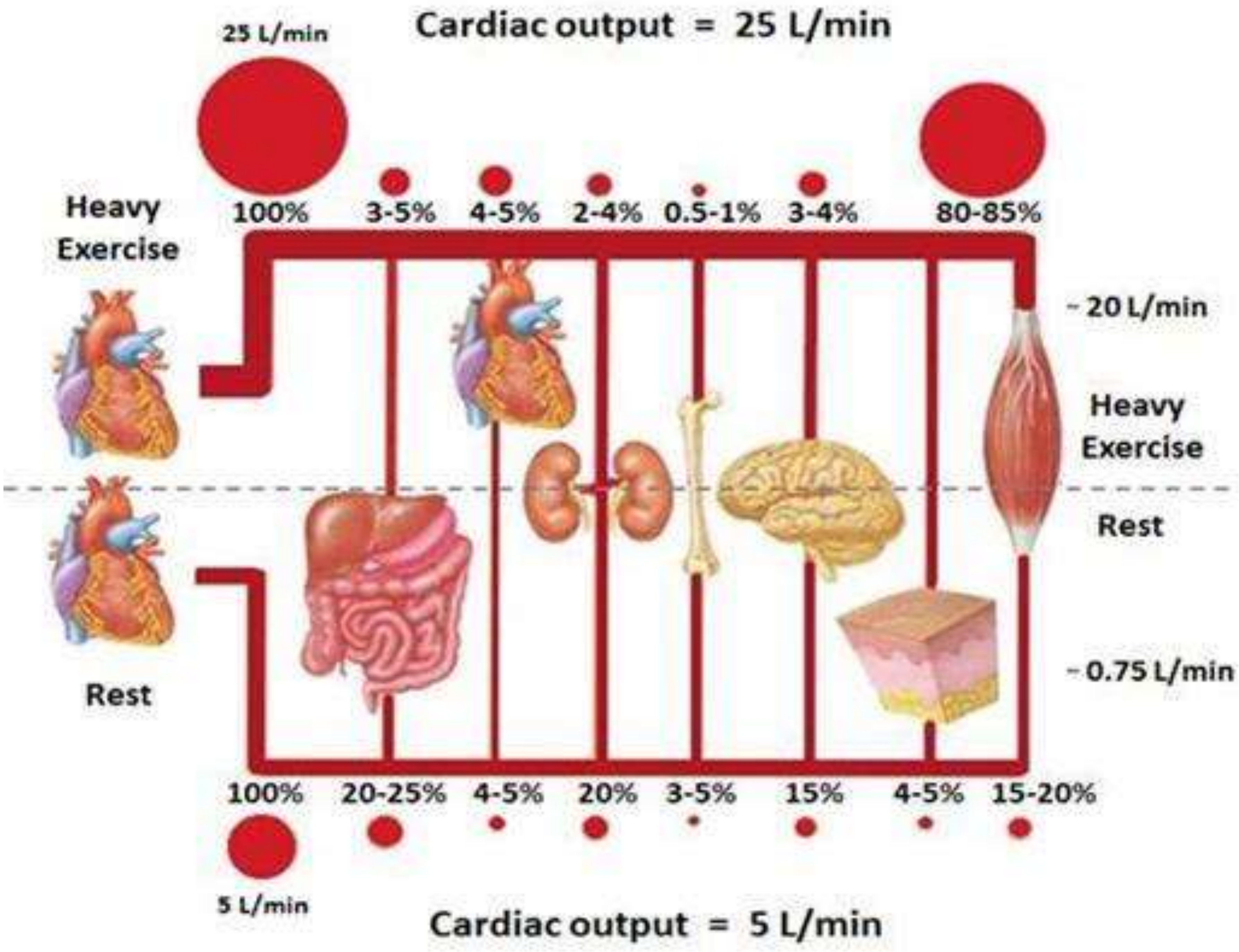
Calcium causes Vascular Smooth Muscle Contraction



Vascular smooth muscle contraction is triggered by a rise in the intracellular free Ca2+ concentration, the amplitude of the contractile activity being dependent on the magnitude of the calcium signal. The change in the Ca2+ concentration can be due to an increased influx of Ca2+ from the extracellular space or to a release of Ca2+ from intracellular stores.

The influx of Ca2+ occurs via two separate pathways, i.e. through voltage dependent Ca2+ channels which are opened by depolarization of the cell membrane, and receptor-operated calcium channels which are opened by the interaction of agonists with their receptors. In contrast to striated muscles activation of smooth muscle involves the reversible phosphorylation of myosin by a specific kinase, the myosin light chain kinase which is activated by Ca2+ via the intracellular calcium receptor calmodulin. Although Ca2+ is the major determinant of the contractile activity, the response of the contractile apparatus to Ca2+ can be modulated over a wide range. Modulators are H+ -ions and inorganic phosphate. Which may accumulate during hypoxia, and the cyclic nucleotide cAMP and cGMP which play an important role in vasodilation. The relation ship between Ca2+ and contraction may also be modulated by certain drugs (e.g. calcium antagonists). Calcium and Vascular Smooth Muscle Contraction. Available from:

https://www.researchgate.net/publication/18062780_Calcium_and_Vascular_Smooth_Muscle_Contraction [accessed Jul 6, 2017].



Despite their relatively small size-less than 1% of the body weight, the kidneys receive about 20% of the heart’s blood output for filtration;

It implies the importance of kidney function in one’s survival.

Blood Volume

- The largest blood volume in the cardiovascular system is in the systemic veins.
- The second largest blood volume is in the pulmonary system.
- Both represent major blood reservoirs.
- The systemic veins and the pulmonary vessels have very high compliance compared to the systemic arteries; this is primarily responsible for the distribution of blood volume.

Blood Distribution

- Largest portion of blood at rest is in systemic veins and venules
  - Blood reservoir
  - 1/3 of venous blood is in the large venous networks of the **liver, bone marrow, and skin**
- **Venoconstriction** reduces volume of blood in reservoirs and allows greater blood volume to flow where needed

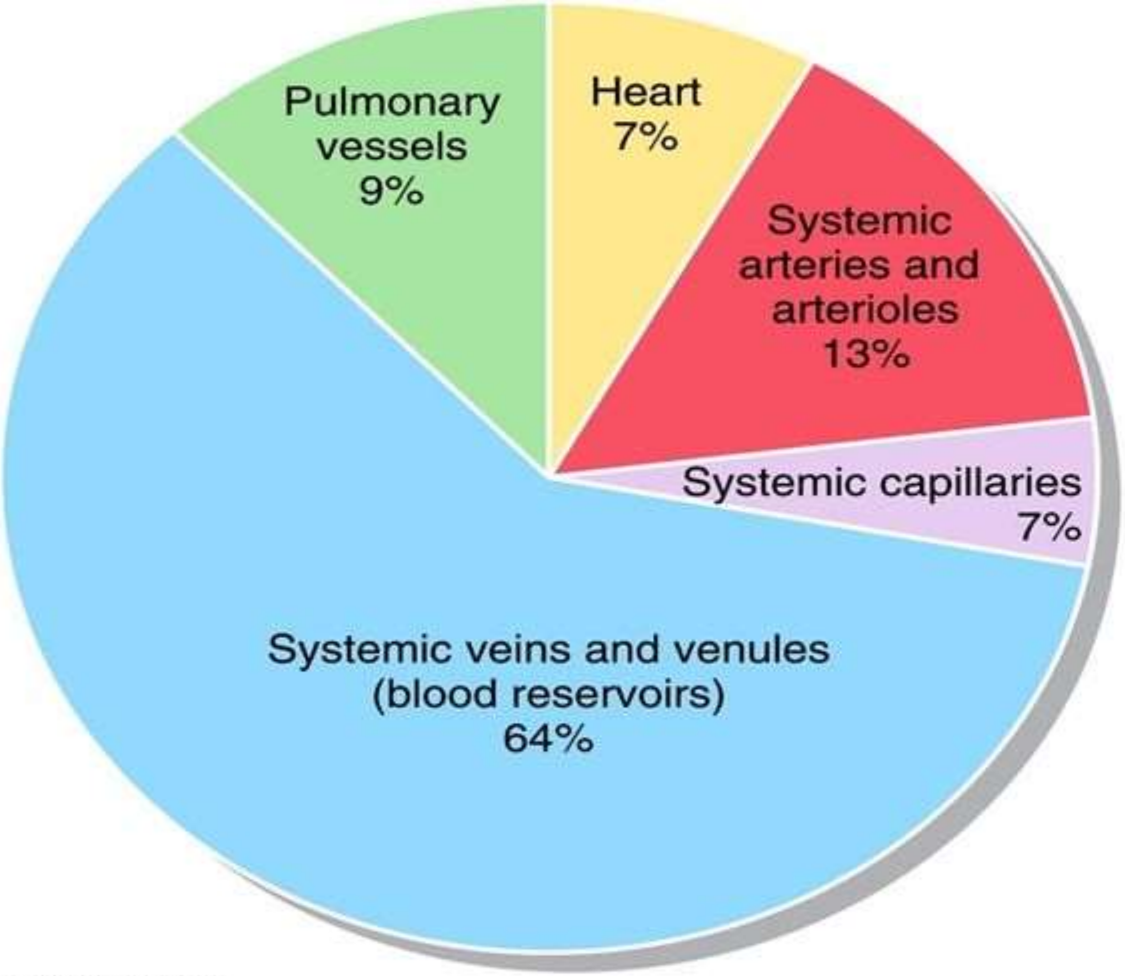
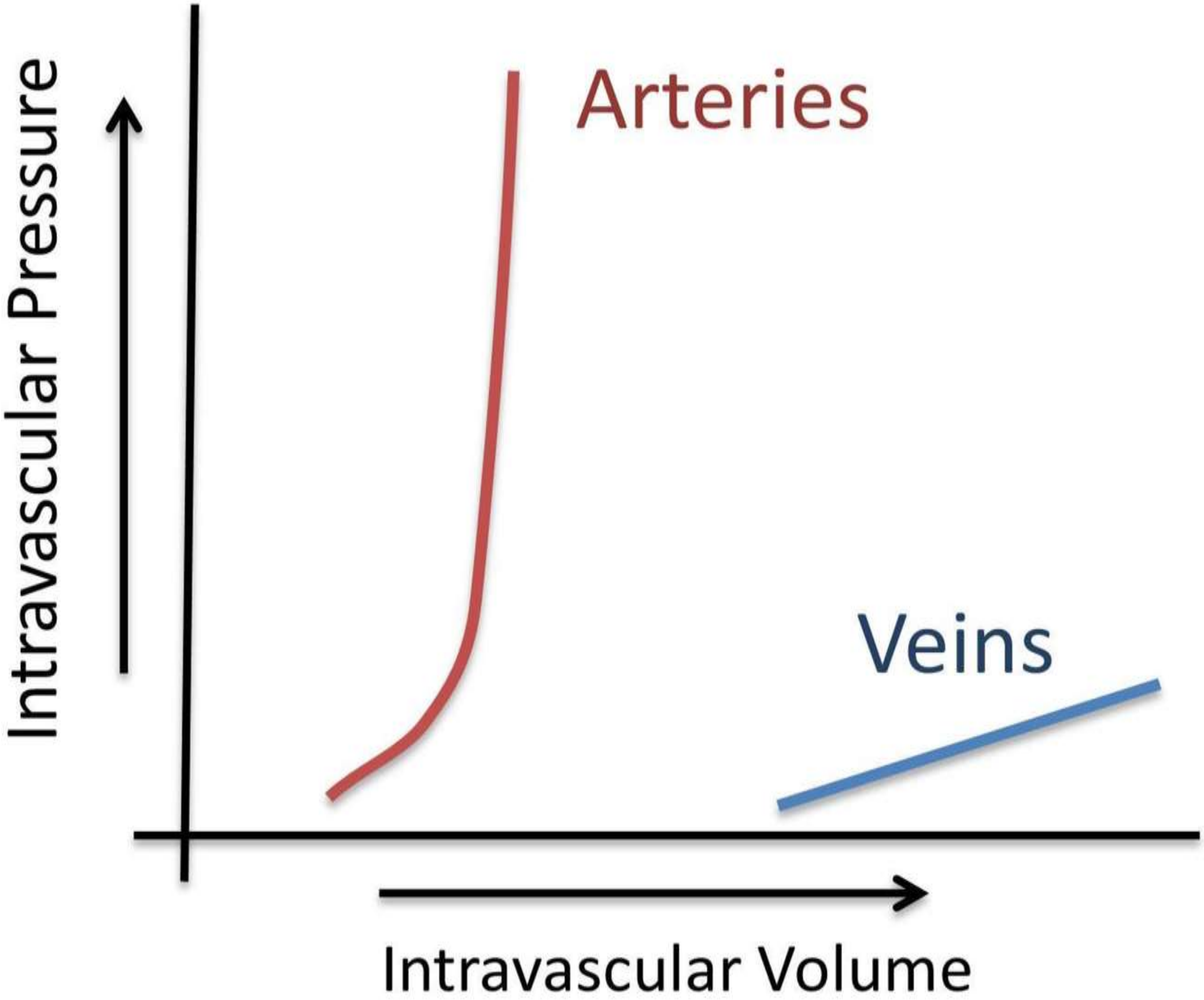


Figure 21.06 Tortora - PAP 12/e



Vascular compliance is the property of the vessel that allows it to expand when more volume is forced into it by the Heart.

For a given quantity of blood pressure, vessels with a high compliance can be filled with large volumes like the veins, whereas vessels with low compliance can only be filled with small volumes, like the arteries.

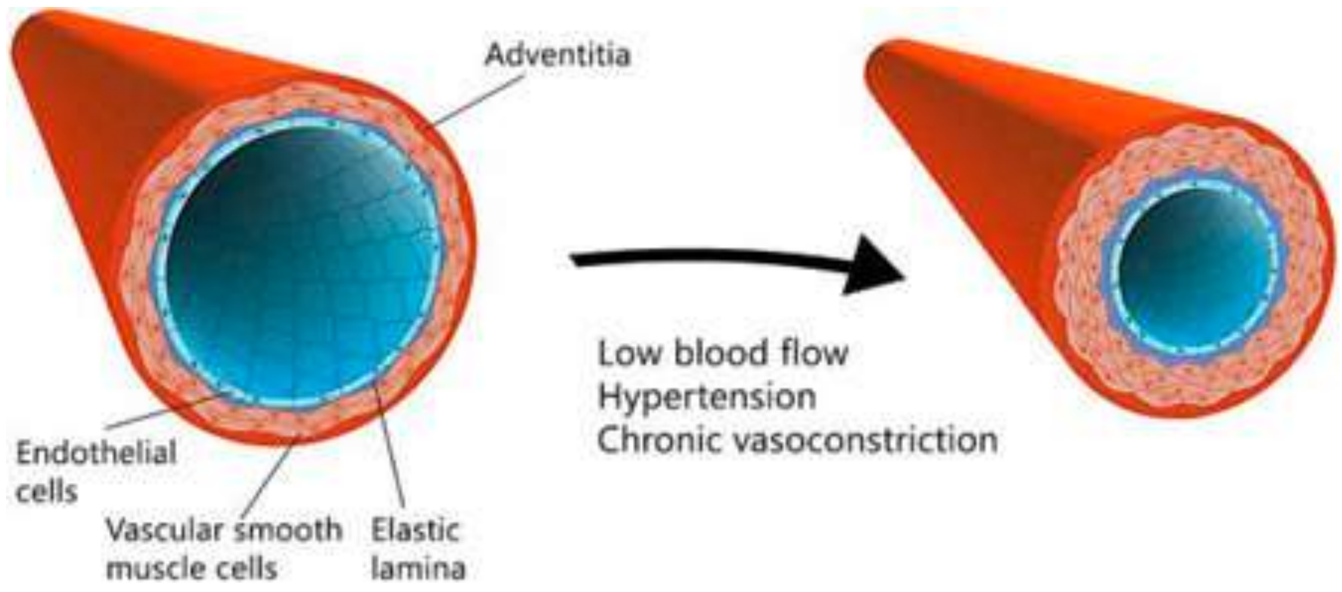
Vasoconstriction is one mechanism by which the body regulates and maintains mean arterial pressure.

Factors that trigger vasoconstriction can be of exogenous or endogenous origin. Ambient temperature is an example of the former. Cutaneous vasoconstriction will occur because of the body's exposure to the severe cold.

Examples of endogenous factors include the autonomic nervous system, circulating hormones, and intrinsic mechanisms inherent to the vasculature itself (also referred to as the myogenic response).

Chronic vasoconstriction increases peripheral resistance and causes high blood pressure.

Three-fourth of body's capillaries are shut down at a given time.



The role of extracellular **calcium** in the vasoconstriction evoked by endothelin-1

Some mechanisms responsible for extracellular Ca++ entry into rat aortic smooth muscle cells were studied in response to endothelin-1 (ET-1). Isometric tension of de-endothelialized aortic strips was recorded. It was shown that the calcium-free medium or nifedipine blockade of calcium entry diminished responses to ET-1 to 20-30% of the control levels. Depolarization of the specimens with hyperpotassium solution also reduced constriction almost by 50%. When sodium ions were replaced by NMDG in the medium, a response to ET-1 showed a 50% reduction. The findings suggest that the potential-dependent calcium channels of the L-type are involved in cellular calcium entry, the opening of the channels depending upon the entry of Na+.

PMID: 8117994

https://www.ncbi.nlm.nih.gov/pubmed/8117994

Implications: high potassium and low sodium diets or drinks can reduce vasoconstriction, thus the blood pressure.

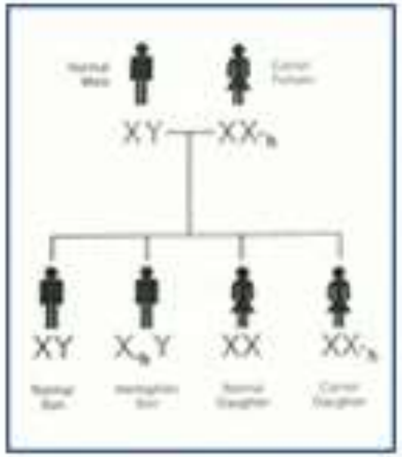
Hypertension causes

Stress

Obesity

Diabetes

Age



Heredity

Excess salt

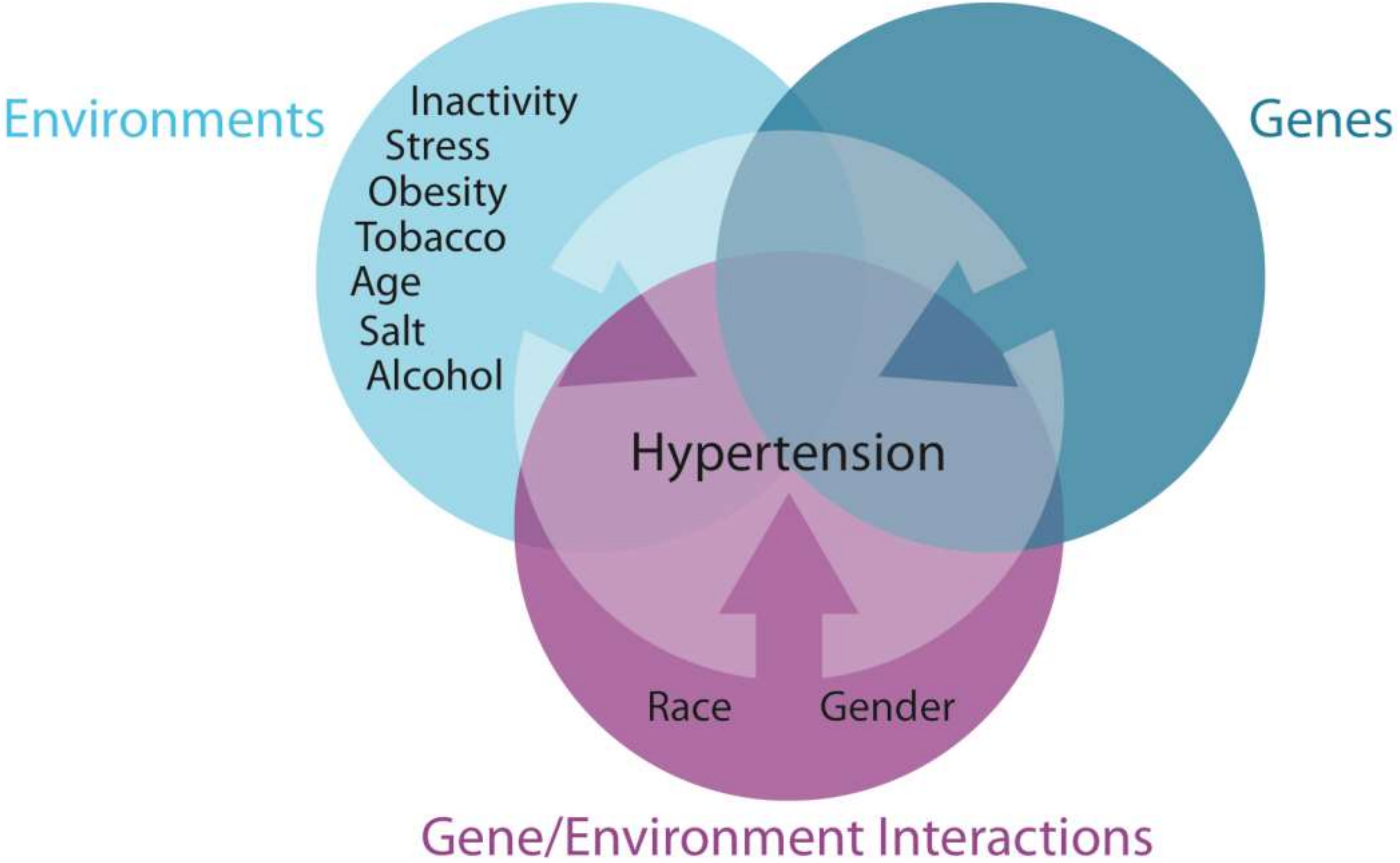
Unhealthy diet

Alcohol consumption

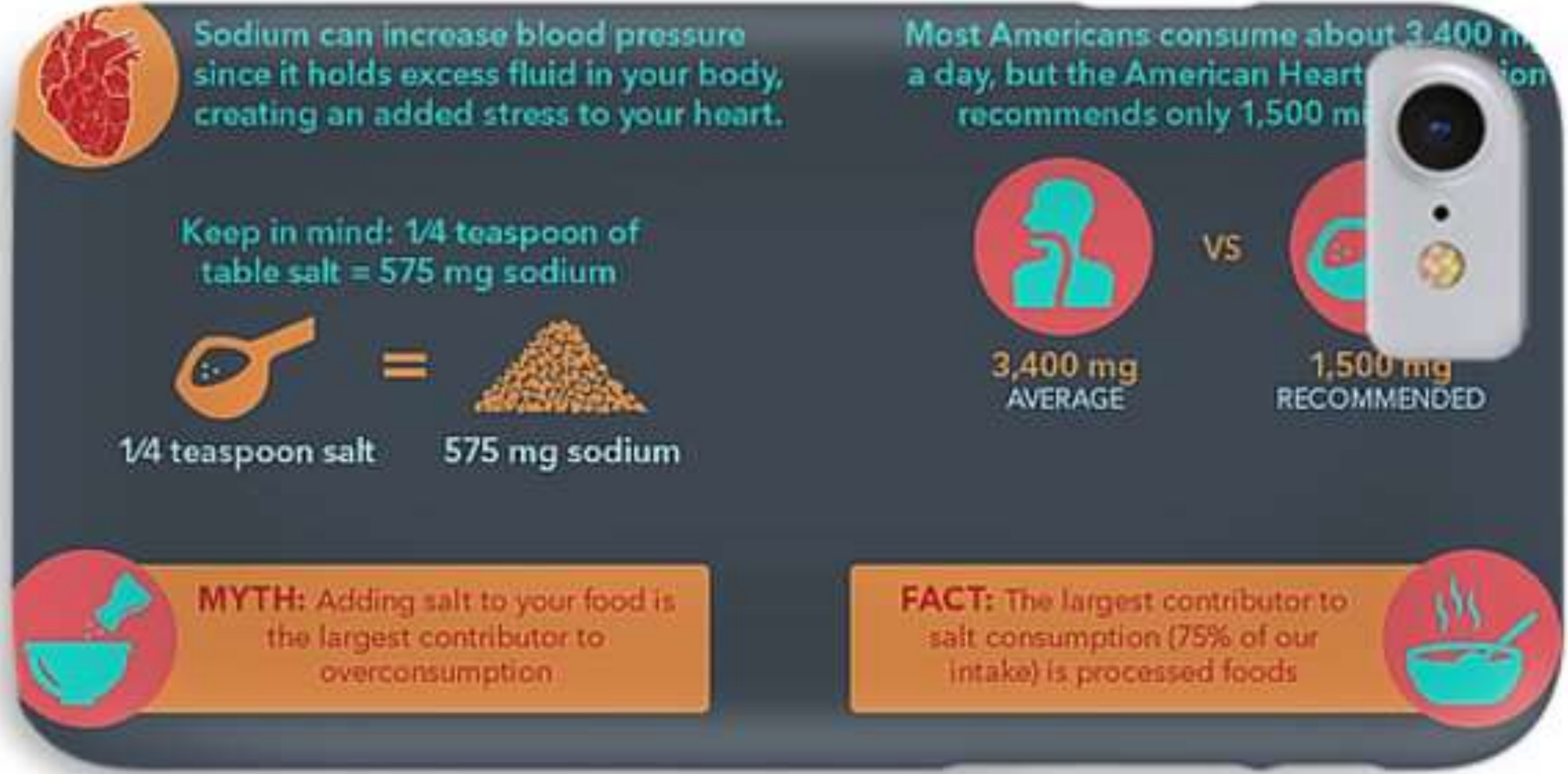
Smoking

CAUSES AND RISK FACTORS

- **Obesity**- Weight gain is highly associated with increased frequency of hypertension, especially with central abdominal obesity.
- **Diabetes Mellitus**- Hypertension is more common in diabetic patients
- **Elevated Cholesterol and Triglycerides**- High levels of cholesterol and triglycerides are primary risk factors for atherosclerosis (plaque build up in your blood vessels).
- **Too much salt in your diet**- High sodium intake contributes to high blood pressure and causes water retention.


Environments
Inactivity
Stress
Obesity
Tobacco
Age
Salt
Alcohol
Genes
Hypertension
Race
Gender
Gene/Environment Interactions


Stress & Blood Pressure
Fight/Flight
mechanism
Stress
Signals
Hypothalamus
Adrenaline
Cortisol
Adrenal
gland
Increase BP & HR
Increase blood sugar
STRESS
Manage stress to
lower blood pressure


Sodium can increase blood pressure since it holds excess fluid in your body, creating an added stress to your heart.
Most Americans consume about 3,400
a day, but the American Heart
recommends only 1,500
Keep in mind: 1/4 teaspoon of table salt = 575 mg sodium
=
1/4 teaspoon salt
575 mg sodium
VS
3,400 mg
AVERAGE
1,500 mg
RECOMMENDED
MYTH: Adding salt to your food is the largest contributor to overconsumption
FACT: The largest contributor to salt consumption (75% of our intake) is processed foods

Dehydration cause constriction of blood vessel and high blood pressure

When the cells in the body are under-supplied with water, the brain's pituitary gland produces the neurotransmitter vasopressin, a hormone that has the property of constricting blood vessels in areas where there is cellular dehydration. During dehydration, the quantity of water in the bloodstream is reduced. Vasopressin, as its name suggests, squeezes the vascular system, i.e., the capillaries and arteries, to reduce their fluid volume. This maneuver is necessary to continue having enough pressure to allow for a steady filtration of water into the cells. This gives vasopressin a hypertensive property. High blood pressure is a common experience among people who are dehydrated (for more information on hypertension and heart disease, see chapter 8 of Timeless Secrets of Health and Rejuvenation, www.ener-chi.com). A similar situation occurs in the liver's bile ducts, which begin to constrict in response to restricted availability of water. Gallstone formation is a direct result of dehydration.

A person who drinks alcohol suppresses the secretion of vasopressin and thereby increases cellular dehydration (if alcohol consumption is excessive, cellular dehydration may reach dangerously high levels). To survive the body "drought," the body has to secrete ever more stress hormones, among them the addictive endorphins. With regular consumption of alcohol, meaning every day for several years, dehydration increases even further and endorphin production becomes an addictive habit. This may lead to alcoholism, a disease that has devastating consequences on a person's personal and social life.

http://www.ener-chi.com/articles/dangers-of-dehydration/

Hypothesis: fructose-induced hyperuricemia as a causal mechanism for the epidemic of the metabolic syndrome

Takahiko Nakagawa, Katherine R Tuttle, Robert A Short & Richard J Johnson

Abstract
The increasing incidence of obesity and the metabolic syndrome over the past two decades has coincided with a marked increase in total fructose intake. Fructose—unlike other sugars—causes serum uric acid levels to rise rapidly. We recently reported that uric acid reduces levels of endothelial nitric oxide (NO), a key mediator of insulin action. NO increases blood flow to skeletal muscle and enhances glucose uptake. Animals deficient in endothelial NO develop insulin resistance and other features of the metabolic syndrome. As such, we propose that the epidemic of the metabolic syndrome is due in part to fructose-induced hyperuricemia that reduces endothelial NO levels and induces insulin resistance. Consistent with this hypothesis is the observation that changes in mean uric acid levels correlate with the increasing prevalence of metabolic syndrome in the US and developing countries. In addition, we observed that a serum uric acid level above 5.5 mg/dl independently predicted the development of hyperinsulinemia at both 6 and 12 months in nondiabetic patients with first-time myocardial infarction. Fructose-induced hyperuricemia results in endothelial dysfunction and insulin resistance, and might be a novel causal mechanism of the metabolic syndrome. Studies in humans should be performed to address whether lowering uric acid levels will help to prevent this condition.

http://www.nature.com/nrneph/journal/v1/n2/full/ncpneph0019.html

High Blood Sugar and High blood Pressure Go hand in hand

Are you on a high grain, low fat regimen? If so, I have bad news for you, because this nutritional combination is a prescription for hypertension and can absolutely devastate your health. Groundbreaking research published in 1998 in the journal *Diabetes* reported that nearly two-thirds of the test subjects who were *insulin resistant* (IR) also had high blood pressure, and insulin resistance is directly attributable to a high sugar, high grain diet, especially if accompanied by inadequate exercise. So, chances are that if you have hypertension, you also have poorly controlled blood sugar levels, because these two problems often go hand in hand.
As your insulin level elevates, so does your blood pressure.

As explained by Dr. Rosedale, insulin stores magnesium. If your insulin receptors are blunted and your cells grow resistant to insulin, you can't store magnesium so it passes out of your body through urination. Magnesium stored in your cells relaxes muscles. If your magnesium level is too low, your blood vessels will constrict rather than relax, which will raise your blood pressure and decrease your energy level. Insulin also affects your blood pressure by causing your body to retain sodium. Sodium retention causes fluid retention.

Fructose Can Cause Your Blood Pressure to Skyrocket

Average American consumes 70grams of fructose each day and a study found, daily consumption of 74grams or more of fructose increases the risk of hypertension by 77%. Fructose cause high uric acid, which constricts the blood vessels and cause gout. http://articles.mercola.com/sites/articles/archive/2010/10/08/discover-the-secret-to-lowering-your-blood-pressure-in-15-minutes.aspx

Furthermore, smoking causes blood viscosity to surge by as much as 20%, depending on the degree of cigarette use (Ernst E. J Cardiovasc Risk 1995; 2:435-9).

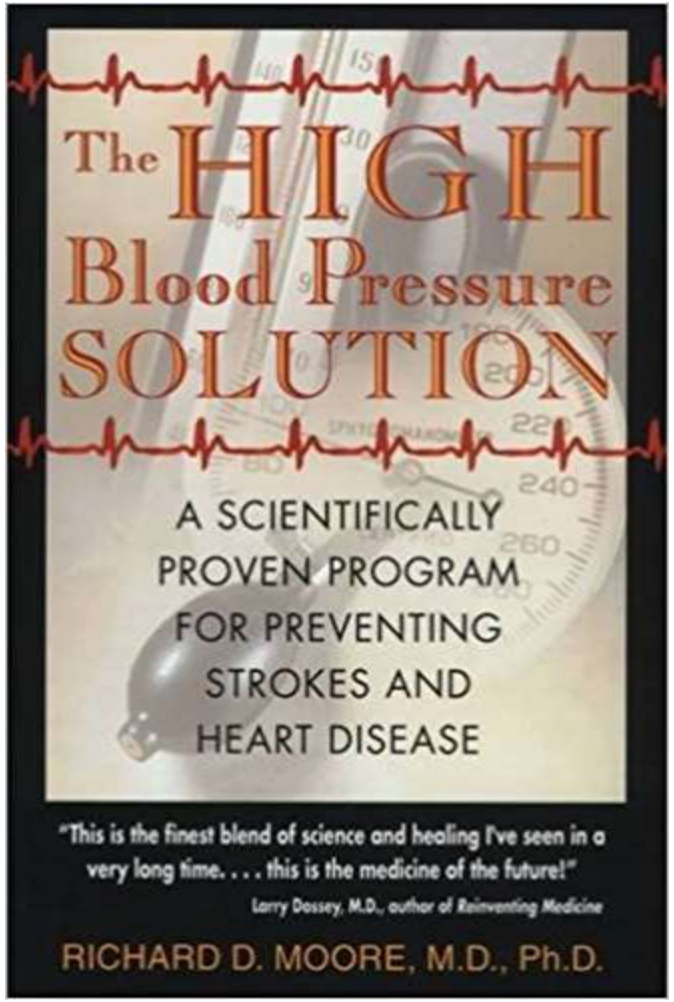
This is a fact worth pointing out to patients who continue to smoke.

Potassium - to - Sodium Ratio Affects Overall Health by Dr. Richard. D. Moore

If you take foods like meat, fish, fowl, eggs and dairy products, 99% will have at least three, four or five times as much potassium as sodium. The key factor is to eat whole unprocessed foods. If people ate only whole, unprocessed foods and used salt modestly, there would be no problem with potassium-sodium imbalance.

Nevertheless, The Salt Solution and The High Blood Pressure Solution list foods that are particularly high in potassium and also list the major sodium villains.

http://www.drpasswater.com/nutrition_library/Potassium%20_to%20_Sodium_Ratio.html



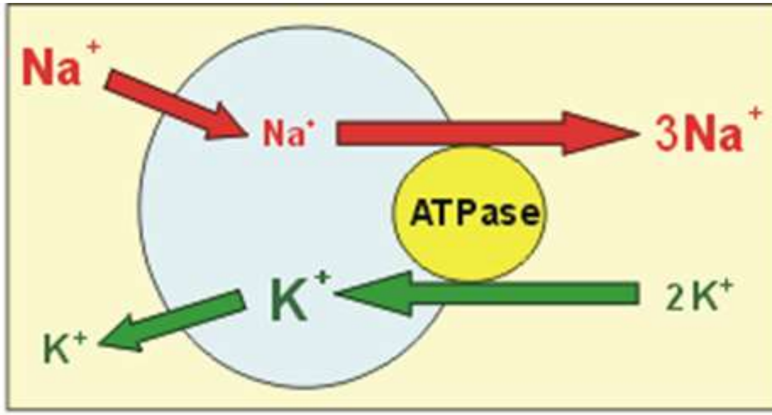
Potassium - to - Sodium Ratio Affects Overall Health by Dr. Richard. D. Moore

a decrease in the potassium and an increase in the sodium in people with high blood pressure is occurring in all the cells of the body-not just the arterial wall cells. But, if one thinks for just a moment-as this researcher who called was thinking: the smooth muscle cells around the small arteries or arterioles control blood pressure. Add to this the fact that the trigger for causing muscle contractions is calcium, and it becomes obvious. It was one of those things where two and two were sitting there in front of me and I hadn't bothered to add them together.

What suddenly came to me was the recognition that as calcium goes up in those muscle cells, the muscles are stimulated to contract and constantly constrict the blood vessels. This, of course, raises blood pressure. Dietary sodium can be the cause of the increased calcium in these cells and the resultant constricted blood vessels. Potassium would, of course, stimulate the sodium/potassium pump and, thus, indirectly, through the resulting increase in sodium-calcium exchange, decrease the intracellular calcium and allow the muscles in the blood vessel walls to relax.

http://www.drpasswater.com/nutrition_library/Potassium%20_to%20_Sodium_Ratio.html

The sodium pump in a resting cell consumes almost a quarter of all the energy available



"Is the pH inside the cell variable or constant?"
Of course, the corollary hypothesis is that there is a pattern to the enzyme pH profile, which is indeed the way it turns out. The pH is not constant, but is a physiological variable. The pH level is involved with regulation of glycolysis, and to some extent, cell division.

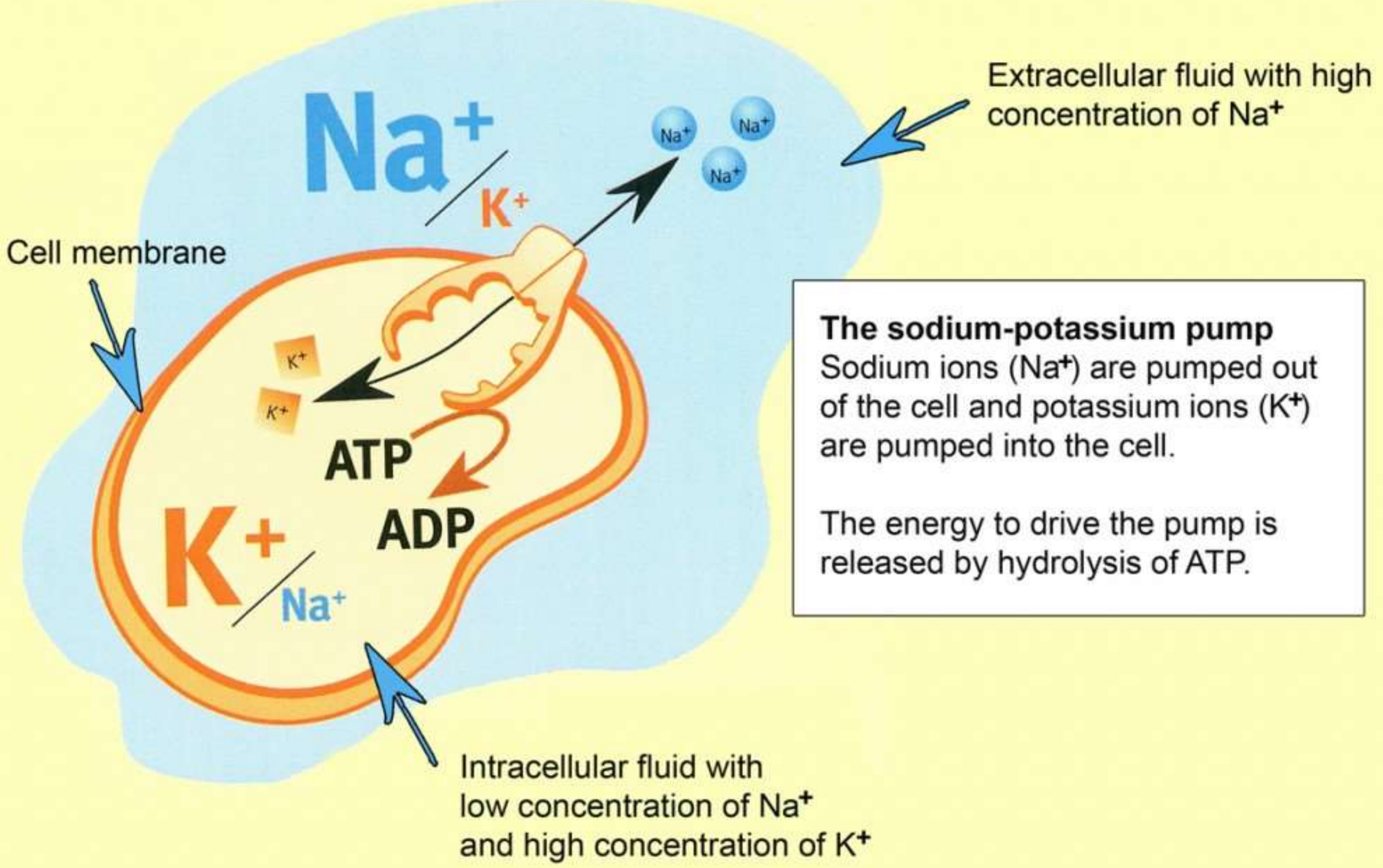
Three or four people besides myself had begun working on regulation of pH. Before long, a couple of the others showed that one way to accomplish this regulation is via the sodium/hydrogen exchange pump, whereby sodium leaks back into the cell due to a difference in its energy gradient. Technically, the electrochemical potential -- or free-energy gradient -- provides the energy to move a proton, which is acid or a hydrogen ion (H+) out of the cell.

HOW INTRACELLULAR pHi is increased by insulin?

That was a possible way to explain our observation of insulin-increased pH. So we undertook experiments that confirmed our theory. Those experiments, incidentally, were very gratifying because they were based on a thermodynamic mathematical analysis that makes predictions which we verified, namely, that at a certain calculable value of extracellular sodium, if the sodium is lowered by replacing it with magnesium or sucrose, the sodium/hydrogen exchange pump no longer works. ***Further, if the sodium is lowered below that point where the insulin stimulated it, it should make the pH more acidic. And that's what actually happens. This is neat: just by changing the sodium outside the cell, you can convert the action of insulin on glycolysis from stimulation to inhibition.***

Parenthetically, we showed this is the way that insulin affects and stimulates glycolosis: if we lowered the sodium outside the cell below this particular value that can be calculated, we found that insulin-instead of stimulating glycolosis-inhibits it. All this without adding any foreign chemicals. This is a pretty convincing conclusion.

http://www.drpasswater.com/nutrition_library/Potassium%20_to%20_Sodium_Ratio.html



The sodium-potassium pump

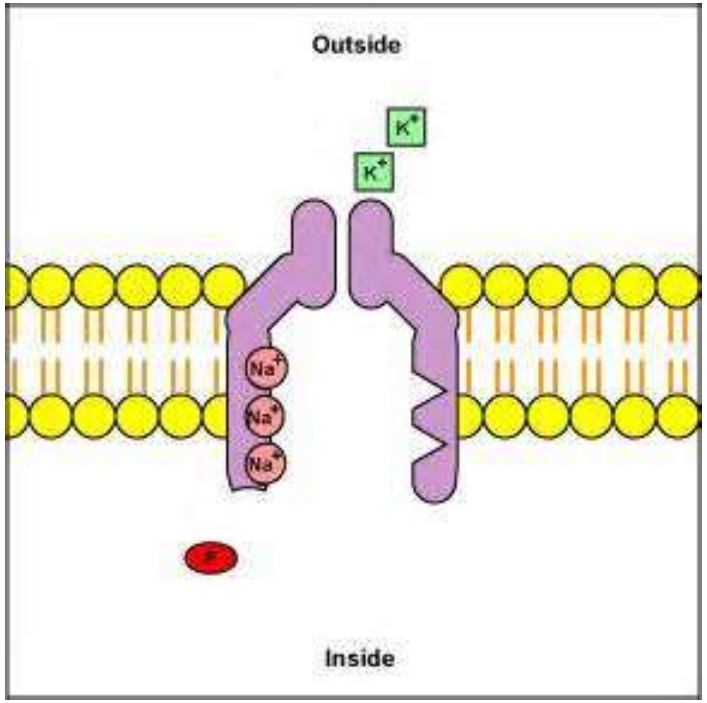
Sodium ions (Na^+) are pumped out of the cell and potassium ions (K^+) are pumped into the cell.

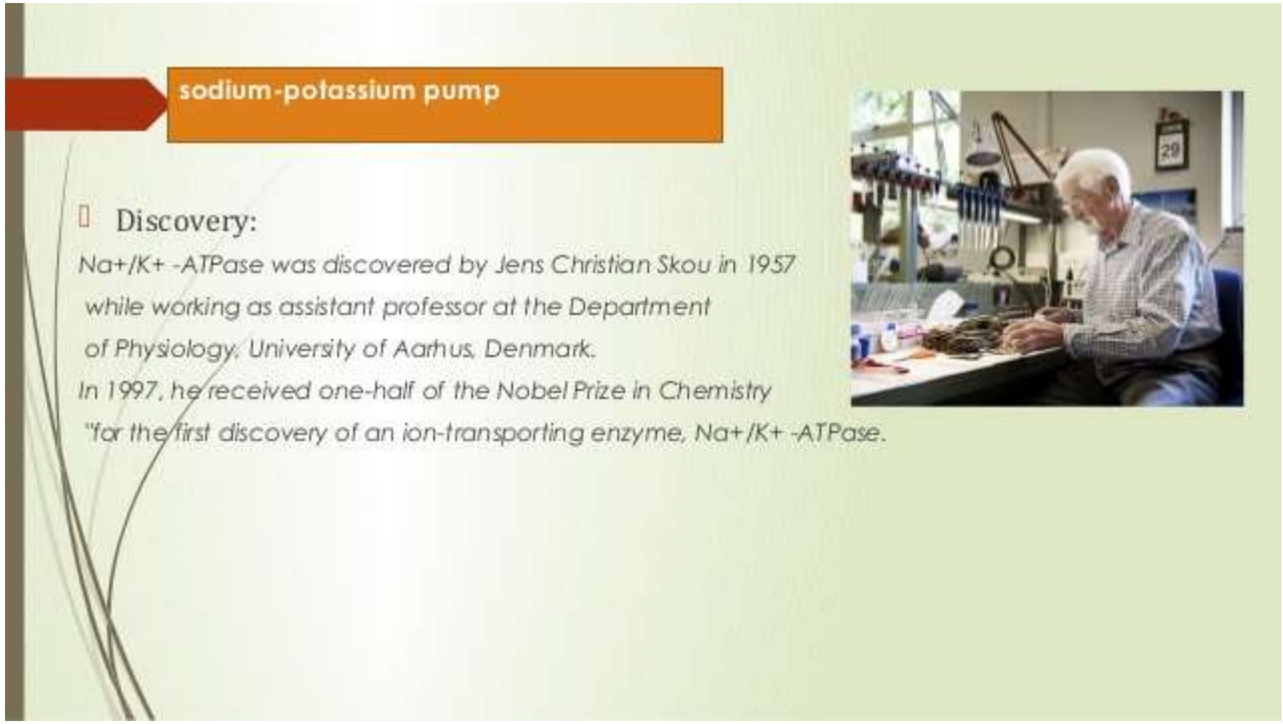
The energy to drive the pump is released by hydrolysis of ATP.

Sodium-potassium pumps are a type of membrane transport protein found in neurons, muscle fibers, and other types of excitable cells. The pump proteins help maintain the proper intracellular and extracellular concentrations of sodium (Na+) and potassium (K+) ions and electrochemical gradient while the cells in their resting state.

Each pump protein repeatedly moves three Na+ ions out of the cell for every two K+ ions it moves in. As a result, Na+ ions become concentrated in the extracellular fluid (ECF) and K+ ions become concentrated in the intracellular fluid (ICF).

The process is active and requires the energy released from ATPi which is hydrolysed to ADP + Pi by an enzymatic portion of the pump protein. Because they function as enzymes, sodium-potassium pumps are also called Na+ / K+ ATPases.

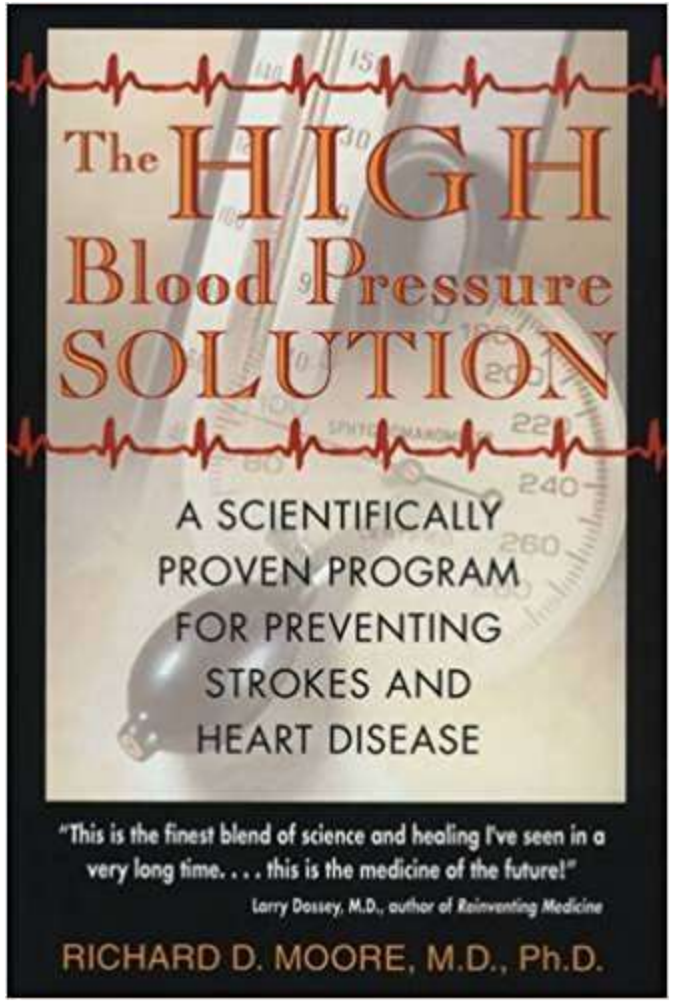




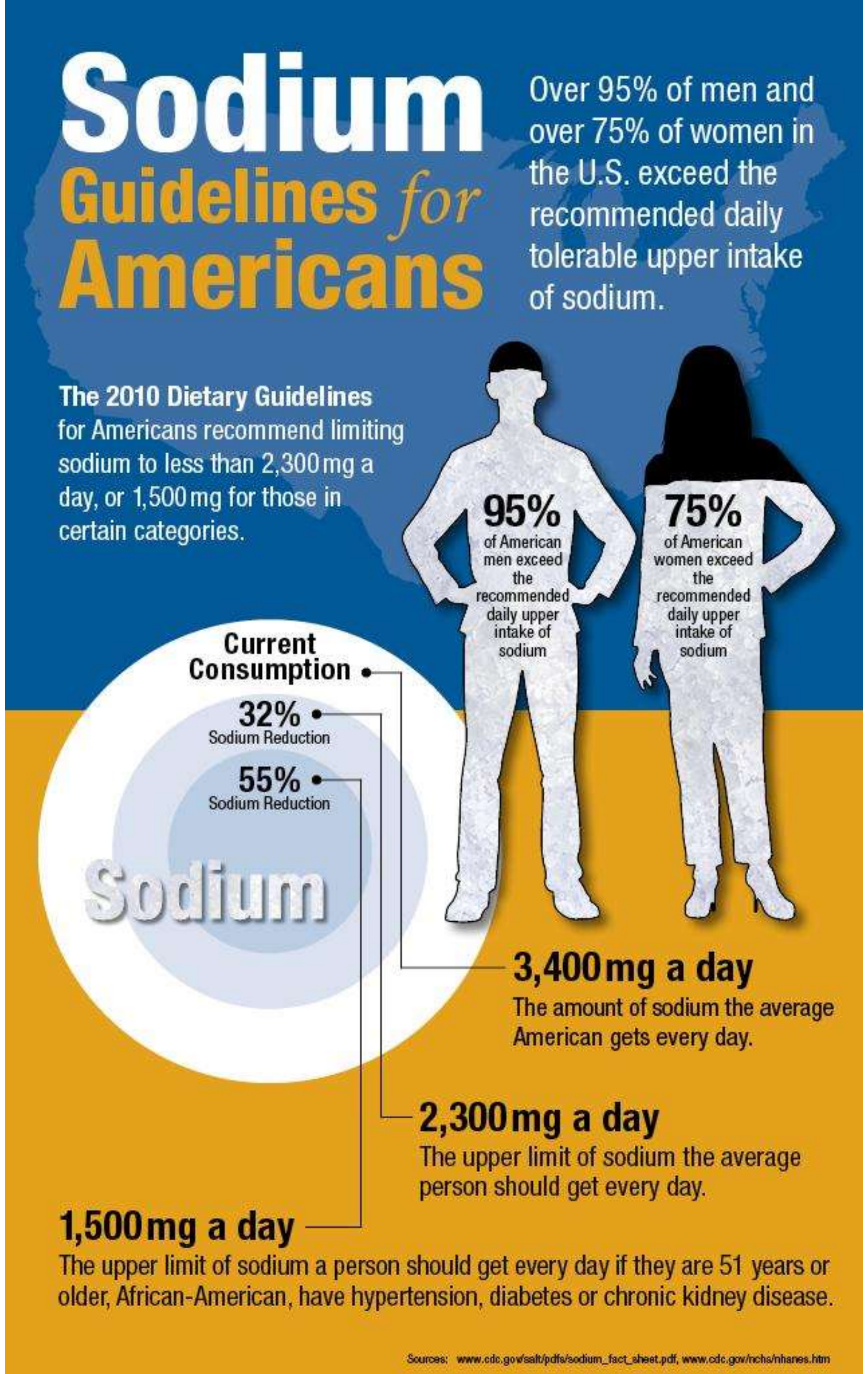
Lower sodium inside the call without the involvement of potassium is virtually impossible

Therefore, it is virtually impossible -- not just because of the sodium/potassium exchange pump and all these things in the body which tend to move sodium in one direction and potassium in the other direction, but just because of physical reasons (the laws of physics) -- to lower sodium inside the cell without the involvement of potassium. Potassium has such an important role in the body. You can't lower the sodium without replacing it with potassium. That is the key: there is just no sense in talking about either sodium or potassium alone! This is so awfully important. It is one point that I would love to get across to the medical profession, but up until now most practitioners have failed to get it.

These are two variables that must be taken into account together! The two are linked, and you have to look at them together if you are going to see a pattern



http://www.drpasswater.com/nutrition_library/Potassium%20_to%20_Sodium_Ratio.html



Recommendations

Sodium in the diet (called dietary sodium) is measured in milligrams (mg). Table salt is 40% sodium. One teaspoon (5 milliliters) of table salt contains 2,300 mg of sodium.

Healthy adults should limit sodium intake to 2,300 mg (5.8g table salt) per day. Adults with high blood pressure should have no more than 1,500 mg (3.8g table salt) per day. Those with congestive heart failure, liver cirrhosis, and kidney disease may need much lower amounts.

Salt reduction compaign and recommendations in Finland since 1970s

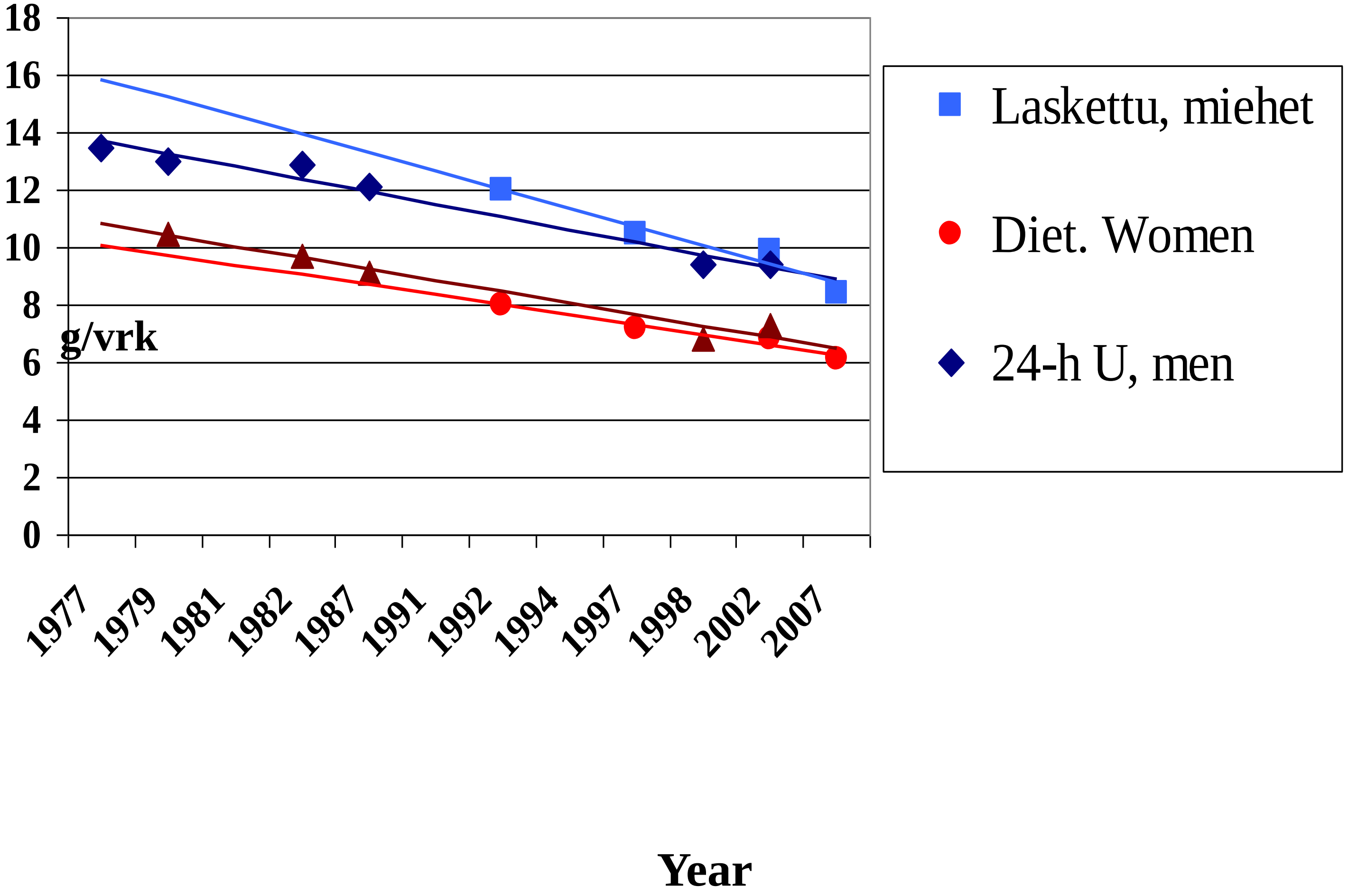
In Finland the official recommendations to decrease the intake of salt to one half (5g) of the prevailing levels (10g), have encouraged media to take a more clear anti-salt position than might have been the case in the absence of such recommendations.

Finland, which has aggressively reduced salt in food over three decades, has seen a 40 per cent decline in average sodium intake. That has helped produce a large reduction in average blood pressure levels and an 80-per-cent drop in deaths due to stroke.

These different measures have resulted in a progressive and marked decrease in the average intake of salt in the Finnish population. Parallel to this reduction in salt intake there has been a reduction in average population blood pressure. For example there has been more than a 10 mm Hg reduction in diastolic blood pressure. This reduction in blood pressure largely explains the decrease of strokes and heart attacks. There has been an 80% reduction in the death rates both from stroke and heart disease in the middle-aged population, which can help account for the reduction in overall mortality in Finland which has decreased so much that the life expectancy has increased by several years among both women and men. Since both obesity and alcohol consumption have increased this fall of blood pressure can largely be explained by the decrease in salt intake. The findings in Finland are consistent with an overall beneficial effect of a comprehensive population-wide salt intake reduction.

http://www.worldactiononsalt.com/worldaction/europe/53774.html
How To Reduce Heart Disease By 75%
https://www.pritikin.com/your-health/health-benefits/reverse-heart-disease/252-heart-disease-deaths-plunge-75.html

Salt intake in Finland 1977-2007



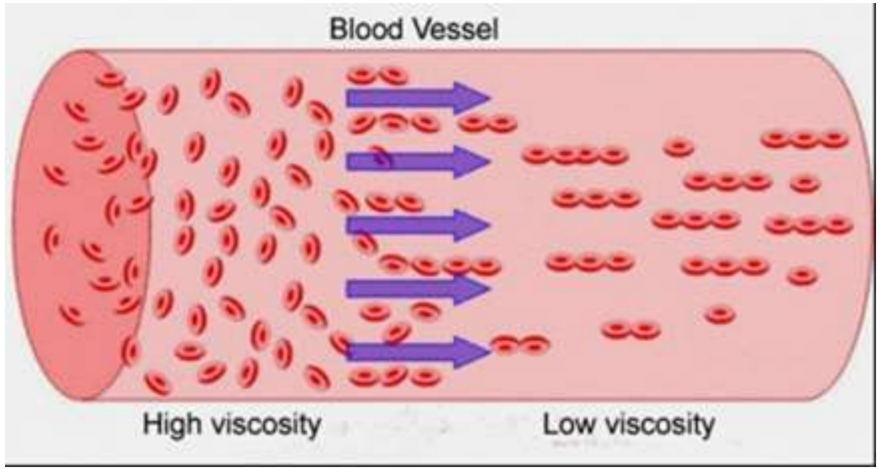
Blood viscosity is the unifying parameter for CVD

Simply put, blood viscosity is the thickness and stickiness of blood. Diastolic blood viscosity "as a global marker of the whole-blood rheological properties may be a better discriminant of cardiovascular risk in hypertensive men." They added that blood viscosity, an overall measure of flow resistance of bulk blood, depends on several factors, including cell concentration, cell aggregation, cell deformability and plasma protein concentration.

Blood viscosity holds certain similarities with blood pressure. Like blood pressure, the viscosity of blood changes during each cardiac cycle and is reported using two numerical quantities: systolic and diastolic viscosity.

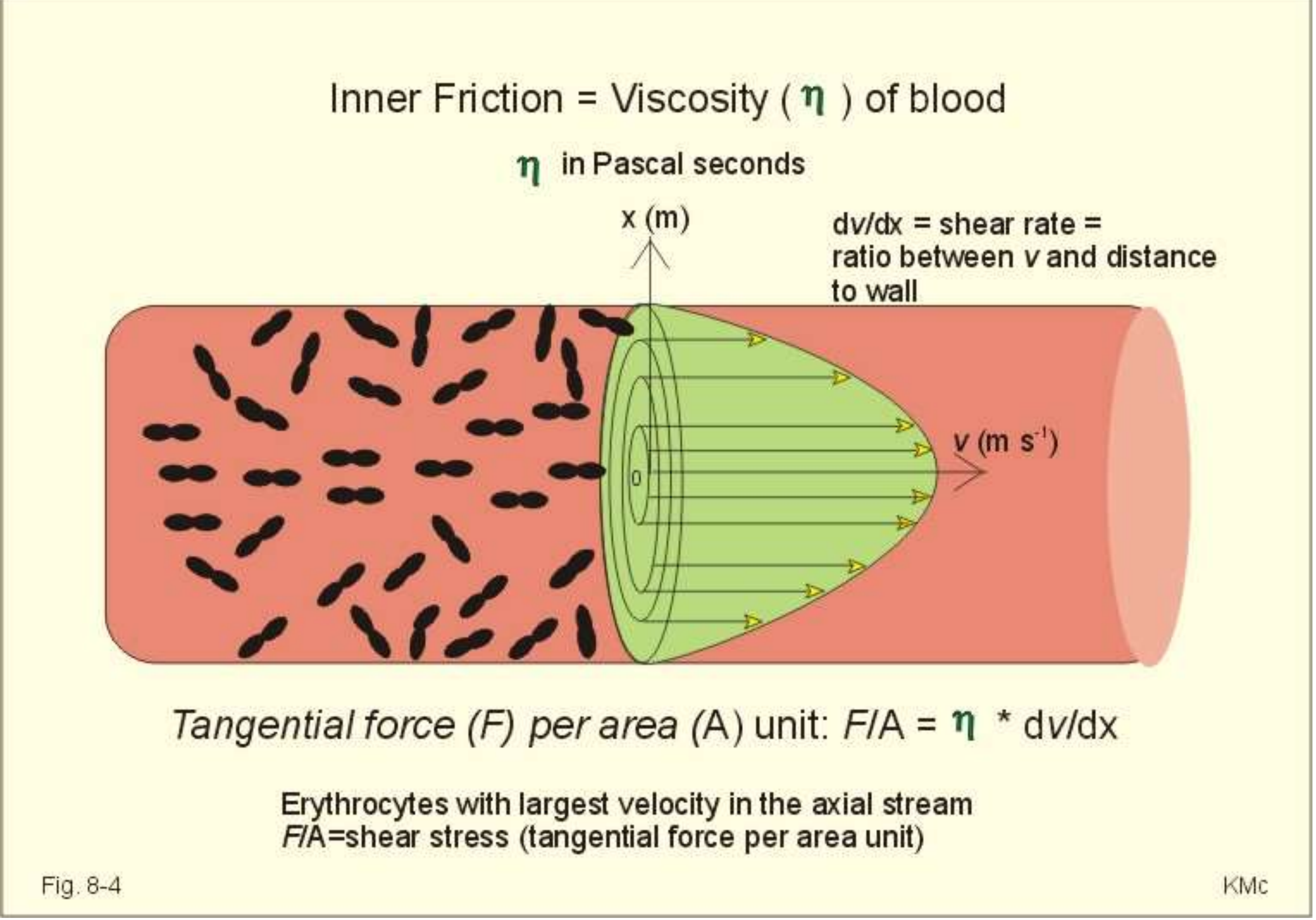
However, while blood pressure is parameter of the circulatory system as a whole, blood viscosity is a parameter specific to the fluid flowing through the system. Therefore, viscosity can be said to precede pressure and to be biophysically more fundamental than pressure.

http://meridianvalleylab.com/the-relationship-between-blood-pressure-and-blood-viscosity



blood viscosity is the only biological parameter that has been linked with all of the other major cardiovascular risk factors, including high blood pressure, elevated LDL cholesterol, low HDL, type-II diabetes, metabolic syndrome, obesity, smoking, age, and male gender.

This led to the proposition, which is becoming more widely accepted, that blood viscosity is the unifying parameter for CVD.



Simply put, blood viscosity is the thickness and stickiness of blood. It is a direct measure of the ability of blood to flow through the vessels. It is the critical biophysical parameter that determines how much friction the blood causes against the vessels; how hard the heart has to work to pump blood; and how much oxygen is delivered to organs and tissues.

https://holisticprimarycare.net/topics/topics-a-g/functional-medicine/1297-blood-viscosity-the-unifying-parameter-in-cardiovascular-disease-risk.html

Blood Viscosity: The Unifying Parameter In Cardiovascular Disease Risk

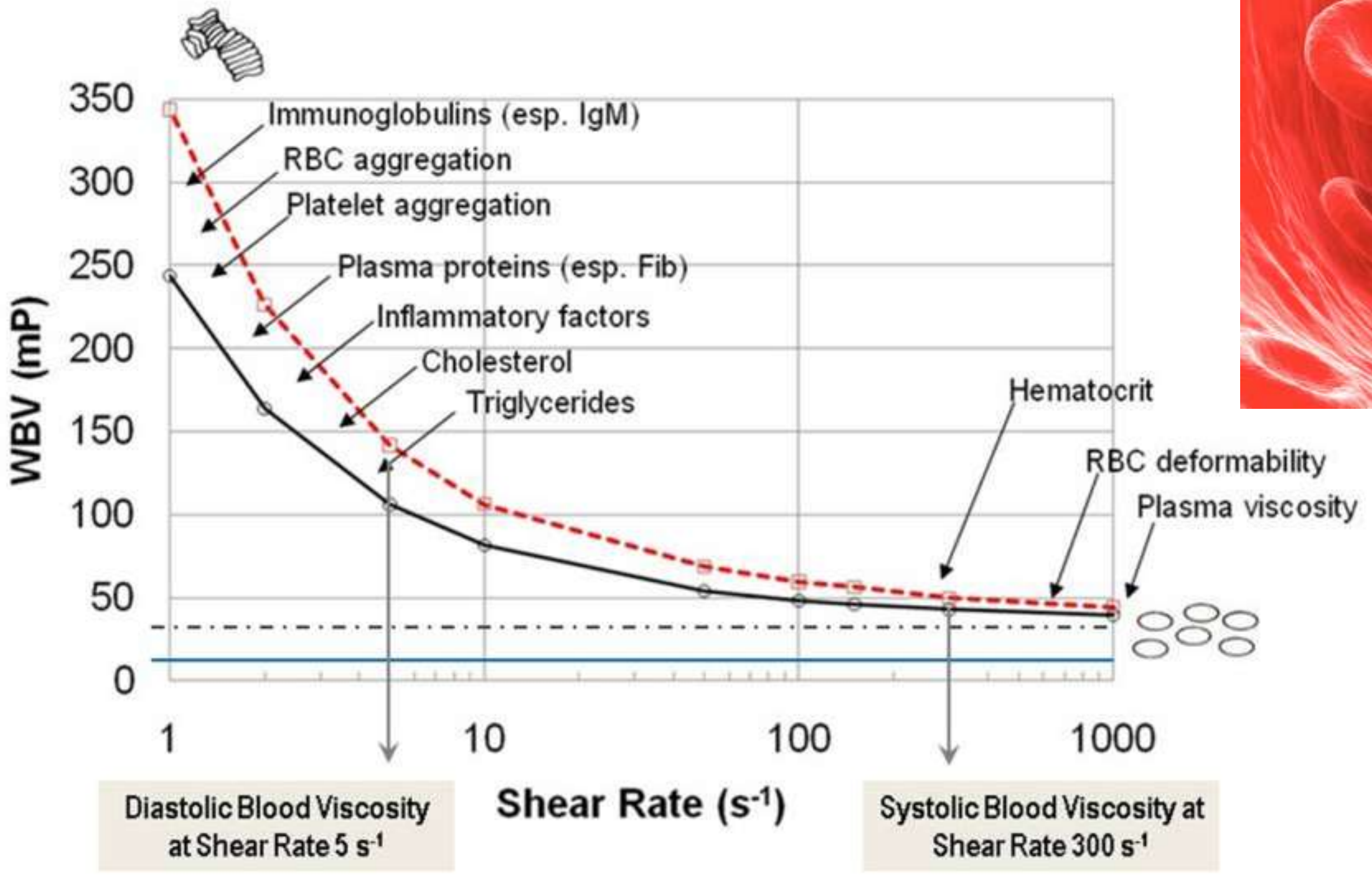
The largest blood viscosity study ever conducted was part of the Edinburgh Artery Study in the 1990's, which followed a random population of 1,592 middle-aged adults for a mean of 5 years. It showed that blood viscosity, after adjustment for age and sex, was significantly higher in patients experiencing heart attacks and strokes than those who did not (p=0.0003). The 20% of the individuals with the highest viscosity had 55% of the major CV events during the 5-year period. In contrast, only 4% of those in the lowest viscosity group had any significant events.

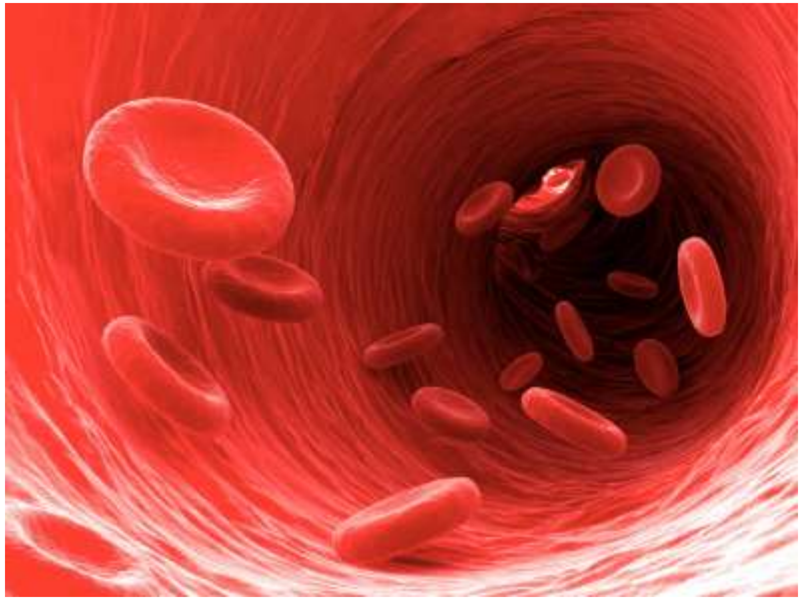
What is remarkable is that these findings were based solely on measuring systolic blood viscosity (that is, high shear rate viscosity), where the variation range is very narrow. Even so, the link between systolic blood viscosity and CV events was statistically as strong as the links between diastolic blood pressure and LDL cholesterol on one hand, and CV events on the other. The association between systolic viscosity and CV events was stronger than that between smoking and CV events (Lowe GD, et al. Br J Haematol 1997; 96:168-73).

https://holisticprimarycare.net/topics/topics-a-g/functional-medicine/1297-blood-viscosity-the-unifying-parameter-in-cardiovascular-disease-risk.html

Blood viscosity is the thickness and stickiness of blood

Figure 1





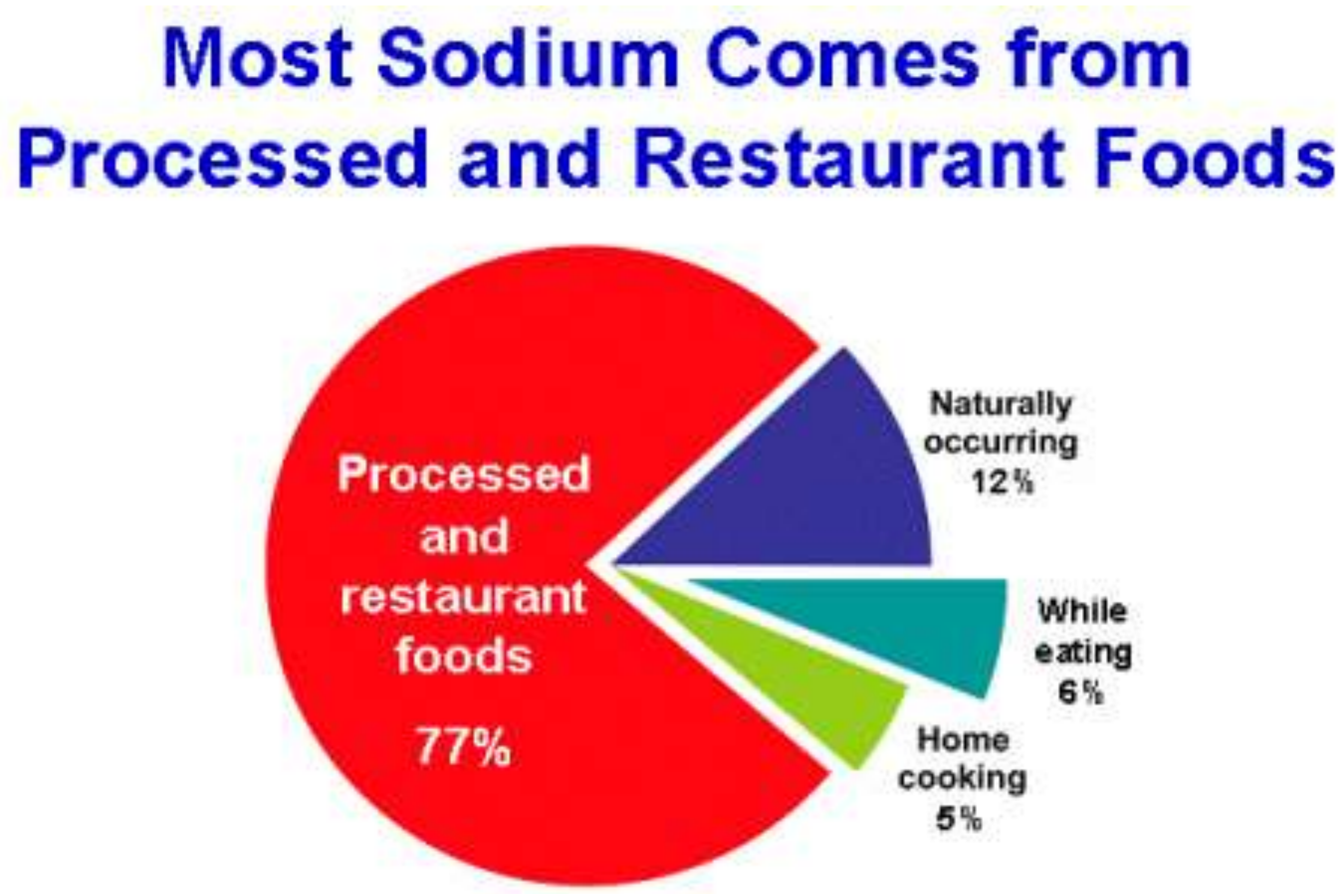
In a prospective study, 331 middle-aged men with high blood pressure were followed for up to 12 years after measuring diastolic blood viscosity (i.e., low shear rate viscosity). The subjects were divided into three groups according to viscosity levels: those in the highest tertile had more than three times more CV events than those in the lowest tertile (hazard ratio = 3.42, 95% confidence interval = 1.4-8.4, p=0.006), (Ciuffetti G, et al. Eur J Clin Invest 2005; 35:93-8).

In a study of 128 obese people (BMI > 28 kg/m2) and 90 non-obese healthy controls, diastolic blood viscosity was 15% higher in obese vs. non-obese patients (Rillaerts E, et al. Int J Obes 1989; 13:739-45). Numerous other studies have also shown that type-II diabetics have higher systolic and diastolic viscosity than healthy non-diabetic people. Patients with metabolic syndrome have higher viscosity than those without, and viscosity scores can predict incident diabetes in initially non-diabetic adults.

Many studies have linked cholesterol with blood viscosity; LDL is consistently associated with higher blood viscosity, while HDL is associated with lower viscosity (Sloop GD, et al. Clin Sci 1997; 92:473-79). It is interesting that smoking causes blood viscosity to surge by as much as 20%, depending on the degree of cigarette use (Ernst E. J Cardiovasc Risk 1995; 2:435-9). This is a fact worth pointing out to patients who continue to smoke.

https://holisticprimarycare.net/topics/topics-a-g/functional-medicine/1297-blood-viscosity-the-unifying-parameter-in-cardiovascular-disease-risk.html


Essential Hypertension Causes
Excess Salt
Abnormal Arteries
Increased Blood volume
Genetic Disorders
Stressful Life
Secondary Hypertension Causes
Health Conditions
Certain Medicines
Recreational Drugs
Pregnancy
Hormonal Therapy



Salt is a key culprit in hypertension

Too much salt linked with nearly 10 percent of total deaths in 2012

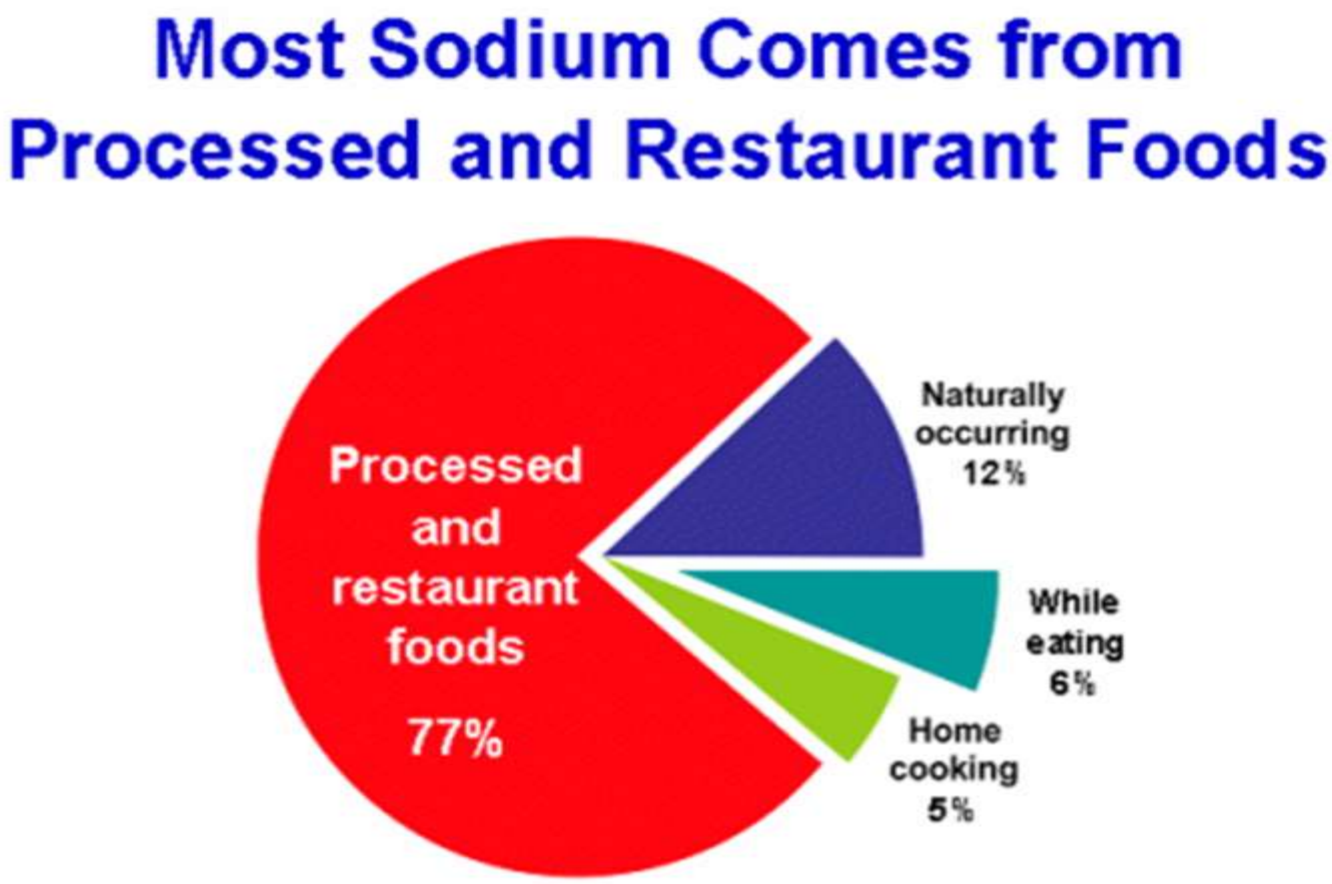
The research is based on U.S. government data showing there were about 700,000 deaths in 2012 from heart disease, strokes and diabetes and on an analysis of national health surveys that asked participants about their eating habits. Most didn't eat the recommended amounts of the foods studied.

The 10 ingredients combined contributed to about 45 percent of those deaths, according to the study.

In the study, too much salt was the biggest problem, linked with nearly 10 percent of the deaths. Overeating processed meats and undereating nuts and seeds and seafood each were linked with about 8 percent of the deaths.

The study was conducted by Tuft University, published on Mar 7, 2016.

https://chicago.craigslist.org/chc/rnr/6214494932.html



大多数食盐源自加工和餐饮的食物

2012年，过多的盐与将近10%的死亡有关。这项研究基于美国政府的数据，数据显示，2012年有大约70万人死于心脏病、中风和糖尿病，并通过国家健康调查的分析，询问了参与者的饮食习惯。

研究显示，大多数人没有按照推荐的摄入量。

根据这项研究，这10种成分结合在一起导致了45%的死亡。

在研究中，过多的盐是最大的问题，与近10%的死亡有关。

过量食用加工过的肉类和未食用的坚果、种子和海鲜，这些都与大约8%的死亡有关。

这项研究是由塔夫特（Tuft）大学于2016年3月7日发表的。

After 30 Minutes

Sodium Attack on Your Body

A Big Mac consists of 970 milligrams of sodium. This huge amount of salt can spur dehydration. With symptoms that closely mimic those of hunger, it's easy for dehydration to trick you into thinking you need to go back for a new round.

Too much intake of sodium makes it hard for your kidneys to eliminate salt. This aggravates the situation: the sodium overdose makes your heart work faster in order to pump blood through your veins. This causes high blood pressure and can ultimately lead to heart diseases and strokes.

Salt's effects on your body

http://www.bloodpressureuk.org/microsites/salt/Home/Whysaltisbad/Saltseffects

Salt works on your kidneys to make your body hold on to more water.

This extra stored water raises your blood pressure and puts strain on your kidneys, arteries, heart and brain.

Kidneys

Your body removes unwanted fluid by filtering your blood through your kidneys. Here any extra fluid is sucked out and put into your bladder to be removed as urine.

To do this, your kidneys use osmosis to draw the extra water out of your blood. This process uses a delicate balance of sodium and potassium to pull the water across a wall of cells from the bloodstream into a collecting channel that leads to the bladder.

Eating salt raises the amount of sodium in your bloodstream and wrecks the delicate balance, reducing the ability of your kidneys to remove the water.

The result is a higher blood pressure due to the extra fluid and extra strain on the delicate blood vessels leading to the kidneys.

Over time, this extra strain can damage the kidneys - known as kidney disease. This reduces their ability to filter out unwanted and toxic waste products, which then start to build up in the body.

If kidney disease is left untreated and the blood pressure isn't lowered, the damage can lead to kidney failure. This is when the kidneys are no longer able to be filter the blood and the body slowly becomes poisoned by its own toxic waste products.

Arteries

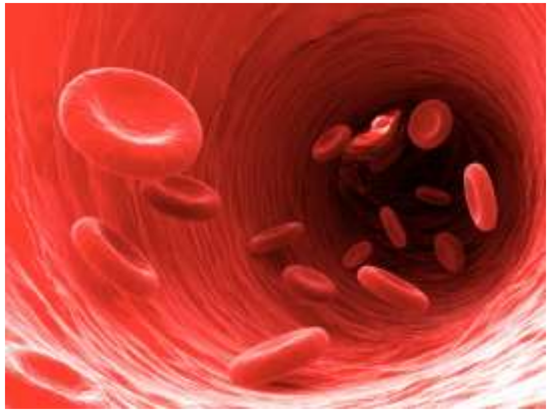
The extra blood pressure caused by eating too much salt puts extra strain on the insides of your arteries.

To cope with the extra strain, the tiny muscles in the artery walls become stronger and thicker. Yet this only makes the space inside the arteries smaller and raises your blood pressure even higher.

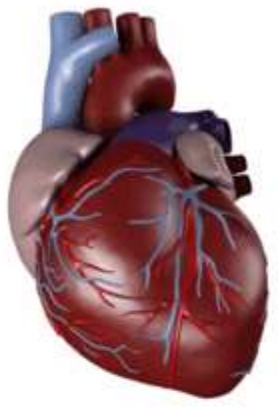
This cycle of increasing blood pressure (which occurs slowly over a number of years) can ultimately lead to the arteries bursting or becoming so narrow that they then clog up entirely.

When this happens, the organs of the body that were receiving the blood from the arteries become starved of the oxygen and nutrients they need. This can result in the organs being damaged and can be fatal.

http://www.bloodpressureuk.org/microsites/salt/Home/Whysaltisbad/Saltseffects



Heart



The raised blood pressure caused by eating too much salt may damage the arteries leading to the heart.
At first, it may cause a slight reduction in the amount of blood reaching the heart. This may lead to angina (sharp pains in the chest when being active).
With this condition the cells in the heart don't work as well as they should because they are not receiving enough oxygen and nutrients. However, lowering blood pressure may help to alleviate some of the problems and reduce the risk of greater damage.

If you continue to eat too much salt then, over time, the damage caused by the extra blood pressure may become so severe that the arteries burst or become completely clogged.

If this happens, then the part of the heart that was receiving the blood no longer gets the oxygen and nutrients it needs and dies. The result is a heart attack.

The best way to prevent a heart attack is to stop the arteries becoming damaged.
And one of the best ways of doing this is keep your blood pressure down by eating less salt.

http://www.bloodpressureuk.org/microsites/salt/Home/Whysaltisbad/Saltseffects

Brain

The raised blood pressure caused by eating too much salt may damage the arteries leading to the brain.

At first, it may cause a slight reduction in the amount of blood reaching the brain. This may lead to dementia (known as vascular dementia).

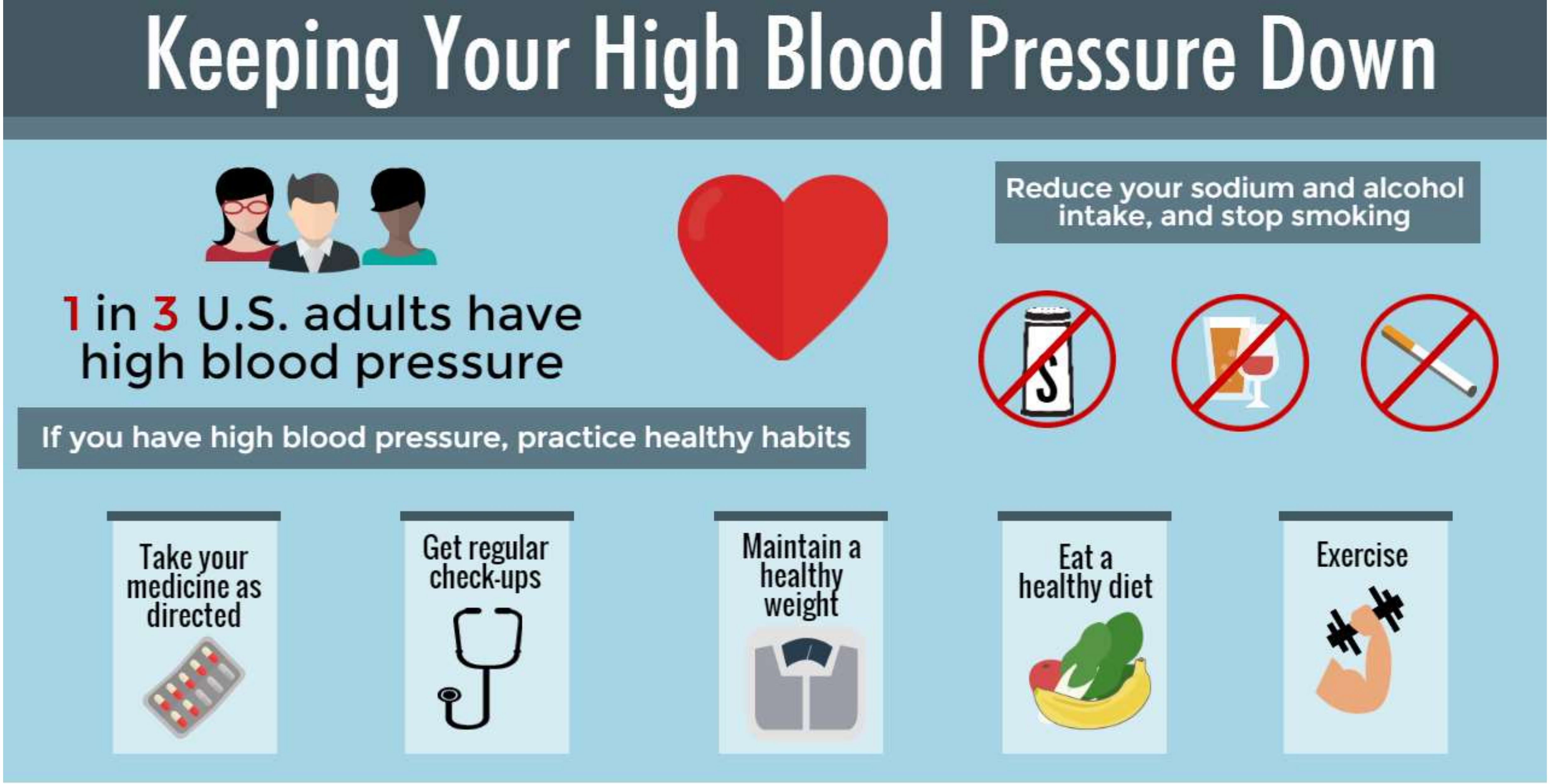
With this condition the cells in the brain don't work as well as they should because they are not receiving enough oxygen and nutrients. However, lowering blood pressure may help to alleviate some of the problems and reduce the risk of greater damage.

If you continue to eat too much salt then, over time, the damage caused by the extra blood pressure may become so severe that the arteries burst or become completely clogged.

If this happens, then the part of the brain that was receiving the blood no longer gets the oxygen and nutrients it needs and dies. The result is a stroke, where you lose the ability to do the things that part of the brain used to control.

The best way to prevent a stroke is to stop the arteries becoming damaged. And one of the best ways of doing this is keep your blood pressure down by eating less salt.

http://www.bloodpressureuk.org/microsites/salt/Home/Whysaltisbad/Saltseffects



Sources: Centers for Disease Control and Prevention (CDC) and Executive Office of Health and Human Services (EOHHS)

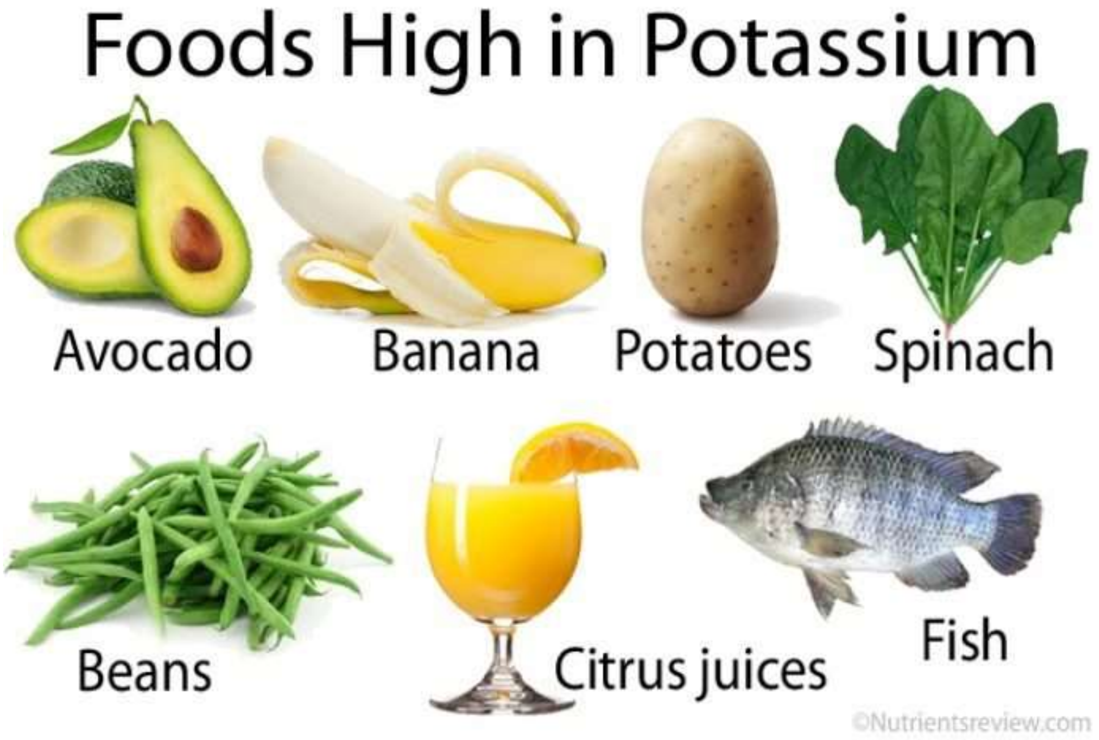
Mass.Gov


Foods to Eat to Control High Blood Pressure
1.) Garlic is natural medicine for treating high blood pressure.
2.) Don't add salt.
3.) Regular physical activity - at least 30 to 60 minutes
4) Apple cider vinegar: Vinegar alkalizes the body and lowers your blood pressure
5) Avoid Coffee.
6) Cucumber: Eat 2 fresh cucumbers every day for 2 weeks
www.livenedup.com


Low potassium diet linked to Hypertension

Our modern "Western" diet is often low in fresh fruits, nuts and vegetables. These are the main sources of the nutrients we need to maintain our blood pressures at healthy levels. Whilst our diet often has an over-supply of sodium, more often than not, there is a deficiency of potassium. That deficiency is a common cause of hypertension.

The recommended daily amount of potassium for an adult is 4,700mg. Most people's diet gives them less than half of this amount. **Bananas** are a good source of potassium, with a medium size banana providing about 10 % of our daily requirement for that mineral. Bananas are especially beneficial because they contain almost no sodium.



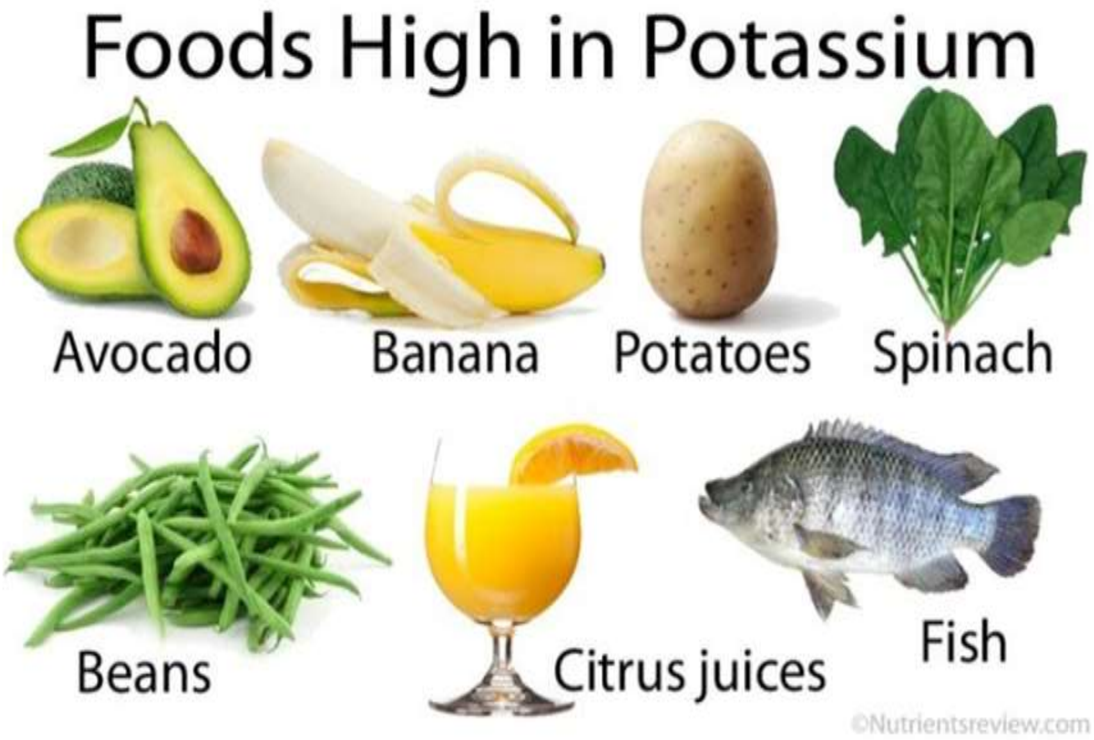
低钾饮食引起高血压

我们现代的“西方化”饮食通常只有少量的新鲜水果、坚果和蔬菜。这些是维持健康水平所需的营养物质的主要来源。然而，我们的饮食经常有过量的钠，但通常情况下，钾缺乏。

这种缺乏症是高血压的常见原因。成人每日推荐的钾量为4700毫克。大多数人的饮食给他们的食物少于这个量的一半。香蕉是钾的很好来源，中等大小的香蕉提供了我们每日所需的10%的矿物质。

香蕉特别有益，因为它们几乎不含钠。早前，印度的一个研究发现，每天二个香蕉可以降低血压10%，效果媲美降压药，而且没有副作用。

含钾丰富的食物有助降低血压



低钾饮食引起高血压

我国的高血压患者超过2.7亿，长期的高血压是导致心脏病的第一大原因。导致血压升高的原因很多，最近的研究发现，低钾摄入量是其中的一个因素。

富含钾的食物对控制高血压(HBP或高血压)很重要，因为钾能减少钠的作用。你吃的钾越多，你的尿液中钠的流失就越多。钾也有助于缓解血管壁的紧张，这有助于进一步降低血压。在血压高于120/80的成年人中，如果没有其他的健康问题，建议通过饮食增加钾元素。

现代的“西方化”饮食通常只有少量的新鲜水果、坚果和蔬菜。这些是维持健康水平所需的营养物质的主要来源。然而，我们的饮食经常有过量的钠，但通常情况下，钾缺乏的。

这种缺乏症是高血压的常见原因。成人每日推荐的钾量为4700毫克。大多数人的饮食提供的钾的少于这个量的一半。香蕉是钾的很好来源，中等大小的香蕉提供了我们每日所需的10%的钾。

香蕉特别有益，因为它们几乎不含钠。早前，印度的一个研究发现，每天二个香蕉可以降低血压10%，效果媲美降压药，而且没有副作用。

不过， 钾对肾病患者，或任何影响身体处理钾的情况，或服用某些药物的人可能是有害的。是否服大量使用富钾食物，应该征询你的医生的意见。

Benefits of Banana for hypertension

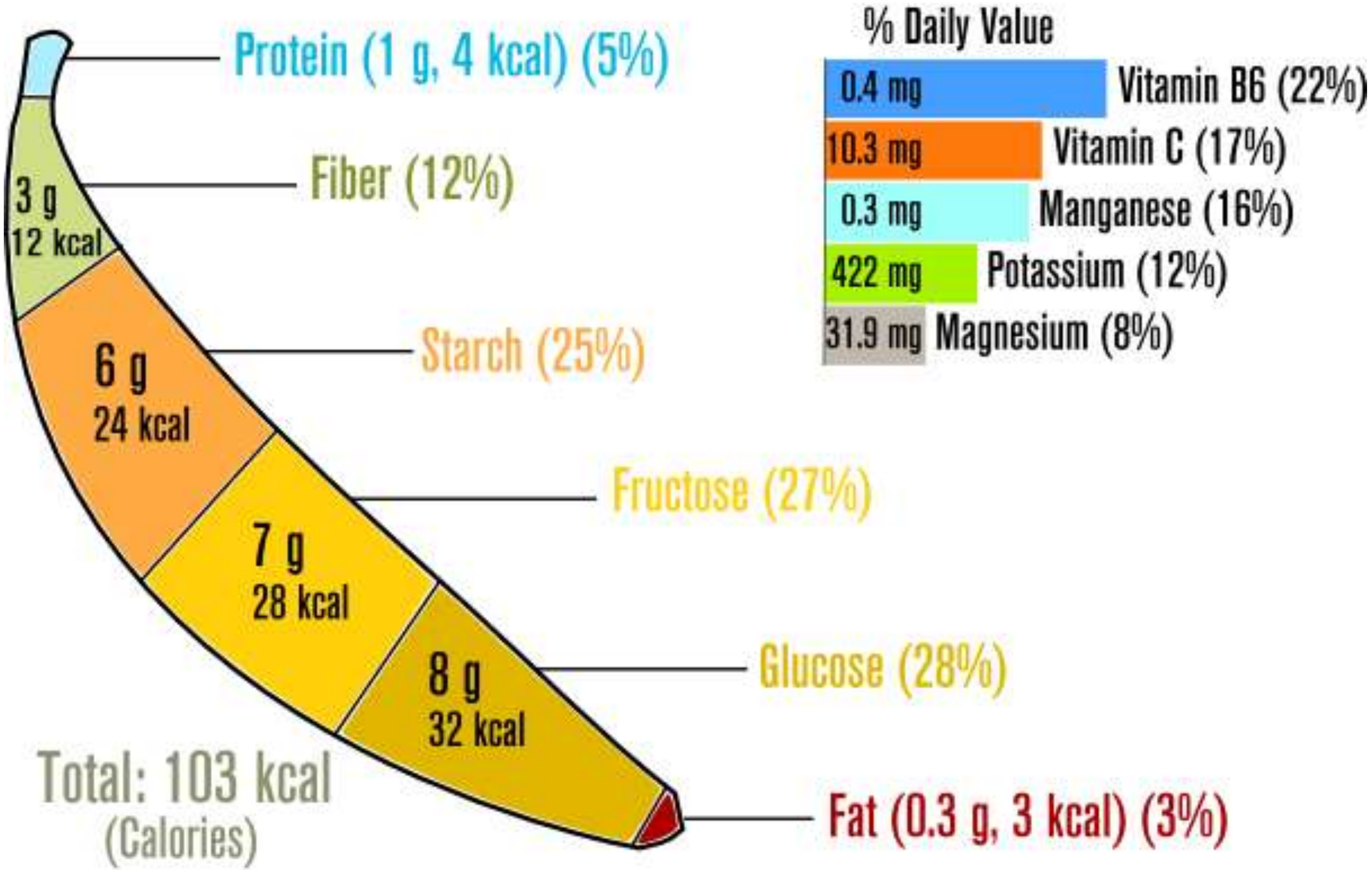
Banana is very rich in potassium and magnesium which can lessen the effects of sodium and calcium

Foods that are rich in potassium are important in managing high blood pressure (HBP or hypertension) because potassium lessens the effects of sodium. The more potassium you eat, the more sodium you lose through urine. Potassium also helps to ease tension in your blood vessel walls, which helps further lower blood pressure.

The recommended potassium intake for an average adult **is 4,700 milligrams (mg) per day**.

Many of the elements of the DASH (Dietary Approaches to Stop Hypertension) diet — fruits, vegetables, fat-free or low-fat (1 percent) dairy foods and fish — are good natural sources of potassium. For example, a medium banana has about 420 mg of potassium (and about 32mg of magnesium) and half a cup of plain mashed sweet potatoes has 475 mg.

What Is A Banana Made Of?



How Eating 2 Bananas a Day Lowers High Blood Pressure

Potassium plays a role in regulating blood pressure. A 1997 study carried out at John Hopkins University in the USA, and which focused on the role of potassium, suggested people would have to eat five bananas a day to have half the effect of a blood pressure-controlling medication. With the knowledge we now have, the finding is not unexpected given that:

there is an inverse relationship between our blood pressure and the amount of potassium we consume; and
five bananas only provides half of the RDA for potassium for an adult.
Research conducted by scientists at Kasturba Medical College in Manipal in southern India, after the John Hopkins University study, found that blood pressure fell by 10% in people who ate two bananas daily for a week. This is as effective as anti-hypertensive medication, but without the side effects.

How eating 2 bananas a day lowers high blood pressure:

This is achieved in two ways:

As has been noted above, bananas area rich source of potassium and have almost no sodium. Eating two bananas a day boosts our potassium intake, which helps regulate our blood pressures; and
Bananas contain natural angiotensin converting enzyme (ACE) inhibitors. ACE produces a substance called angiotensin-2 that constricts blood vessels and raises the pressure inside them. Eating bananas has been shown to stop this happening.

Read More http://how-to-lower-your-blood-pressure.com/?page_id=843

Top 10 Magnesium Rich Foods

Green leafy vegetables aren't the only foods rich in magnesium and chlorophyll. Here are the top 10 foods high in magnesium that you will want to add into your diet.

(Men RDA 400 milligrams and Women RDA 310 milligrams a day)

Spinach — 1 cup: 157 milligrams (40% DV)
Chard — 1 cup: 154 milligrams (38% DV)
Pumpkin seeds — 1/8 cup: 92 milligrams (23% DV)
Yogurt or Kefir — 1 cup: 50 milligrams (13% DV)
Almonds — 1 ounce: 80 milligrams (20% DV)
Black Beans — ½ cup: 60 milligrams (15% DV)
Avocado — 1 medium: 58 milligrams (15% DV)
Figs — ½ cup: 50 milligrams (13% DV)
Dark Chocolate — 1 square: 95 milligrams (24% DV)
Banana — 1 medium: 32 milligrams (8% DV)

https://draxe.com/magnesium-deficient-top-10-magnesium-rich-foods-must-eating/

MAGNESIUM

BODILY FUNCTIONS

Regulates Calcium
-Strong Bones and Teeth
-Helps Excrete Excess Calcium

Relaxes Skeletal Muscle
-Helps Relieve Muscle Cramping and Pain

Energy Production
-Require by Over 300 Energy Producing Reactions

Regulates Heart Contractility
-Blocks Calcium from Heart Muscle
-Heart has 20x Greater Concentration

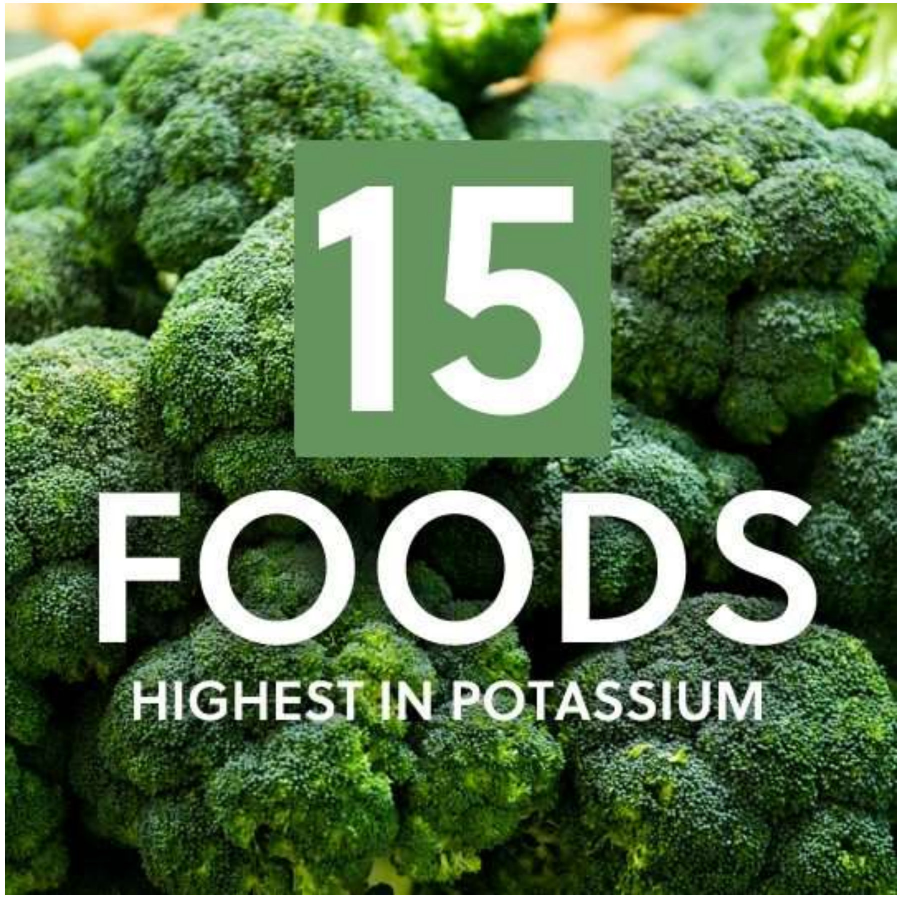
Cleans the Bowel
-Unabsorbed Magnesium Causes Laxitive Effect

Relaxes Smooth Muscle
-Relaxes Bronchioles and Arterioles
-Relaxes Uterine Muscle

[High potassium high magnesium low sodium foods for high blood pressure]

[Rice bran, crude]Potassium: 1485mg Magnesium: 781mg Calcium: 57mg Sodium: 5mg

[Wheat bran, crude]Potassium: 1182mg Magnesium: 611mg Calcium: 73mg Sodium: 2mg



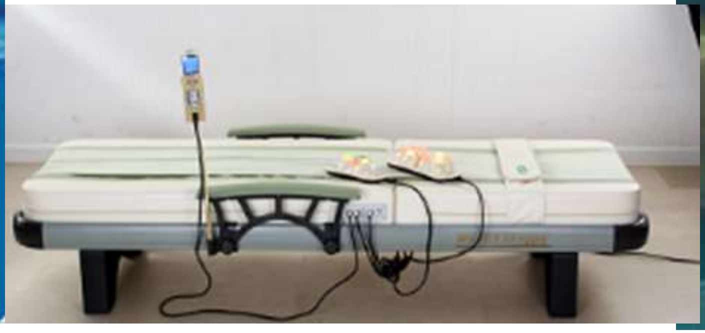
Reduce Blood Pressure Naturally

1. Drink Green Smoothies
2. Eat Ruby Grapefruit
3. Drink 2 litres of water per day
4. Exercise 1 hour each day
5. Eats lots of fruit and vegetables
6. Maintain a healthy weight
7. Manage stress
8. Increase potassium rich foods, such as bananas, tomatoes and zucchini
9. Replace iodise salt with Himalayan salt
10. Take up yoga & meditation

Blood viscosity and blood pressure: role of temperature and hyperglycemia.

We planned a study to research the relations among blood pressure (BP), viscosity, and temperature in healthy subjects and among BP, viscosity, and glucose in diabetics. With simple random sampling method, 53 healthy and 29 diabetes mellitus (DM) type II subjects were selected. Parameters were determined with capillary viscometer and glucometer at 22 degrees C, 36.5 degrees C, and 39.5 degrees C in healthy subjects, and at 22 degrees C on diabetic patients during OGTT with 75 g of glucose. Statistical evaluations of the data were made with regression analysis, Student t test, Spearman's correlation, and analysis of variance. When temperature decreased from 36.5 degrees C to 22 degrees C, blood viscosity increased 26.13%. This increase resulted in a 20.72% decrease in blood flow rate. According to the Hagen-Poiseuille equation, the required BP increase for compensation of the resulting tissue ischemia was 20.72%. Also, a 34.73% decrease in erythrocyte deformability and 18.71% increase in plasma viscosity were seen. When temperature increased from 36.5 degrees to 39.5 degrees C, blood viscosity decreased 10.38%. This caused 11.15% increase in blood flow rate, and 11.15% decrease in BP, according to the equation. Erythrocyte deformability increase of 9.92% and plasma viscosity decrease of 4.99% arose from the temperature rise. There is a correlation between total data for temperatures and viscosities ($r = -0.84$, $P < .001$). When the mean value of blood glucose increased from 100 to 400 mg/dL, viscosity increased 25% ($r = 0.59$, $P = .002$). In this state, blood flow rate decrease was 20% and BP increase for physiological compensation was 25%. Consequently, temperature, glucose and viscosity levels of blood are important factors for BP. ***Implications from this study: higher the temperature, higher the RBC's deformability and lower the viscosity and BP; higher the blood sugar, higher the blood viscosity and BP and lower the REC's deformability***

https://www.ncbi.nlm.nih.gov/pubmed/11368464



BENEFITS OF DRINKING IONIZED ALKALINE WATER for High Blood Pressure

1. Stayed hydrated;
2. Reduced blood viscosity;
3. Protect the kidney;
4. Protect the inner lining of the blood vessel;

Dos and Don'ts to lower blood pressure

- ✔ **High potassium**: in **avocados, seaweeds, sunflower seeds, almonds and Brazil nuts**
- ✔ **High magnesium**: in **green leafy vegetables, nuts and seeds**, especially **almonds, cashew and brazil nuts**.
- ✔ **High fibre**: eat plenty of **vegetables, pulses** such as beans, lentils and chickpeas and **apples**.
- ✔ **High vegetables**
- ✔ **Keep hydrated**
- ✔ **Exercise regularly** combining aerobic with resistance training.

- ✗ **No refined carbohydrates**: **white bread, white rice**
- ✗ **Minimal to no grains**: even wholegrains
- ✗ **No sugar**: in most **processed foods, biscuits, cakes**, **sugary drinks** and **fruit juices**.
- ✗ **Low salt intake**: **avoid processed foods** and limit salt intake in general.
- ✗ **Limit alcohol**
- ✗ **Avoid smoking**
- ✗ **Restrict caffeine**
- ✗ **Reduce stress levels**

Borecole Nutrition

http://www.isdbweb.org/documents/file/511ec204d0f1d.pdf

Aerobic exercises and endurance training.

Many studies have proven that aerobic exercises are the most effective type of physical activity to lower blood pressure.

They strengthen and tone the heart. The stronger the heart is, the less effort it takes to pump blood.

These powerful exercises include **dancing, swimming, cycling, running and fast walking.**

If you want to get the maximum benefits, perform these activities 5 times a week for at least 30 minutes at moderate intensity.

Isometric Resistance Exercises to Lower Blood Pressure

Belgium researchers found **isometric resistance training can lower blood pressure.**

Isometric resistance training involves muscular actions in which the length of your muscles doesn't actually change. In other words, you won't see your muscles moving or stretching. All the force you apply against your muscles is done in a static way. Your muscles are tense but they don't actually contract like they would when you lift a heavy barbell.

Isometric resistance exercises also tend to be fairly safe to perform compared to other types of resistance training. They don't have a history of causing injuries to those who do them.

When the Belgian researchers compared isometric resistance training with other types of resistance training, they found that this form triggered the greatest drop in systolic blood pressure.

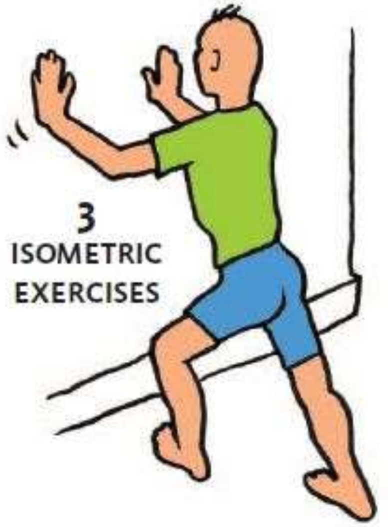
Examples of isometric resistance training like, plank, squeezing a rubber ball or pressing against a wall.

Because of how simple and easy these exercises are, the amazing effect they have on high blood pressure has really surprised researchers.

Just four weeks of exercising by squeezing a ball impressively lowered blood pressure 10% In both systolic and diastolic measurements.

Cornelissen, V.A., et al, "Exercise Training for Blood Pressure: A Systematic Review and Meta-analysis," J Am Heart Assoc. February 1, 2013; 2(1): e004473.

http://www.isdbweb.org/documents/file/511ec204d0f1d.pdf



Isometric Exercises

Isometric exercises are the type of exercise where the muscles don't move much during the exercise. For example, squeezing a rubber ball or pressing against a wall.

Because of how simple and easy these exercises are, the amazing effect they have on high blood pressure has really surprised researchers.

Just four weeks of exercising by squeezing a ball impressively lowered blood pressure 10% In both systolic and diastolic measurements.

Is weightlifting safe for high blood pressure?

Maybe. It depends how high your blood pressure is. You shouldn't lift weights if your blood pressure is uncontrolled — meaning it's higher than 180/110 millimeters of mercury (mm Hg). If your blood pressure is higher than 160/100 mm Hg, check with your doctor before starting a weightlifting program to discuss any precautions or special considerations.

Weightlifting can cause a temporary increase in blood pressure. This increase can be dramatic, depending on how much weight you lift. But, weightlifting can also have long-term benefits to blood pressure that outweigh the risk of a temporary spike for most people.

Regular exercise, including moderate weightlifting, provides many health benefits, including helping to lower blood pressure in the long term.

If you have high blood pressure, talk to your doctor before starting any exercise program. Your doctor can help you develop an exercise program tailored to your needs and medical conditions.

If you have high blood pressure, here are some tips for getting started on a weightlifting program:

Learn and use proper form when lifting to reduce the risk of injury.
Don't hold your breath. Holding your breath during exertion can cause dangerous spikes in blood pressure. Instead, breathe easily and continuously during each lift.
Lift lighter weights more times. Heavier weights require more strain, which can cause a greater increase in blood pressure. You can challenge your muscles with lighter weights by increasing the number of repetitions you lift.
Alternate between upper and lower body exercises to let your muscles rest during exercise.

Resistance exercises or weight lifting (but must be guided and monitored by your doctor)

For quite some time weight lifting was considered to be harmful for blood pressure due to the rapid and abrupt activity of an exercise.

However, according to the investigators, weight lifting is listed as second in effectiveness to lower blood pressure only to aerobic exercises.

Weight lifting helps build up muscle and therefore makes you and your heart stronger. With more lean muscle mass,

you need less effort for your everyday tasks. You don’t need to strain your heart as much, and as a result you will have lower blood pressure.

Another important benefit of weight lifting is its ability to improve insulin sensitivity. High levels of insulin cause salt retention, which leads to fluid withholding, resulting in high blood pressure.

EXERCISE LOWERS BLOOD PRESSURE "AGE"

Exercise has long been recommended as a lifestyle tool against high blood pressure, but a new study suggests that keeping active may actually help slow down the "clock" that typically boosts blood pressure as you age. University of South Carolina scientists and colleagues analyzed data on almost 14,000 men initially without high blood pressure. The men, ages 20 to 60, were categorized by fitness level using baseline treadmill tests and then were followed, with periodic medical examinations, for 36 years.

Average blood pressure rose steadily with age, but sharply less so for the fittest participants. Men with the lowest level of fitness reached a systolic blood pressure of at least 120 mmHg at age 46 years, while their fittest peers didn't hit that mark until age 54 years on average. The least-fit group hit or passed a diastolic pressure of 80 mmHg at age 42 years, while the fittest men kept their diastolic pressure below that level into their 90s.

Publishing their results in the Journal of the American College of Cardiology, researchers concluded, "Our findings underscore the potential modifying effect of fitness on blood-pressure trajectory with aging over the male lifespan.

http://www.nutritionletter.tufts.edu/issues/10_15/special-reports/New-Research-on-High-Blood-Pressure-What-You-Need-to-Know_1663-1.html

Benefits of Taiji Quan

Heart disease

A 53-person study at National Taiwan University found that a year of Taiji significantly boosted exercise capacity, lowered blood pressure, and improved levels of cholesterol, triglycerides, insulin, and C-reactive protein in people at high risk for heart disease, with no improvement noted in the control group. (Journal of Alternative and Complementary Medicine September 2008)

Hypertension

In a review of 26 studies, in 85% of trials, Taiji lowered blood pressure — with improvements ranging from 3 to 32 mm Hg in systolic pressure and from 2 to 18 mm Hg in diastolic pressure. (Preventive Cardiology Spring 2008)

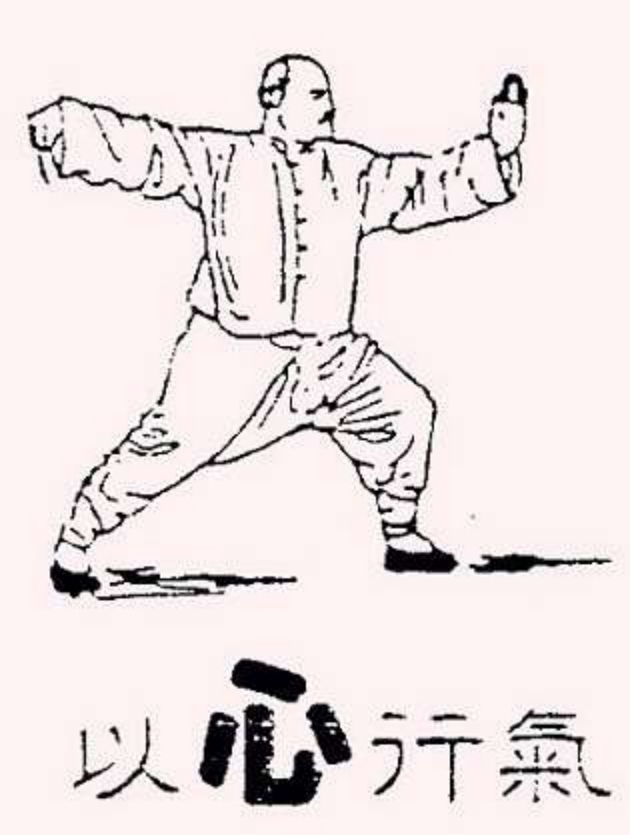
Parkinson's disease

A 33-person pilot study at the Washington University School of Medicine found that people with mild to moderately severe Parkinson's disease showed improved balance, walking ability, and overall well-being after 20 Taiji sessions. (Gait and Posture October 2008)

Stroke

In 136 patients who'd had experienced a stroke at least six months earlier, 12 weeks of Taiji improved standing balance as compared to a general exercise program entailing breathing, stretching, and mobilizing muscles and joints. (Neurorehabilitation and Neural Repair January 2009)

http://onlinelibrary.wiley.com/doi/10.1111/j.1751-7141.2008.07565.x/full



30 grams of milled FLAXSEED daily Lowers high blood pressure as effective as medication

---Study author calls reduction "largest decrease in BP ever shown by any dietary intervention

In findings published in the journal Hypertension, Canadian researchers report that a daily dose of flaxseed might reduce high blood pressure. Researchers conducted a clinical trial in 110 patients with peripheral artery disease (PAD), in which arteries to the extremities become blocked; three-quarters of participants also had hypertension. About half the participants received 30 grams of milled flaxseed (the equivalent of three heaping tablespoons) daily, mixed into foods that were specially prepared for the study, such as muffins, buns, bagels and pasta.

After six months, those randomly assigned to the flaxseed-enriched diet saw significantly lower blood-pressure readings. On average, their systolic pressure (the top number) dropped 10 mmHg, while diastolic pressure (the bottom number) fell 7 mmHg. Those changes, researchers noted, were superior to other dietary interventions and similar to what is often achieved by prescription medication: “It’s at least as good as any medication on the market.”

Flaxseeds are an excellent source of the plant omega-3, alpha-linolenic acid, and contain fiber and antioxidants. Flaxseeds are also the richest food source of lignans, a fiber-like polyphenol compound. But researchers said it wasn’t clear which nutrients were responsible for the blood-pressure benefit. They speculated that biologically active compounds in flaxseed inhibit an enzyme that occurs naturally in the body, in turn affecting blood pressure.

http://www.nutritionletter.tufts.edu/issues/10_15/special-reports/New-Research-on-High-Blood-Pressure-What-You-Need-to-Know_1663-1.html

Listening to classic music can reduce blood pressure

Why Mozart beats Abba when it comes to matters of the heart: Classical music found to 'significantly lower blood pressure'
•Blood pressure tested listening to Mozart, Strauss, Abba and silence
•Mozart and Strauss listeners had lower heart rates and blood pressure
•Lyrics in Abba thought to stimulate brain rather than cause relaxation
•Levels of stress hormone cortisol fell in all those who listened to music

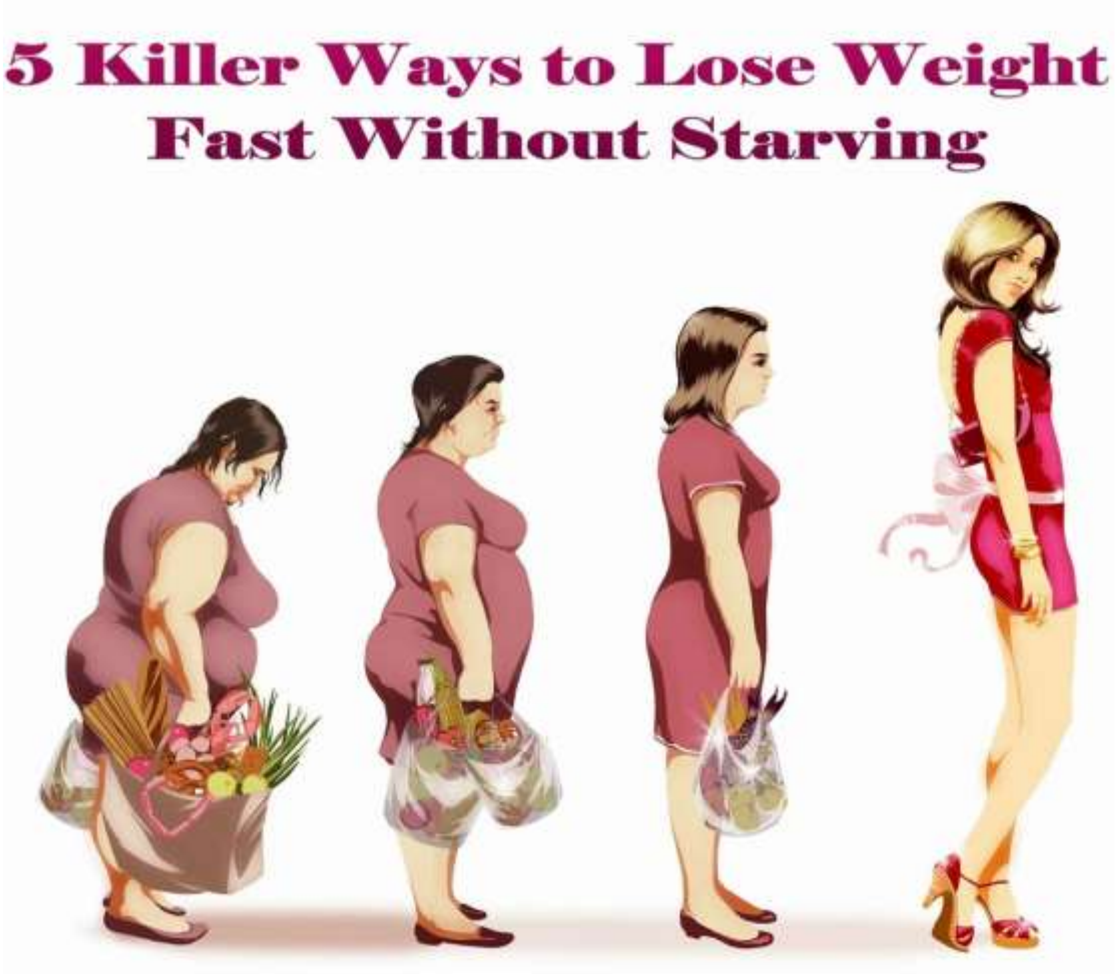
In the study, two groups of 60 participants listened to either.

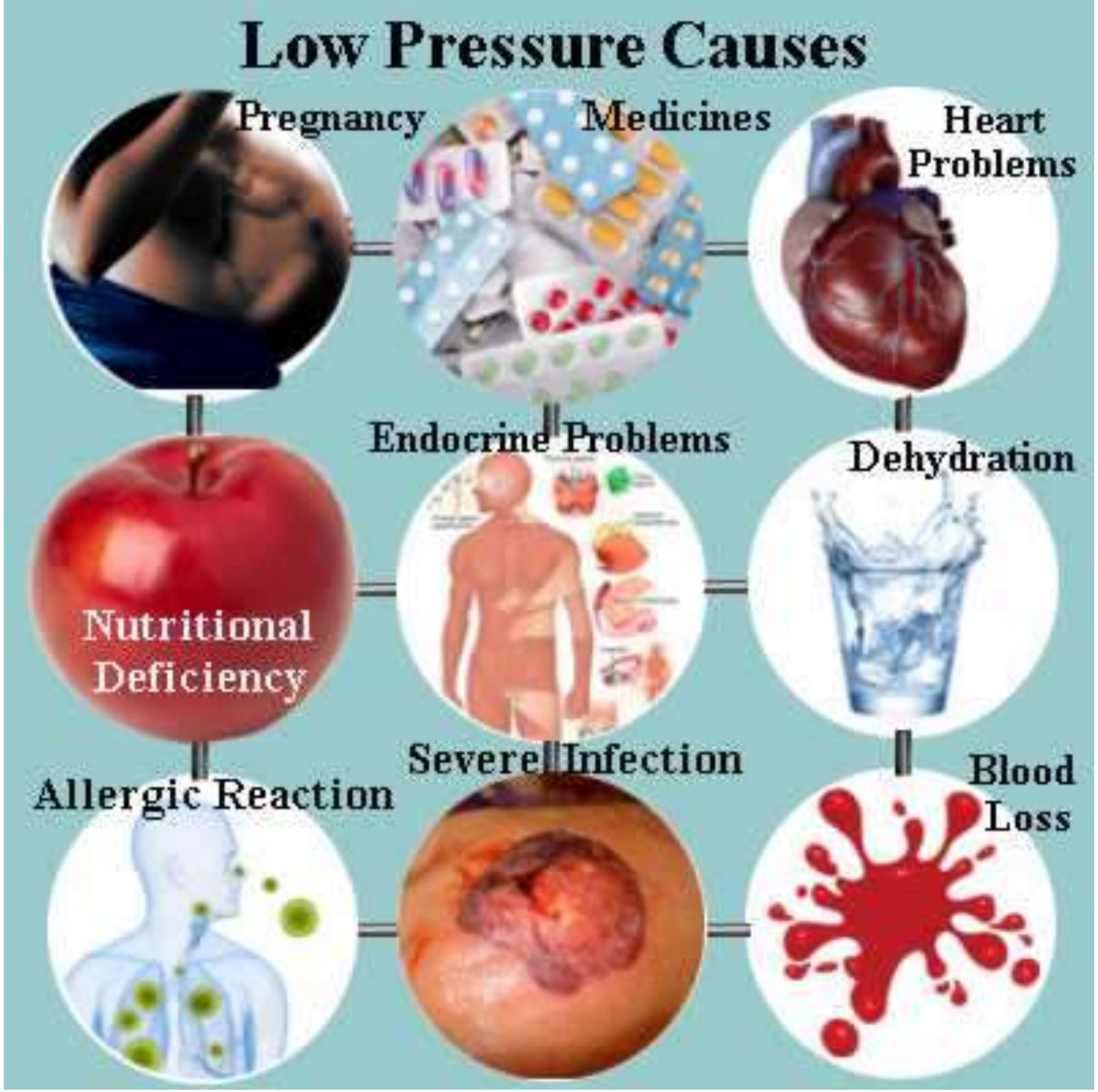
Mozart's Symphony No. 40 in g minor was found to lower blood pressure and heart rates, unlike Abba or silence, a study found

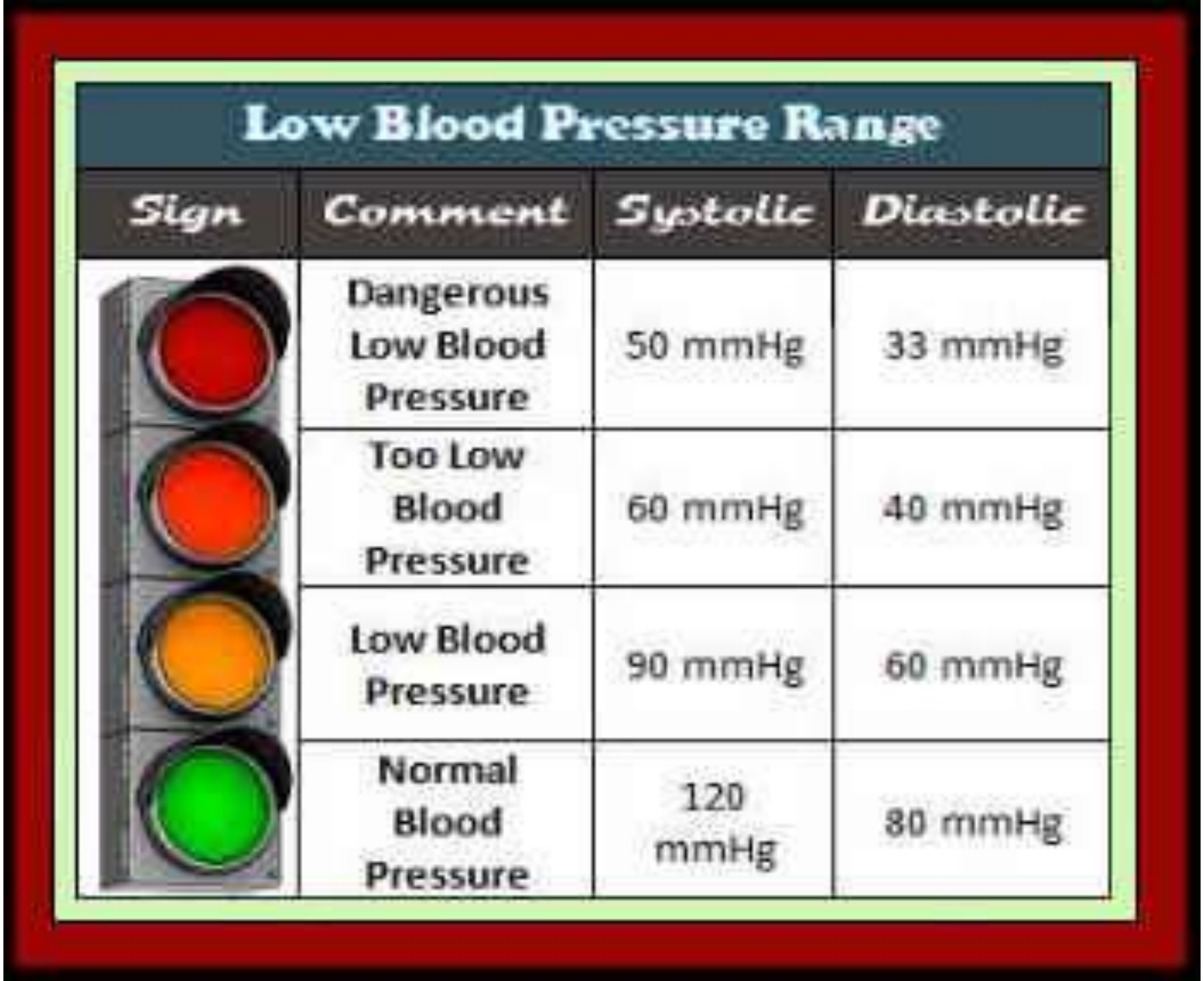
Treatment with medications

If lifestyle measures don’t lower blood pressure sufficiently, one or more medications may be prescribed.

- Thiazide diuretics dilate blood vessels and decrease fluid volume.
- Angiotensin-converting enzyme (ACE) inhibitors dilate blood vessels.
- Angiotensin II receptor blockers (ARBs), like ACE inhibitors, dilate blood vessels.
- Beta-blockers slow heart rate, decrease cardiac output, lessen the force with which the heart muscle contracts, and dilate blood vessels.
- Calcium channel blockers decrease the pumping strength of the heart, slow the heart rate, and relax blood vessels and muscles.
- Renin inhibitors cause blood vessels to dilate.


5 Killer Ways to Lose Weight
Fast Without Starving

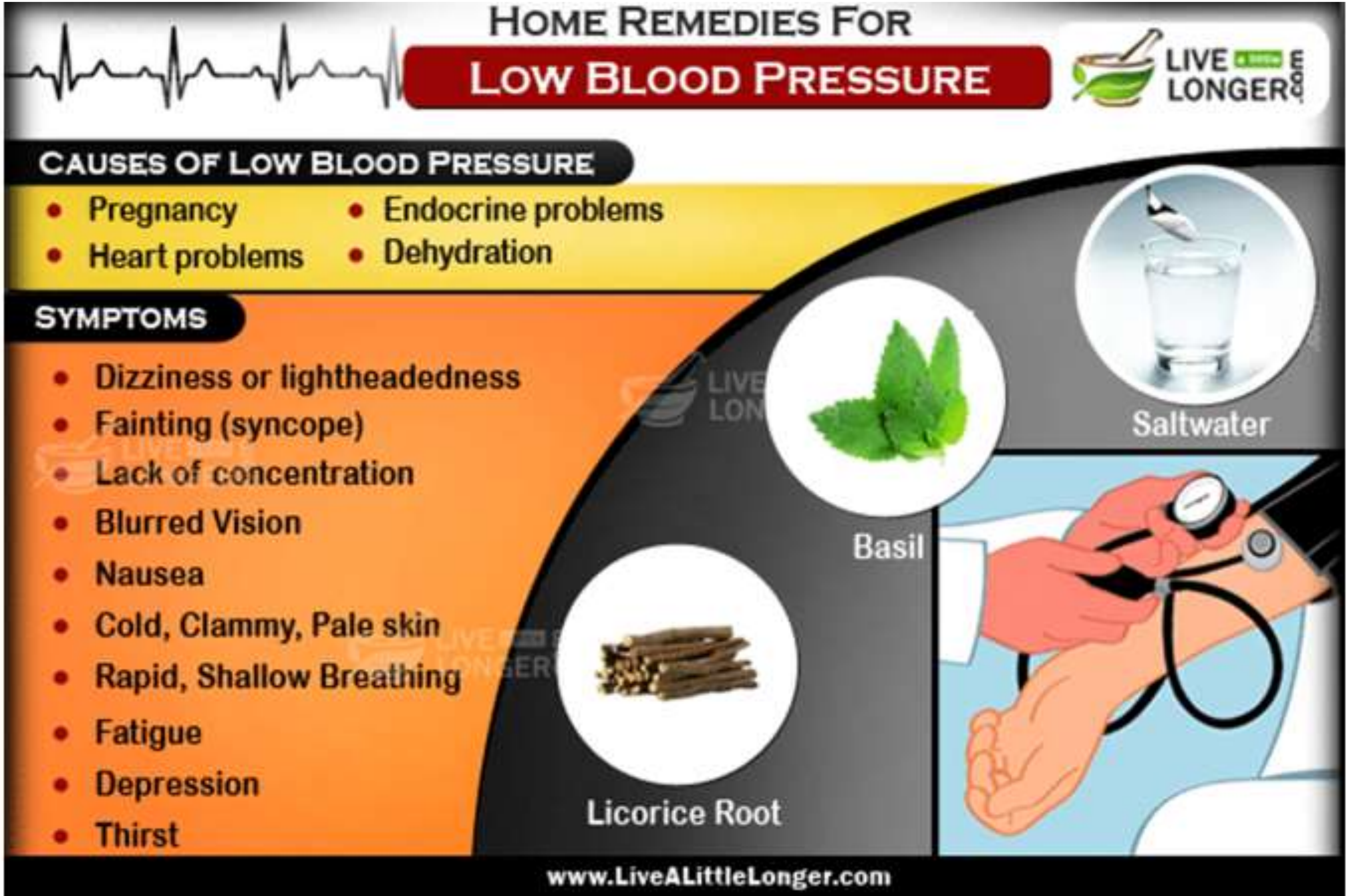

Low Pressure Causes
Pregnancy
Medicines
Heart Problems
Endocrine Problems
Dehydration
Nutritional Deficiency
Severe Infection
Allergic Reaction
Blood Loss



Low Blood Pressure Range			
Sign	Comment	Systolic	Diastolic
	Dangerous Low Blood Pressure	50 mmHg	33 mmHg
	Too Low Blood Pressure	60 mmHg	40 mmHg
	Low Blood Pressure	90 mmHg	60 mmHg
	Normal Blood Pressure	120 mmHg	80 mmHg

While HIGH blood pressure is dangerous because it can lead to heart disease.

But low blood pressure, known as hypotension, can be dangerous as well.


Home Remedies For
Low Blood Pressure
LIVE LONGER .com
Causes Of Low Blood Pressure
• Pregnancy
• Heart problems
• Endocrine problems
• Dehydration
Symptoms
• Dizziness or lightheadedness
• Fainting (syncope)
• Lack of concentration
• Blurred Vision
• Nausea
• Cold, Clammy, Pale skin
• Rapid, Shallow Breathing
• Fatigue
• Depression
• Thirst
Saltwater
Basil
Licorice Root
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