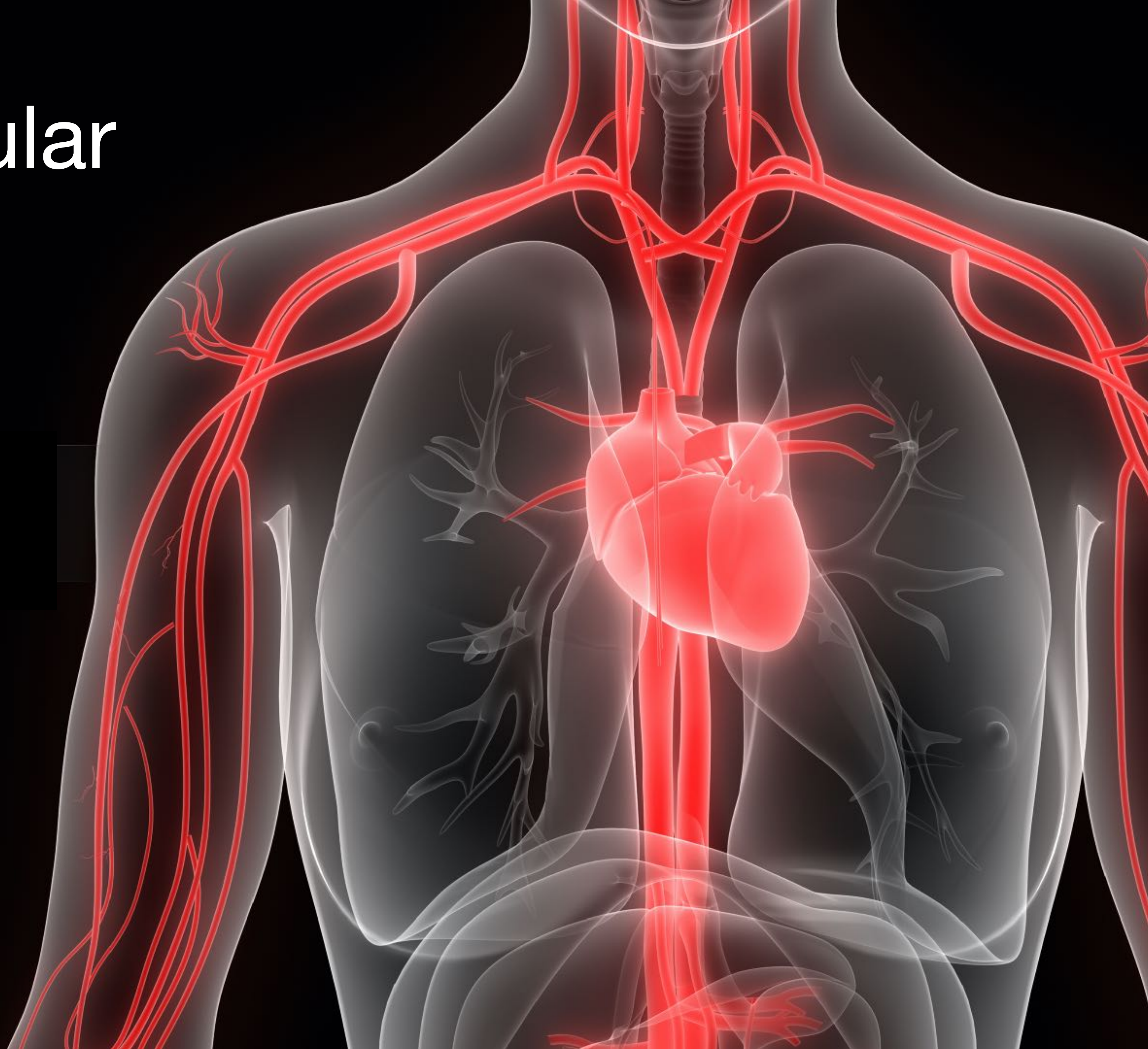




TRULY HEAL

Academy

The Cardiovascular System



Our heart is one of your most important organs, it is the centre of your circulatory system.

The circulatory system is made up: blood vessels, such as capillaries, veins, and arteries that carry blood full of oxygen and nutrients to our organs allowing for a healthy functioning system.

In average the hearts beats about 3 billions times in a lifetime.

It takes 20 seconds for blood to circulate the entire body. Oxygenated blood leaves the aorta at about 1 mile an hour.



It's important functions are:

- **Supplying oxygen from the lungs to the tissues**
- **Supplying substances absorbed from the digestive system to the tissues**
- **Removing carbon dioxide from the tissues to the lungs**
- **Removing waste products from the tissues to the kidneys**
- **Regulating body temperature; increasing the diameter of blood vessels increases heat loss, whereas reducing the diameter of the blood vessels prevents heat loss**
- **Distributing hormones and other chemicals to different parts of the body**

Heart disease is the leading cause of death in the United States killing one person every 36 seconds and 655,000 people a year.

The current epidemic of CVD is largely explained by several modifiable risk factors associated with lifestyle, feasible to modify.

- Unbalanced diet,
- Excessive alcohol and tobacco consumption
- Hypercholesterolemia,
- Diabetes mellitus,
- High blood pressure,
- Visceral obesity,
- Physical inactivity and
- Psychosocial stress increased the risk of future CVD events and are responsible for an estimated 90% of the population-attributable risk fraction of ischemic heart disease and stroke worldwide

Our cardiac health is important and non-negotiable if we want to live a healthy and long life.



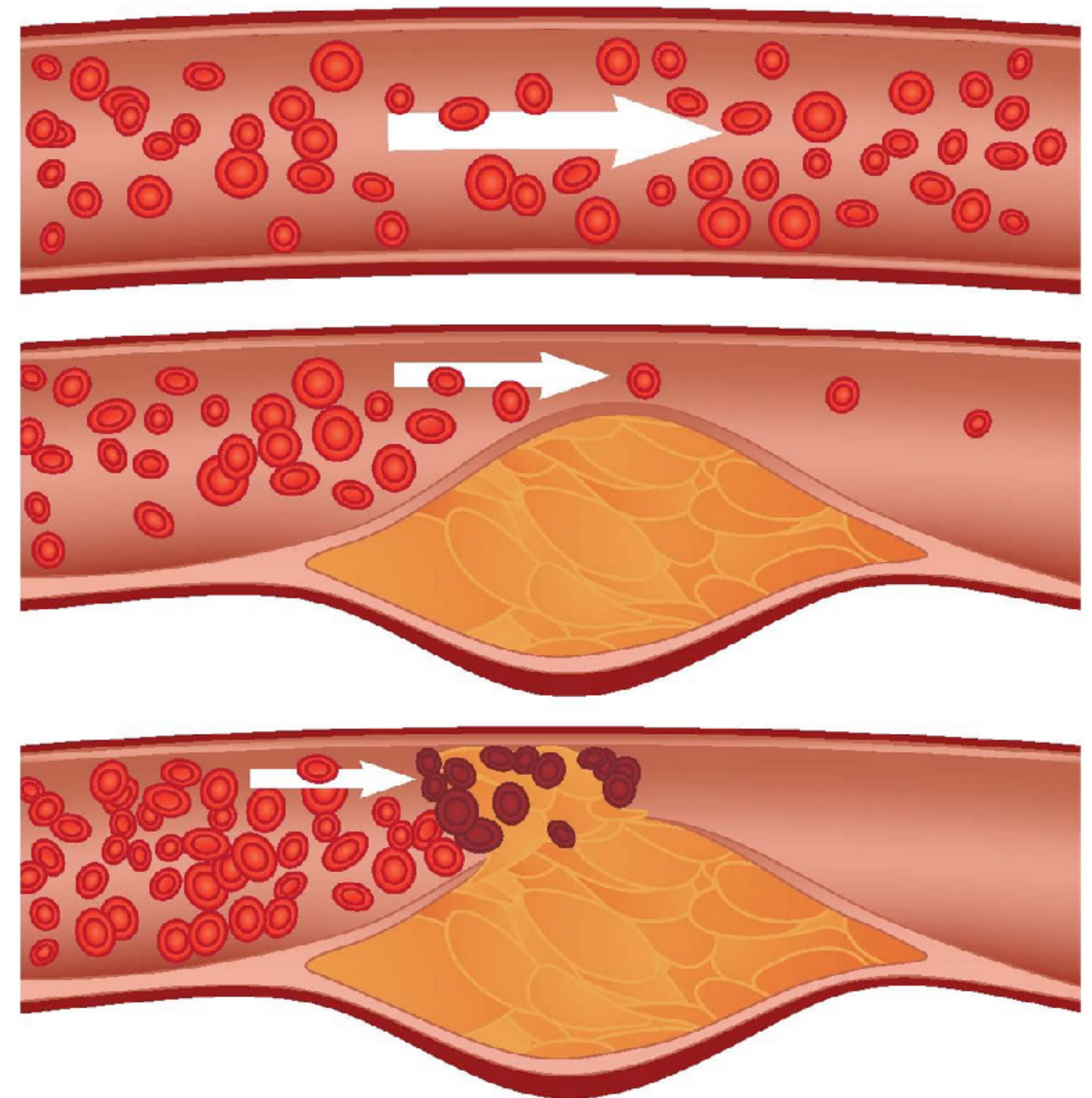
High Blood Pressure - Hypertension

Inflammation in the lining of blood vessels can cause small areas of damage.

Inflammatory cells and cholesterol in the blood, stick to the damaged area to try to repair it.

Eventually calcium forms in this plug and build a permanent lump on the side of the blood vessel.

This narrows the blood vessels and causes resistance to the flow of blood.



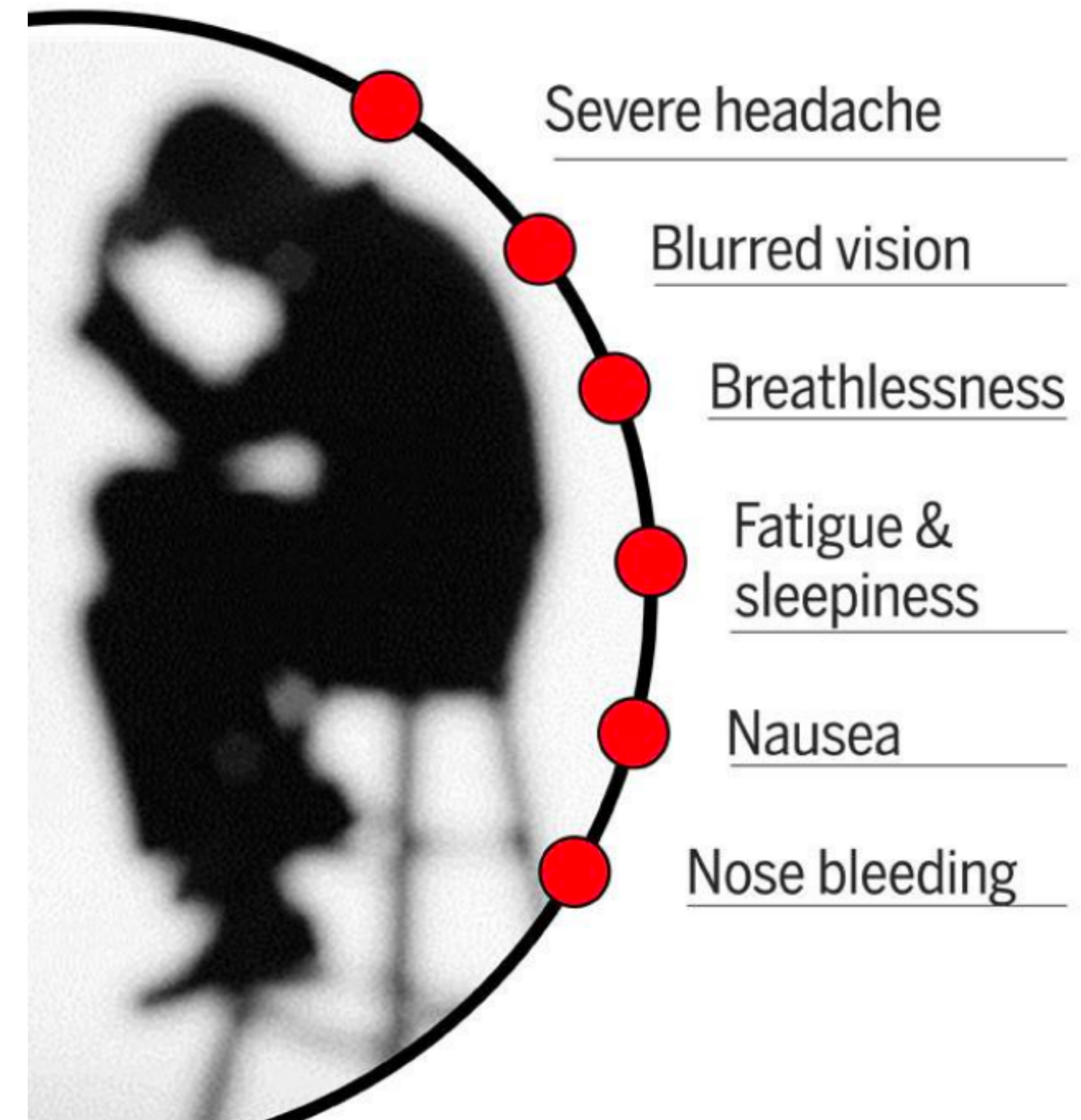
WARNING SIGNS

High Blood Pressure - Hypertension

SYMPTOMS OF HIGH BLOOD PRESSURE

High blood pressure can cause blockages which can cause:

- angina or heart attack in the blood vessels of the heart
- a stroke in the blood vessels of the brain and
- lack of blood flow to other parts of the body.



Causes of Hypertension

- Kidney disease
- Hormonal imbalances
- Inflammation of arterial endothelial lining
- Diabetes
- Obesity
- Gene Polymorphism of eNOS, PON-1, MTHFR, MnSOD, ACE, ADIPOQ, PAI-1
- Infections
- Poor dental health
- Obstructive sleep apnea
- Dehydration
- Smoking
- Drugs
- Excess consumption of Caffeine/Alcohol
- Chronic Stress
- Valvular Heart Disease
- Diet
- Pregnancy induced hypertension
- Congenital heart Defects
- Primary Aldosteronism
- High Homocysteine levels
- Heavy metals
- Liver disease

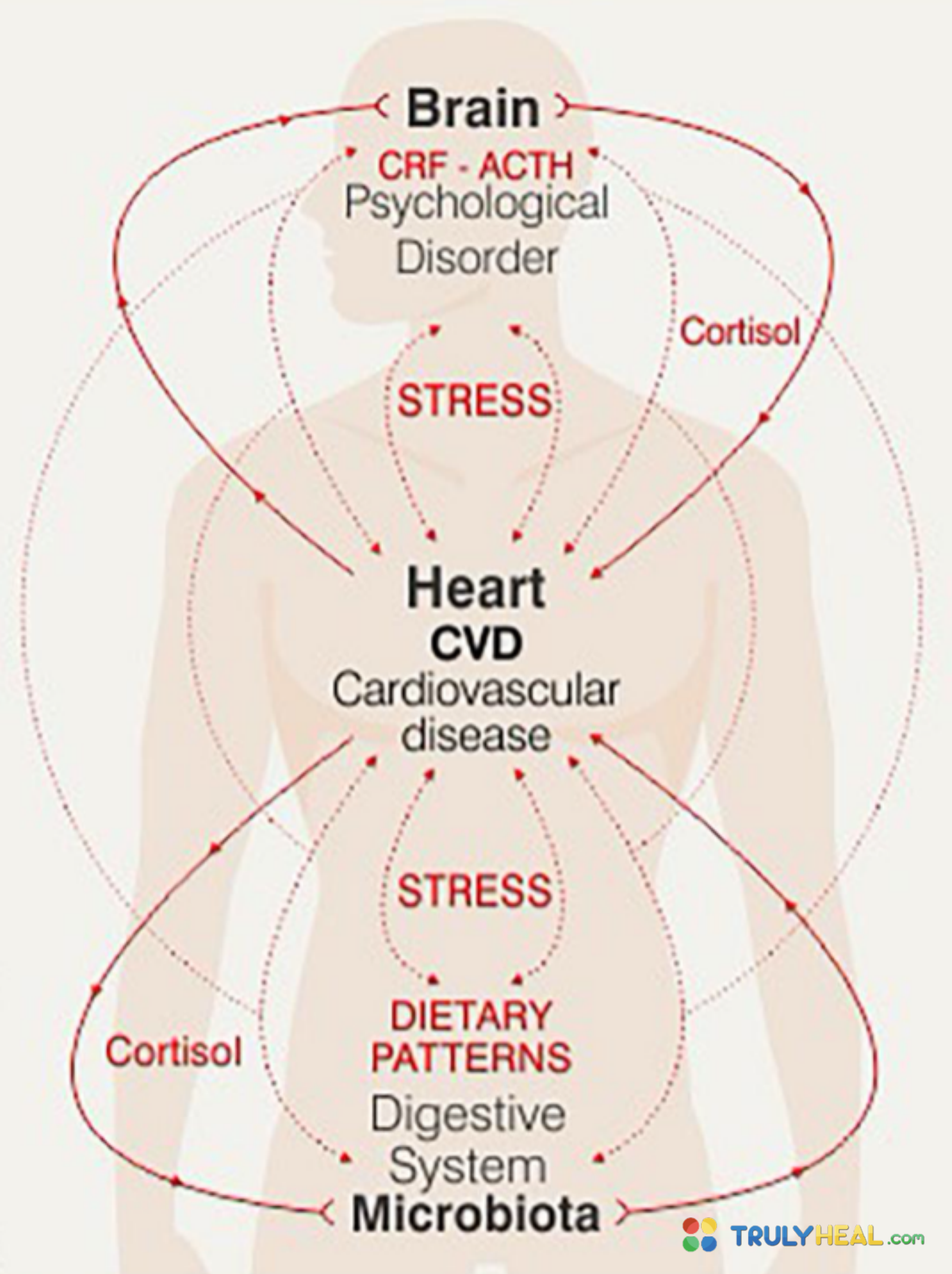
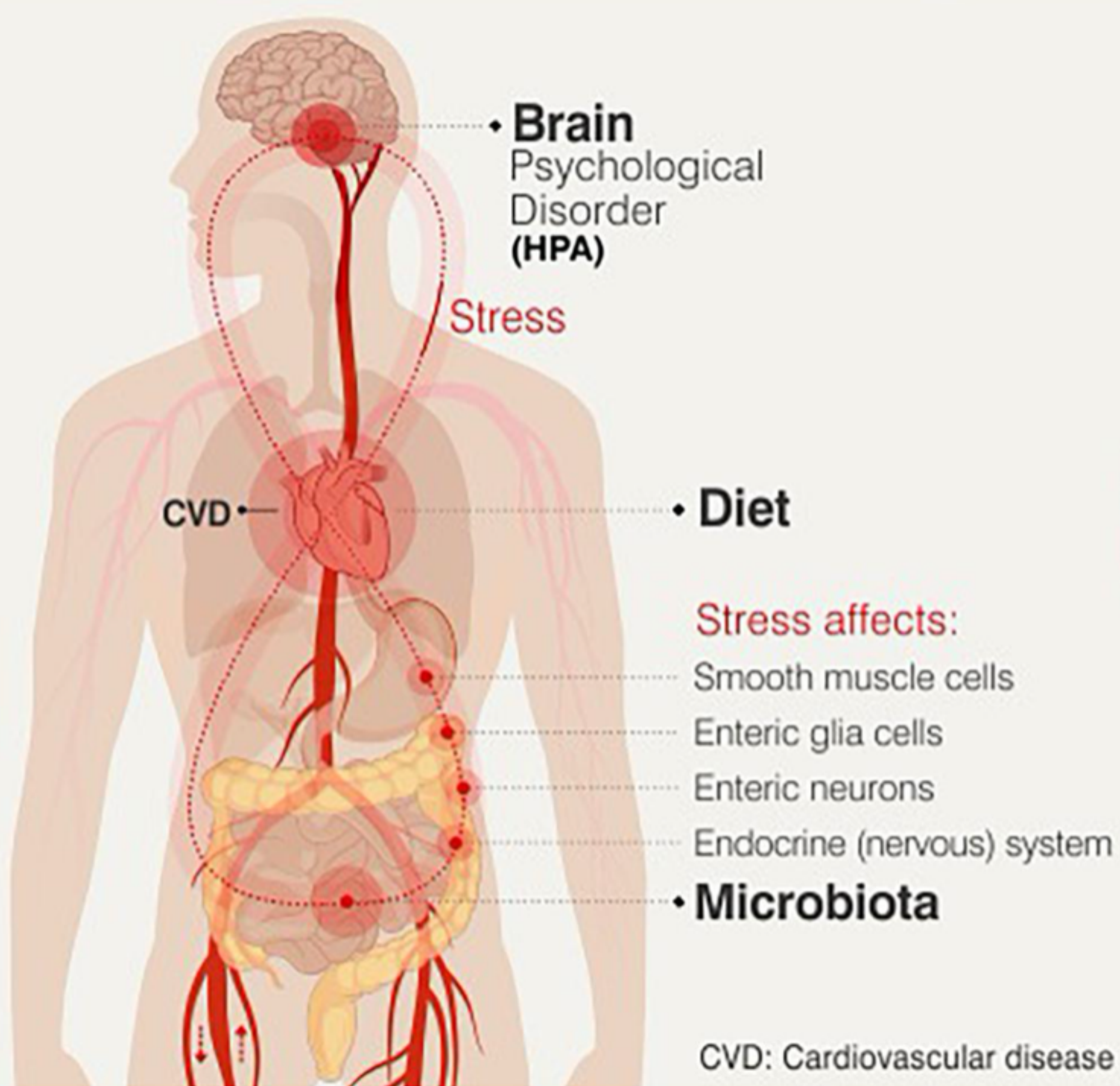
Chronic Stress

Stress can cause hypertension through repeated blood pressure elevations as well as by stimulation of the nervous system to produce large amounts of vasoconstricting hormones that increase blood pressure.



Kulkarni S, O'Farrell I, Erasi M, Kochar MS. Stress and hypertension. WMJ. 1998 Dec;97(11):34-8. PMID: 9894438.

Boone JL. Stress and hypertension. Prim Care. 1991 Sep;18(3):623-49. PMID: 1946791



Gut Health

Changes in the composition of gut microbiota - dysbiosis, has been linked to pathologies such as atherosclerosis, hypertension and heart failure.

- Increased intestinal permeability in patients with chronic heart failure, higher plasma concentrations of endotoxin and inflammatory cytokines.
- In Hypertension: More recently, a limited number of studies indicate a direct association between gut microbiota and blood pressure control in animal models. Communication between the gut enteric nervous system and the central nervous system has similarly emerged as a potential link to blood pressure.

Gut Health

- Atherosclerotic plaques contain bacterial DNA, and the bacterial taxa observed in atherosclerotic plaques were also present in the gut of the same individuals. These observations suggest the possibility that the microbial communities at these sites may be a source of bacteria in the plaque, which may impact plaque stability and development of CVD.
- Under physiological conditions, gut microbiota continue to stimulate the immune system, which is a rapid and effective mechanism for defending against pathogens. Collectively, the microbiota exert a fundamental influence on systemic immunity and metabolism, and healthy gut microbiota are largely responsible for the overall health of the host

Tang WH, Kitai T, Hazen SL. Gut Microbiota in Cardiovascular Health and Disease. Circ Res. 2017;120(7):1183-1196. doi:10.1161/

CIRCRESAHA.117.309715

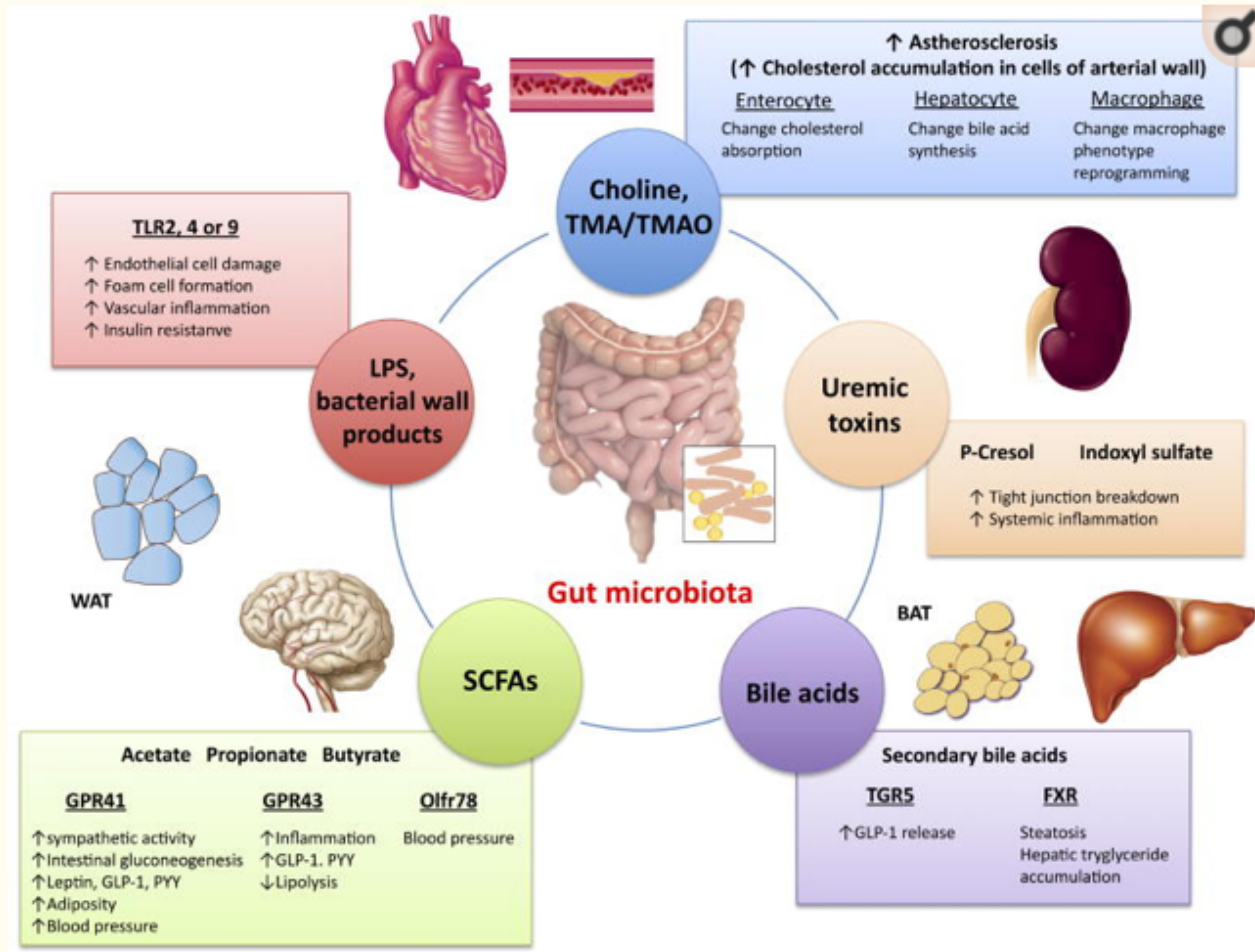
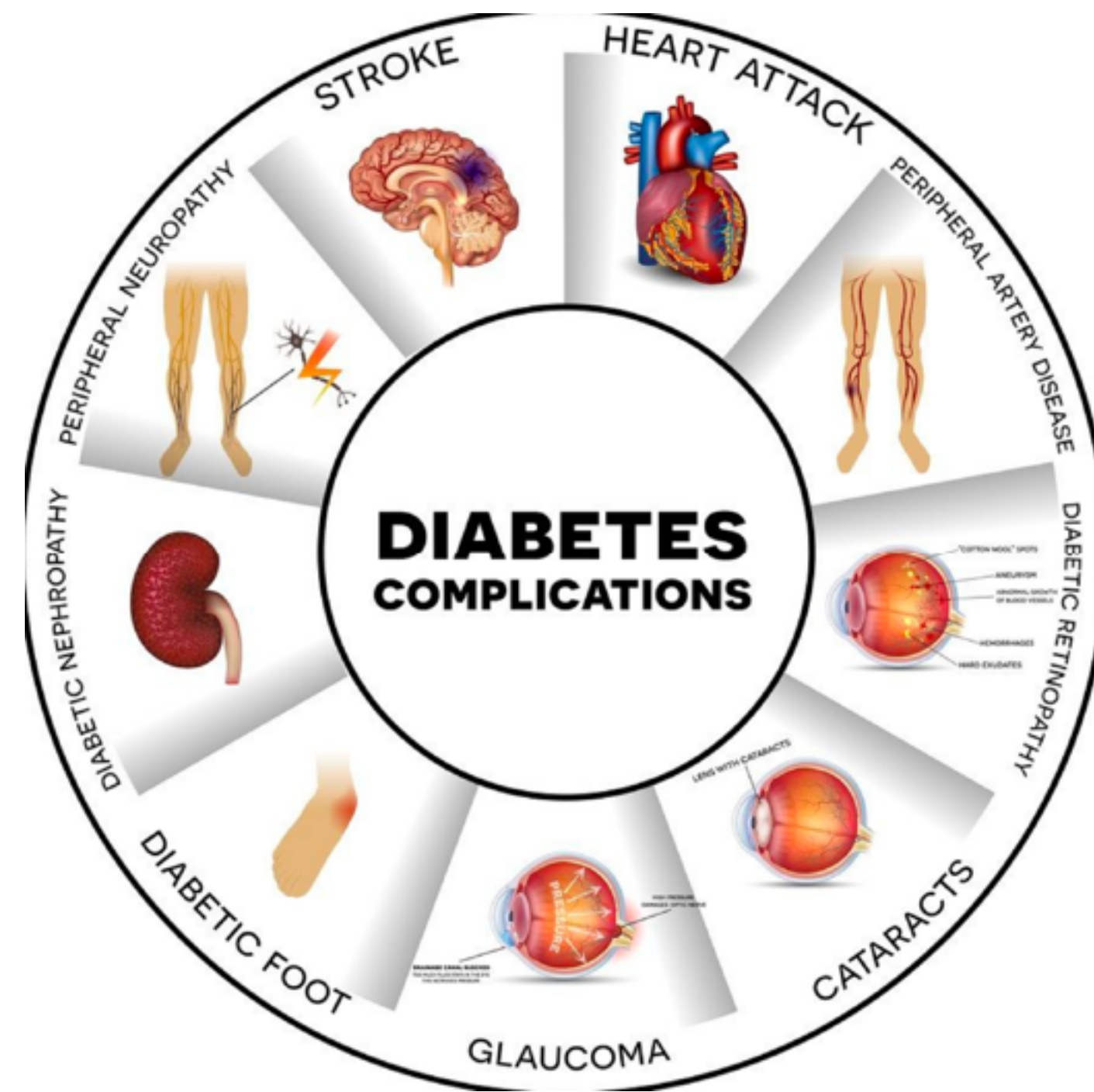


Figure 1

Gut microbiota and possible molecular pathways linked to cardiovascular and cardiometabolic diseases.

Diabetes



According to a study two-thirds of the people suffering from diabetes eventually die of cardiovascular diseases since diabetes significantly heightens the risks of several cardiovascular diseases such as heart attack and stroke.

- Diabetes leads to chronic inflammation and inflates the level of blood sugar to a great extent.
- Chronic higher inflammation levels weaken the walls of arteries that conclusively make them more prone to atherosclerosis.
- The increase in the level of blood glucose prohibits the arteries from expanding further because it stiffens them and prompts blood platelets to grow more glutinous to form blood coagulation inside the arteries.

High Homocysteine

Elevated Homocysteine: Homocysteine is the key determinant of the methylation cycle. High homocysteine can arise due to genetic defects of enzymes involved in homocysteine metabolism (MTHFR, MTR, MTRR)

It also can be high due to nutritional deficiencies of folate, vitamin B6 and vitamin B12

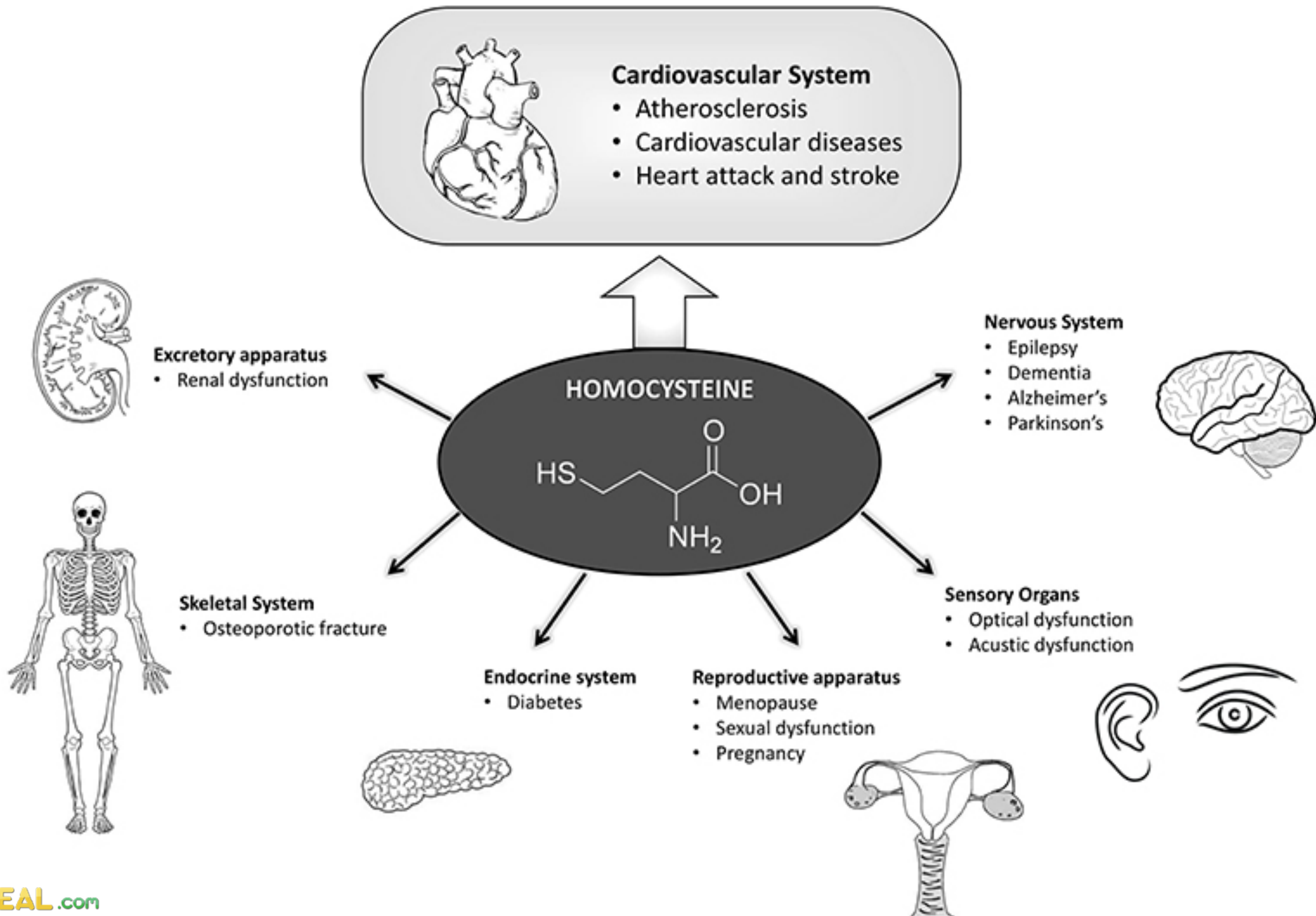
Several diseases such as renal and thyroid dysfunction, cancer, psoriasis, and diabetes as well as various drugs, alcohol, tobacco, coffee, older age and menopause, are believed to be associated with moderately elevated homocysteine concentrations

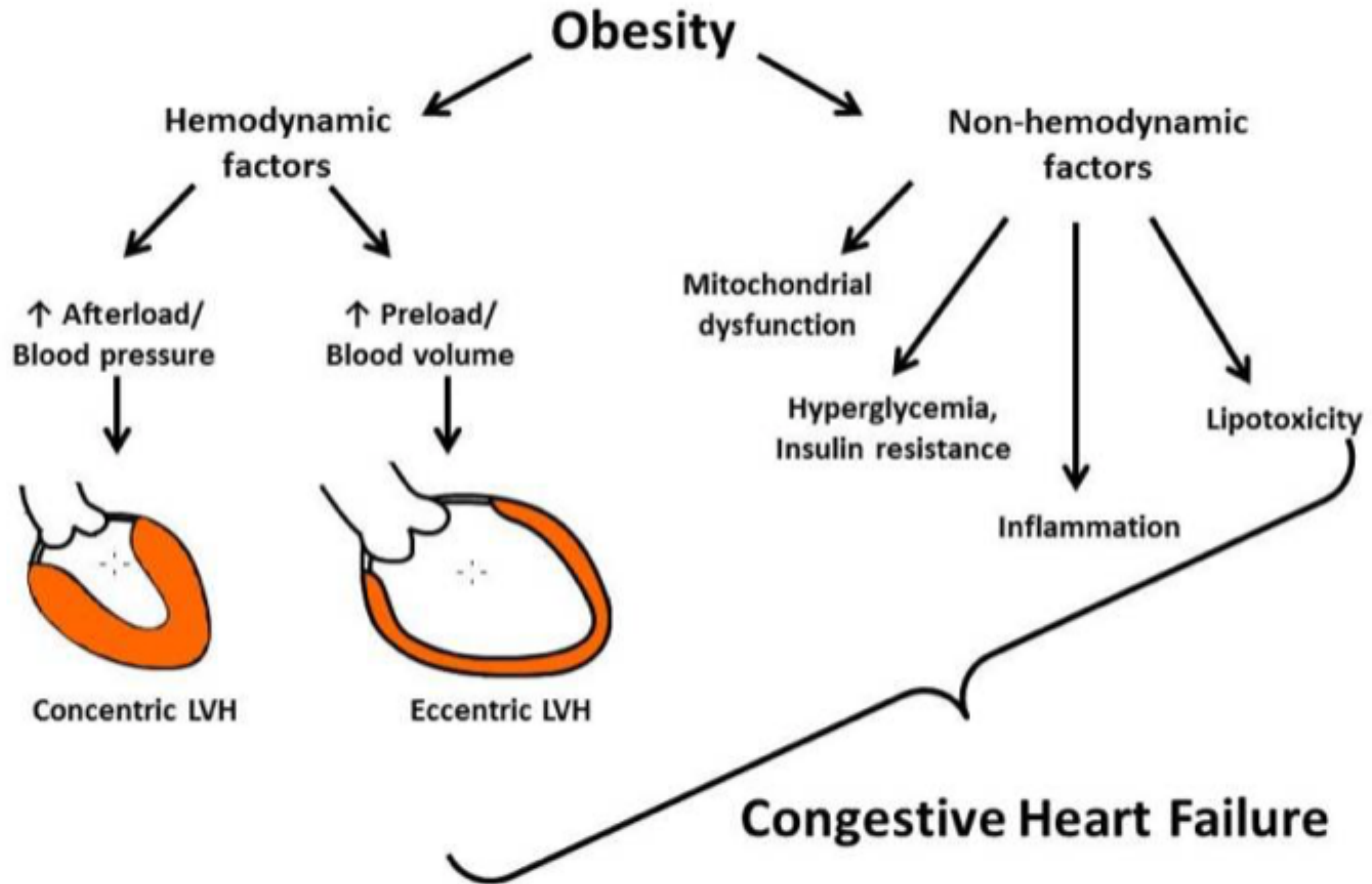
High Homocysteine

High homocysteine causes:

- Arterial inflammation
- Oxidative damage
- Increase in collagen and deterioration of arterial wall elastic material = arterial stiffness
- Reduction of Nitric Oxide production and bioavailability
- Promotion of platelet adhesion - risk of venous thrombosis
- Higher risk of stroke

Ganguly P, Alam SF. Role of homocysteine in the development of cardiovascular disease. Nutr J. 2015;14:6. Published 2015 Jan 10. doi:10.1186/1475-2891-14-6





Infections

Various bacteria and viruses have been shown to have a direct effect on the vascular endothelium as well as an indirect effect by systemic cytokine release, both of which contribute to accelerated atherosclerosis.

Infectious agents that have been linked to atherosclerotic disease include, but not limited to *Chlamydia pneumoniae*, *Porphyromonas gingivalis*, *Helicobacter pylori*, influenza A virus, hepatitis C virus, cytomegalovirus (CMV), and human immunodeficiency virus (HIV).

Numerous studies have shown the presence of bacterial and viral microorganisms in the atherosclerotic plaque.

European Heart Journal, Volume 38, Issue 43, 14 November 2017, Pages 3195–3201, <https://doi.org/10.1093/eurheartj/ehx362>

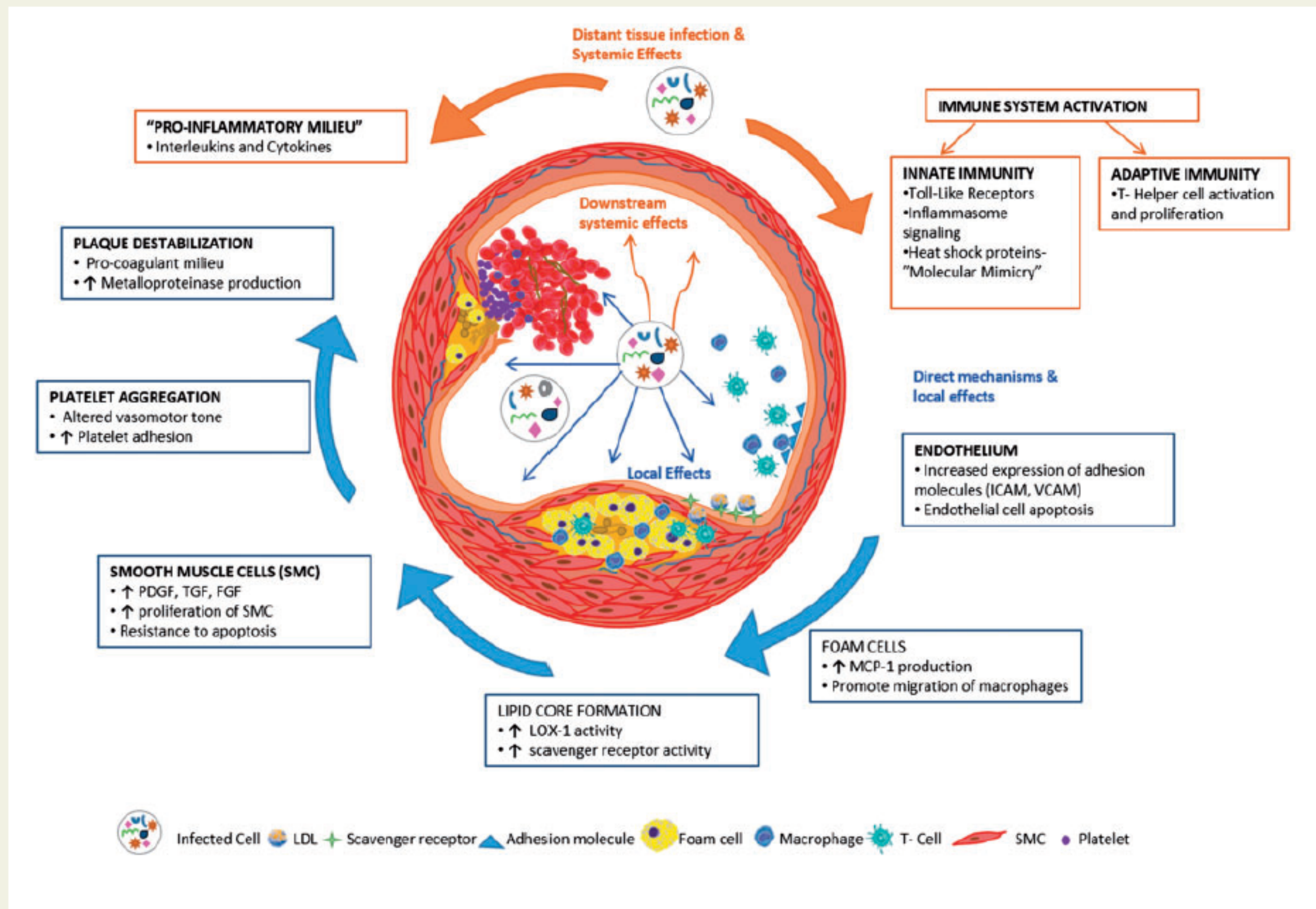
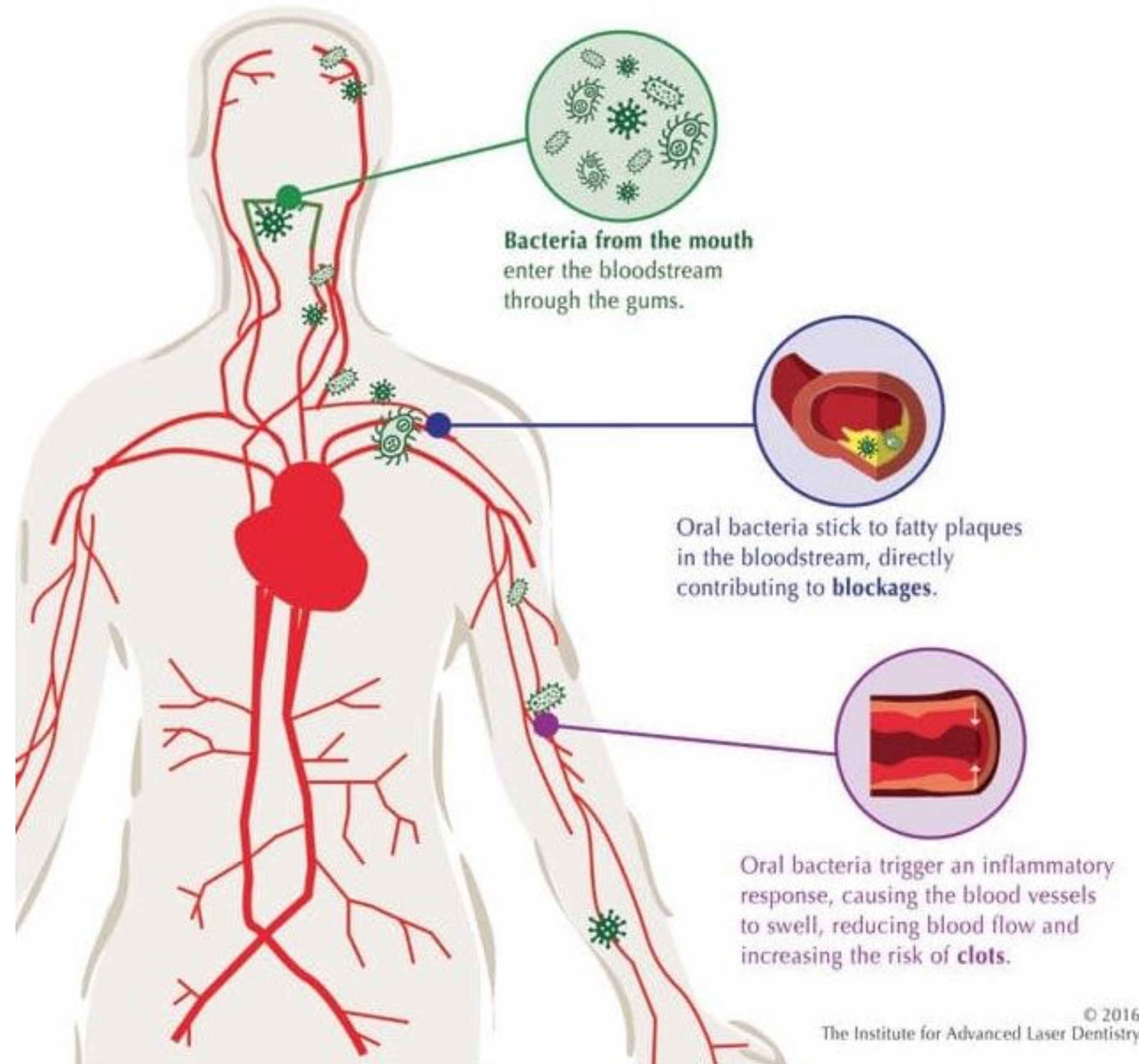


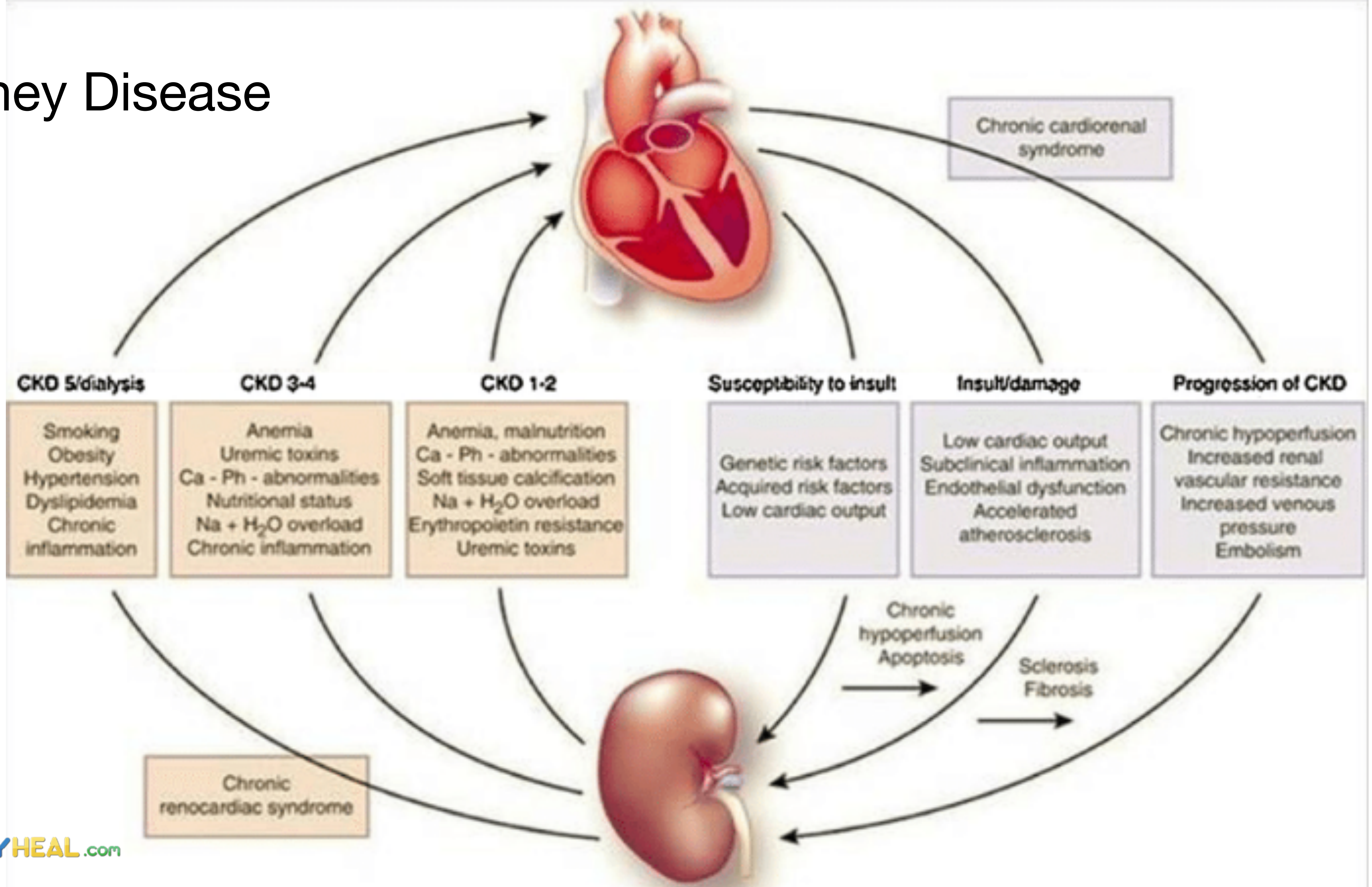
Figure 1 Schematic of various pro-atherosclerotic pathways activated in chronic infection. The blue arrows denote direct effects of the micro-organism on vascular endothelium and the orange arrows depict systemic effects that are pro-atherosclerotic.

Poor Dental Health

The American Dental Association and American Heart Association have acknowledged the relationship between gum disease and heart disease. Gum disease may increase the risk of heart disease because inflammation in the gums and bacteria may eventually lead to narrowing of important arteries.

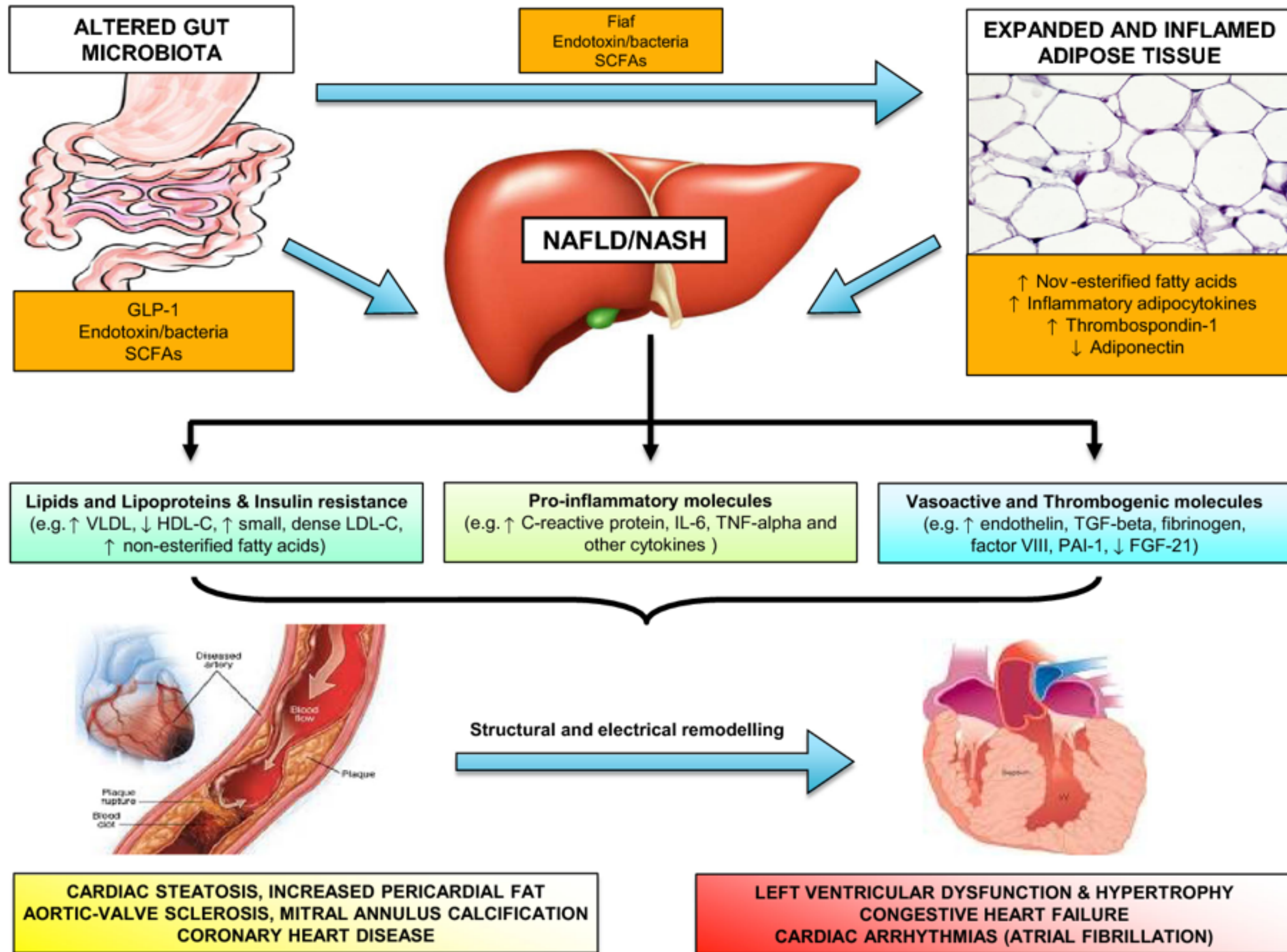


Kidney Disease



Liver Disease

Biological mechanisms linking NAFLD, expanded, and inflamed adipose tissue and altered gut microbiota with cardiovascular and cardiac complications.



Toxins

Recent epidemiological studies have shown that higher urinary BPA concentration in humans is associated with various types of cardiovascular diseases, including angina, hypertension, heart attack and coronary and peripheral arterial disease.



Gao X, Wang HS. Impact of bisphenol a on the cardiovascular system - epidemiological and experimental evidence and molecular mechanisms. Int J Environ Res Public Health. 2014;11(8):8399-8413. Published 2014 Aug 15. doi:10.3390/ijerph110808399

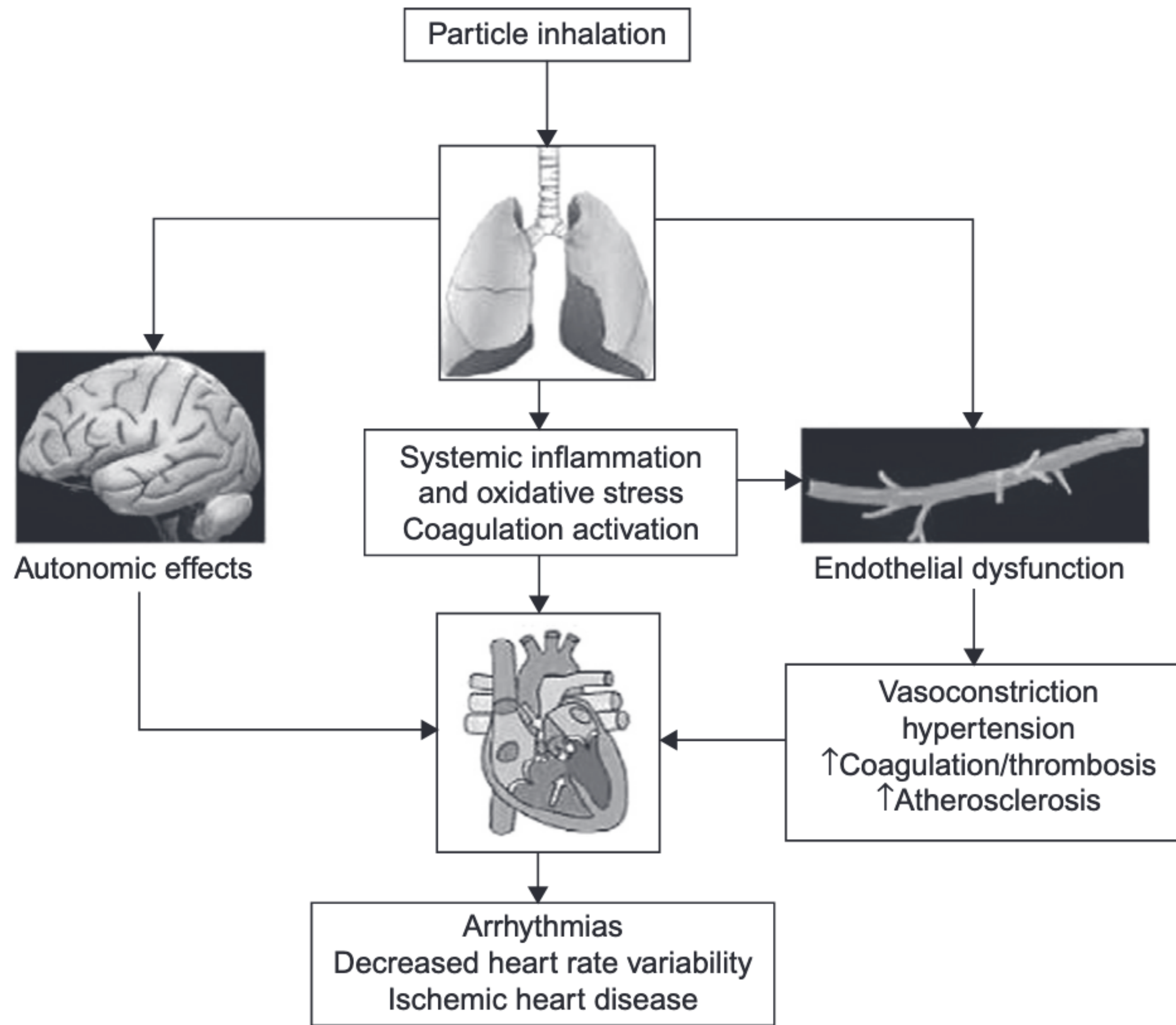
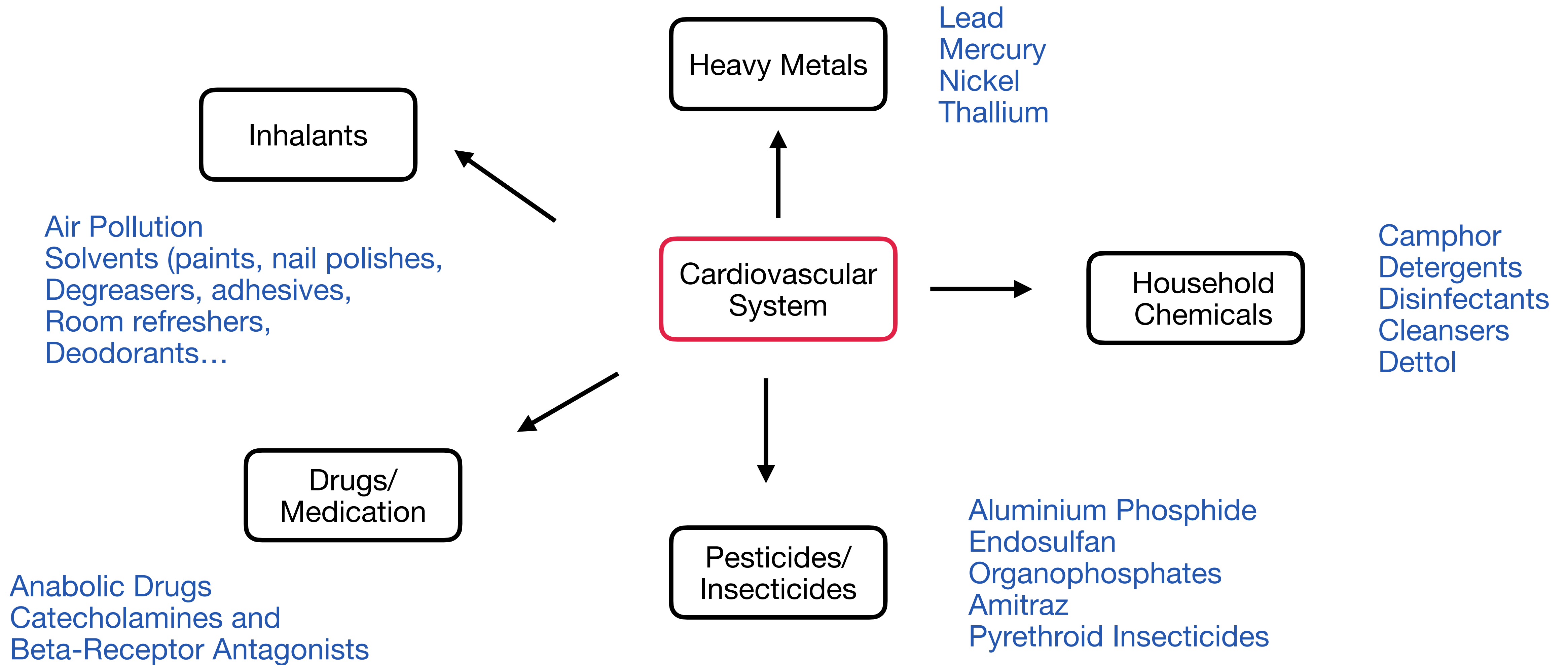


FIGURE 3.1 Effects of particulate matter on the cardiovascular system. Source: *Reproduced with permission from Franchini and Mannucci, 2009.*³⁵

Toxins and the Cardiovascular System





Hormonal Imbalances

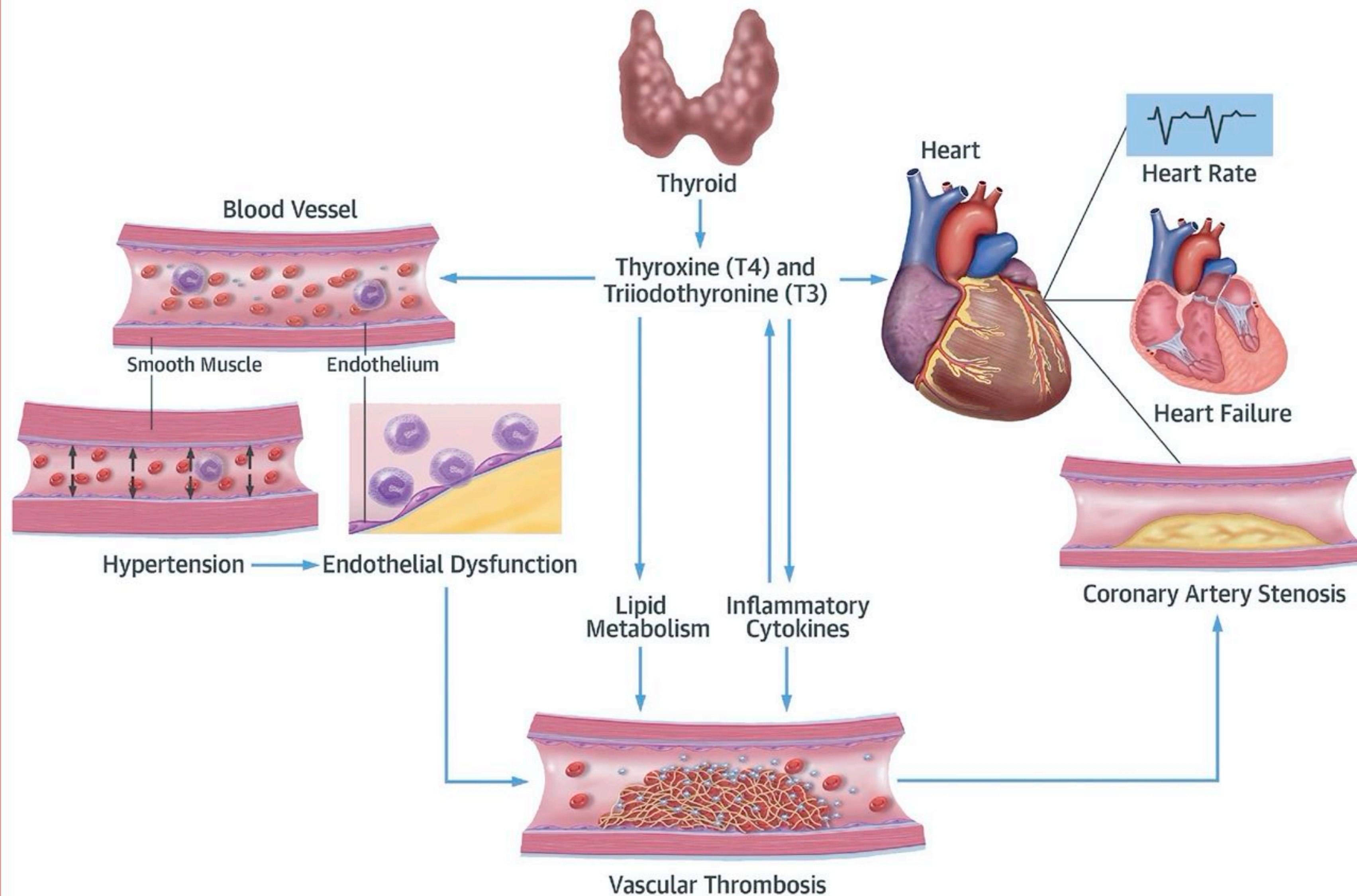
Thyroid:

Blood pressure is altered across the entire spectrum of thyroid disease.

Hyperthyroidism: include increased cardiac output, contractility, tachycardia, widened pulse pressure, decreased systemic vascular resistance, and increased basal metabolic rate.

Hypothyroidism: include decreased cardiac output, narrow pulse pressure, increased systemic vascular resistance, and decreased metabolic rate.

CENTRAL ILLUSTRATION: The Interactions Between Thyroid Hormones and the Cardiovascular System



The Interactions Between Thyroid Hormones and the Cardiovascular System

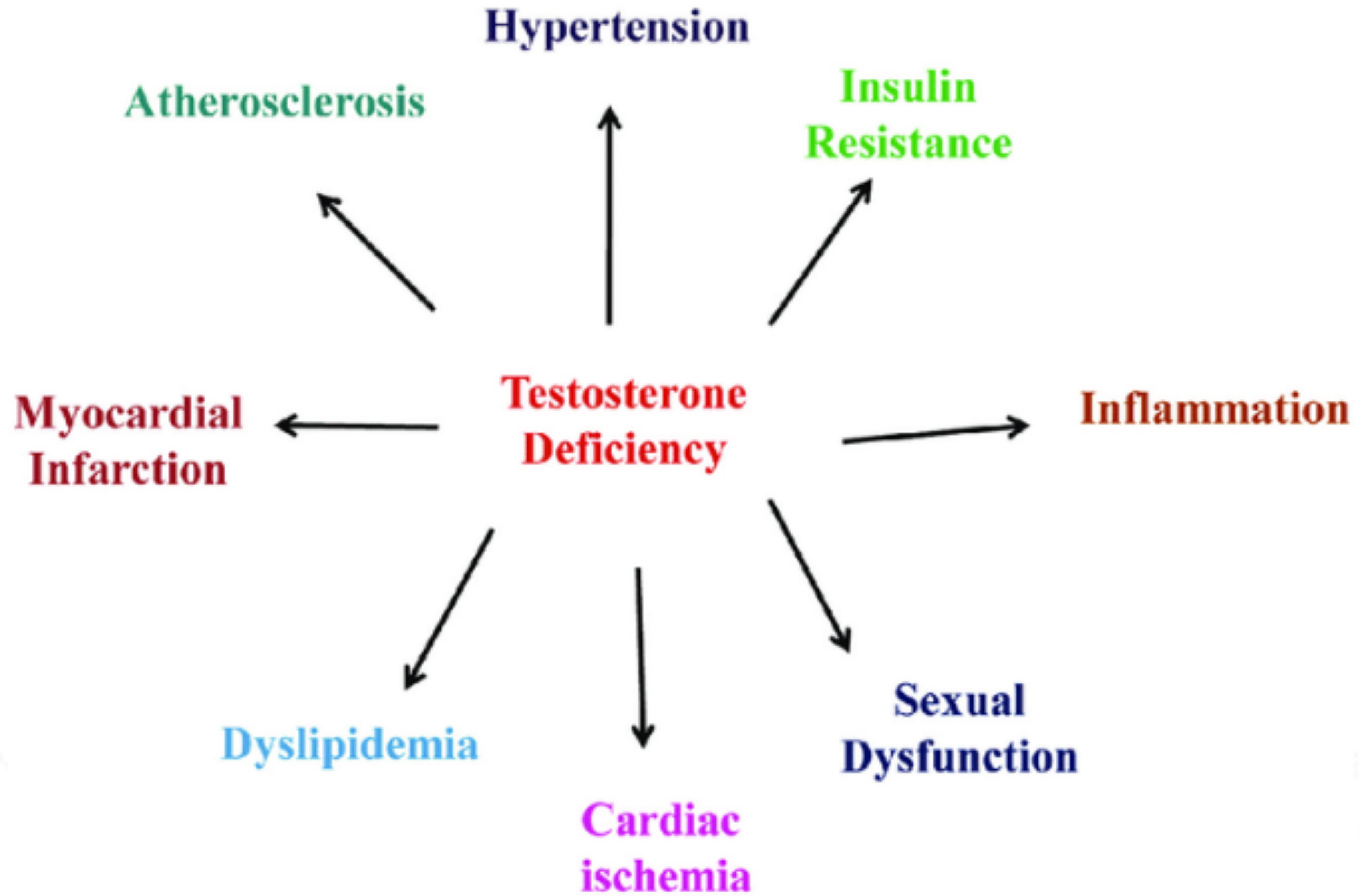
Thyroid hormones (TH) have a complex relationship with the cardiovascular system through multiple mechanisms. The main effects of thyroid hormones are observed on the heart (by influencing rate, rhythm, myocardial contraction, and risk of coronary artery disease), the vascular tree (through regulating blood pressure via smooth muscle tone and endothelial function), and by direct effects on cardiovascular risk factors (via lipid metabolism and modulation of inflammatory pathways).

Hormonal Imbalances

Sex hormones:

Several studies have indicated that estrogens might have cardio-protective actions on myocardial contractility through its modulator effects on NO generation.

Due to this fact cardiovascular disease risk rises for women after menopause. More recent studies of women, such as the Heart and Estrogen/progestin Replacement Study (HERS) and the Women's Health Initiative (WHI) concluded overall health risks exceeded the benefits provided by HRT. Women who participated in the WHI showed an increased risk for breast cancer, coronary heart disease (including nonfatal heart attacks), stroke, blood clots and gall bladder disease. Based on the results of these studies, HRT is not indicated for cardiovascular risk reduction.



Association of testosterone deficiency and cardiovascular risk factors.

Hormonal Imbalances

Epinephrine, norepinephrine, B-type natriuretic peptide, renin, angiotensin II, aldosterone, endothelin and estrogen as in table. In addition to their hemodynamic effects, hormones affect the cardiovascular system through non-hemodynamic mechanisms including inflammation, oxidative stress, and metabolic effects.

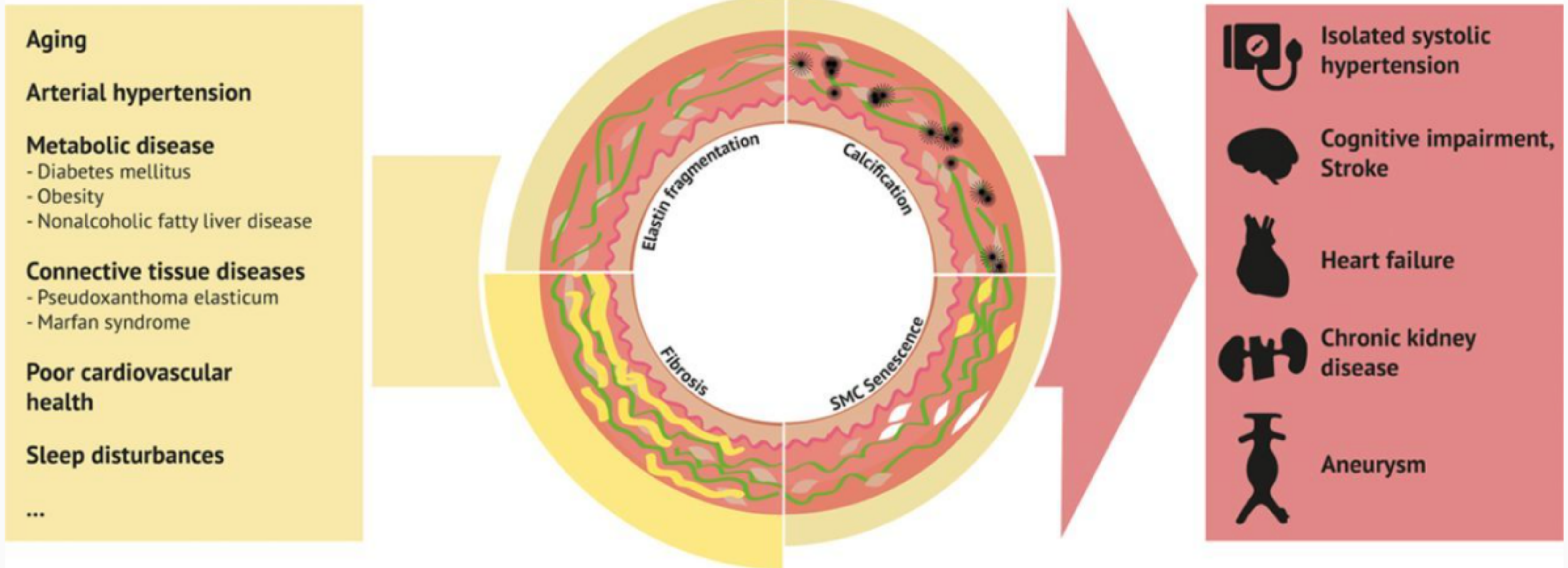
Table 1 Effects of hormones on the circulatory system.

	Target	SVR	HR	SNS	Oxidative Stress	CRP
Epinephrine	EC,VSMC	(↑↓)	↑	↑	(↑↓)	↑
Norepinephrine	VSMC	↑	↑	↑	↑	↓
BNP	EC,VSMC	↓	↔	↓	ND	ND
Angiotensin II	EC,VSMC	↑	(↑↓)	↑	↑	↔
Aldosterone	EC,VSMC	↑	↔	ND	↑	↔
Endothelin	VSMC	↑	(↑↓)	↑	↑	↑
Estrogen	EC	↓	↔	↓	↓	↑

SVR, systemic vascular resistance; HR, heart rate; SNS, sympathetic nervous system; CRP, C-reactive protein; EC, endothelial cells, VSMC, vascular smooth muscle cell. Autonomic changes are assessed via HR variability, sympathetic nervous system (SNS) activity, or norepinephrine plasma levels. Oxidative stress is assessed by isoprostane levels in serum. The state of inflammation is assessed by CRP levels

Hall ME, Yanes L, Long RC, et al. Hormones of the Cardiovascular System. [Updated 2015 Feb 6]. In: Feingold KR, Anawalt B, Boyce A, et al., editors. Endotext [Internet]. South Dartmouth (MA): MDText.com, Inc.; 2000-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK279096/>

Arterial Stiffness

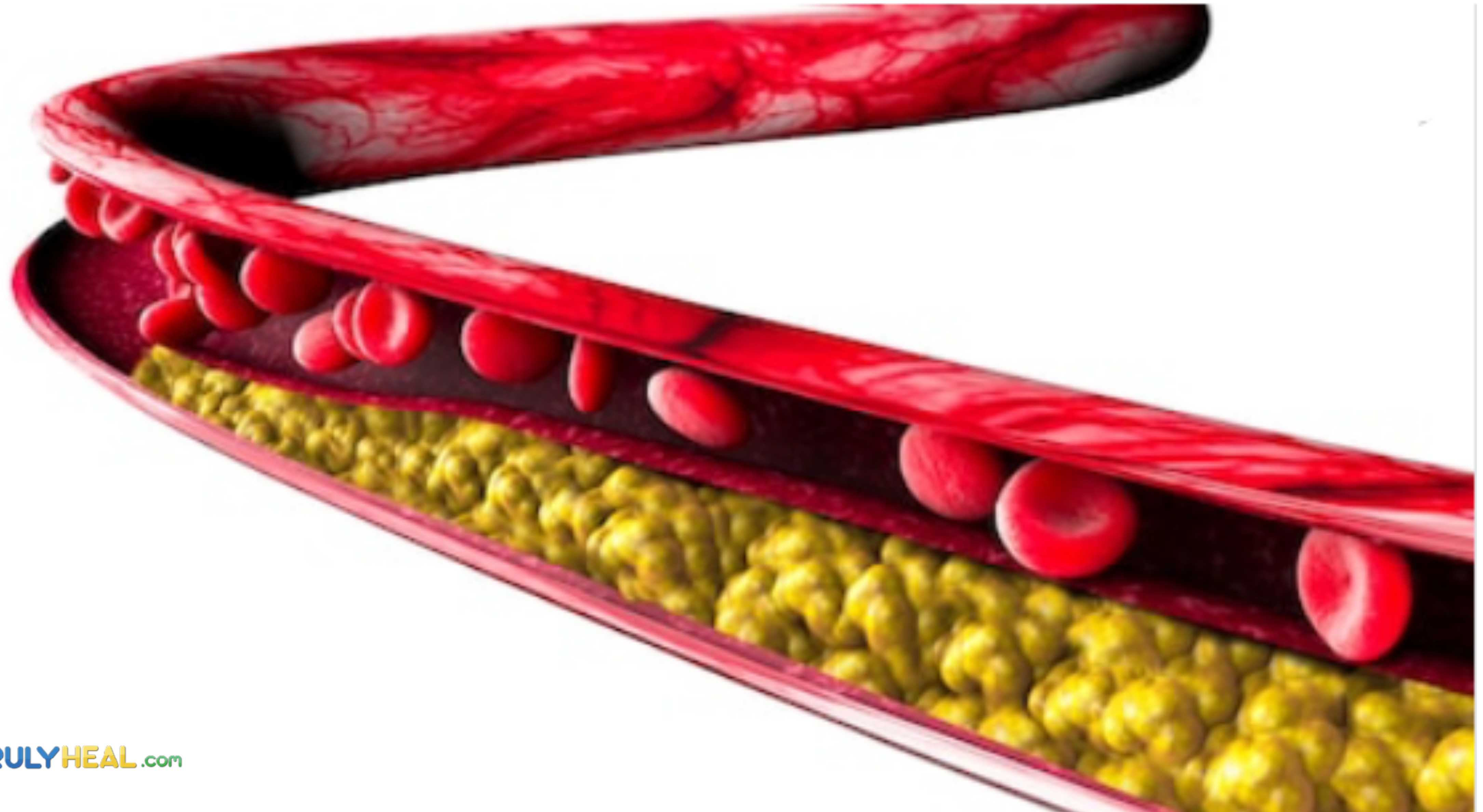


High Cholesterol



- Many people who have heart attacks are on cholesterol lowering medications
- Research shows that people that have cholesterol lower than 180mg/dl are three times more likely to have a stroke
- There is clearly more to this problem than simply lowering cholesterol

High Cholesterol

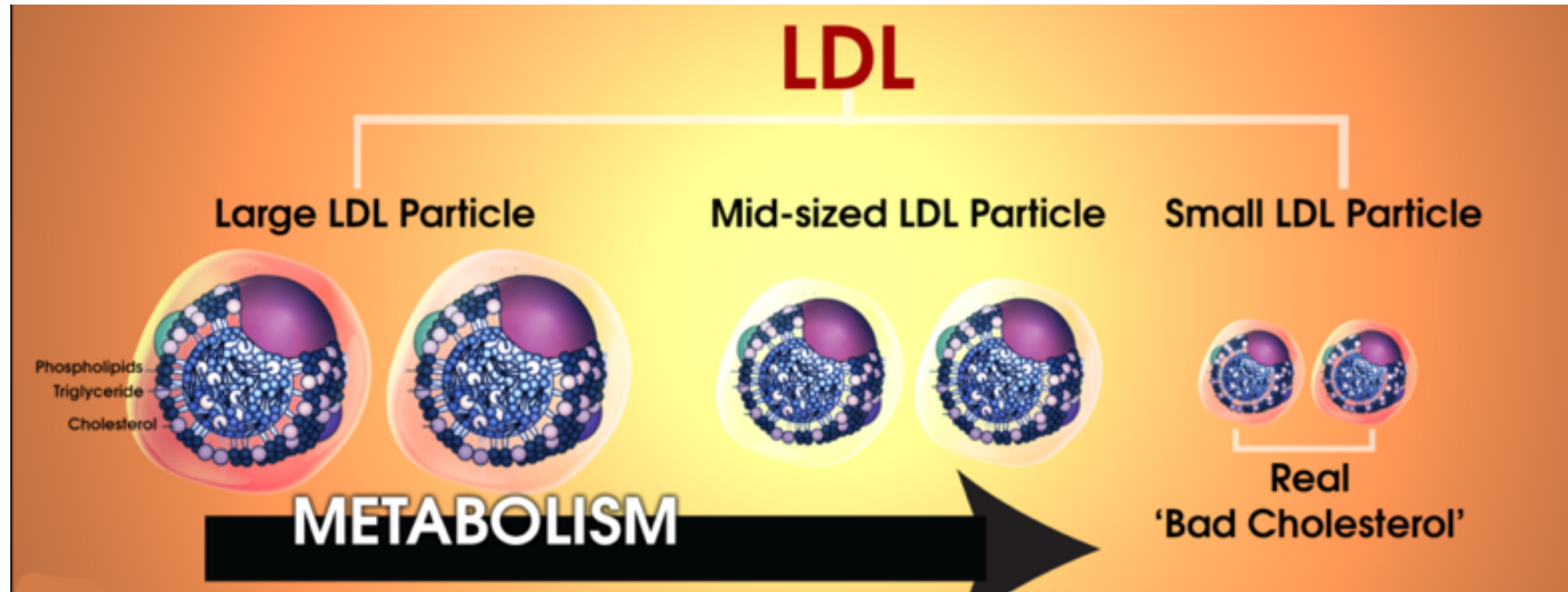


What is Cholesterol?

- Cholesterol is one of the most important molecules in your body and serves many necessary functions.
- Cholesterol is a fat molecule manufactured by every animal cell, a building block of each cell membrane (enables membrane fluidity/movement without tearing)
- Cholesterol is also needed for making vitamin D, steroid and sex hormones (oestrogen, progesterone and testosterone and bile acids for digesting fats and other substances in the intestine.
- Around 25% of the cholesterol in our bodies is found in the brain. In fact, high cholesterol levels are linked to better cognitive function in the elderly

Lipids

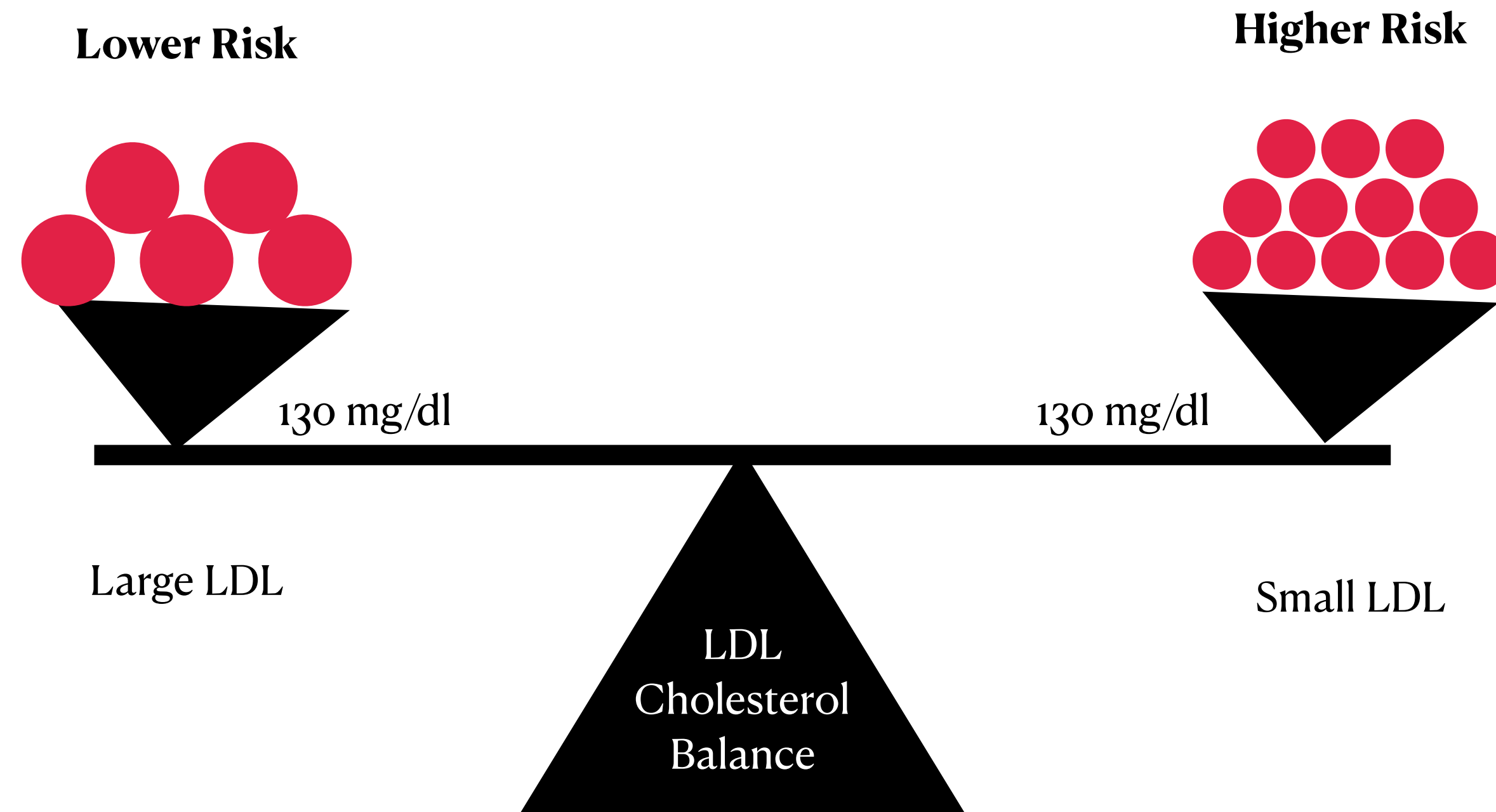
- Cholesterol is a lipid. Lipids are fats and fatty substances used by the body as a source of energy. Lipids include cholesterol, triglycerides, high-density lipoprotein (HDL), low-density lipoprotein (LDL), and very low-density lipoprotein (VLDL).



LDL

Large buoyant LDL particles carry a high volume of the antioxidant Vitamin E, which helps to fend off free radicals. They pose only a very small chance of being oxidized while traveling through the circulatory system.

Small Lipoproteins are dense and carry less anti-oxidant protection.



Statin Drugs

Statins work by preventing the function of an enzyme in the liver that makes both cholesterol and CoQ10.

CoQ10 is an absolute requirement for energy production, oxygen combustion, and protection of your mitochondria.

CoQ10 deficiency is a major cause of Congestive Heart Failure.



Testing

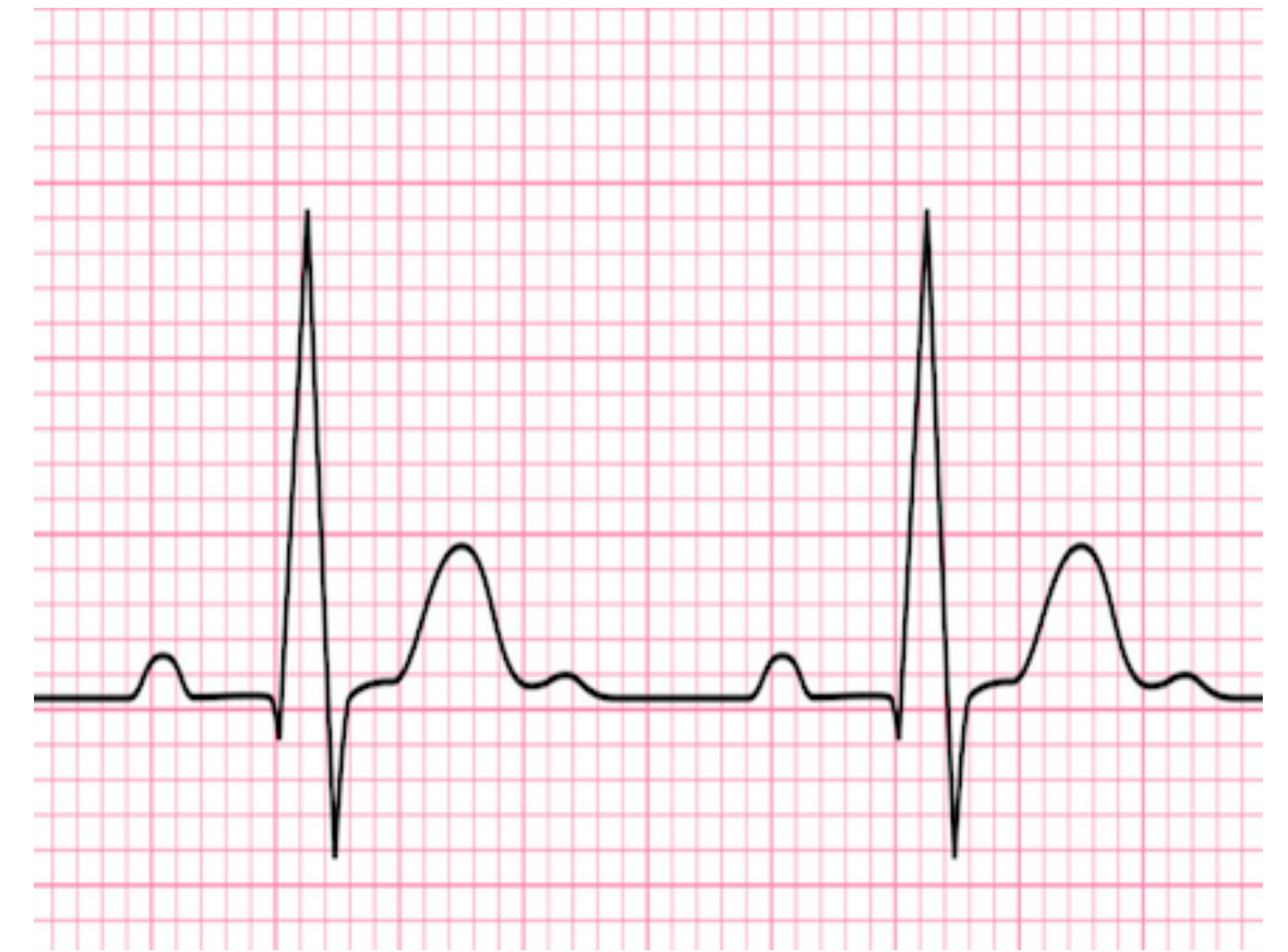
In blood:

- **hs-CRP** (non specific inflammatory marker optimal less than 0.5 mg/L for men and less than 1.0 mg/L for women)
- **Homocysteine** optimal below 8umol/L
- **Omega 3 fatty acid test**, ideal omega-6 to omega-3 ratio is less than 4:1
- **Vitamin D** optimal 80-120 ng/mL
- **Fibrinogen** (a protein in the blood that plays an important role in blood clotting target level: 295-369mg/dl)
- **Amyloid A (SAA)** protein produced in liver in response to infection and inflammation. Plays a direct role in development of atherosclerosis

Testing

Medical test:

- **Blood Pressure** measured electronically
- **Chest X- ray** to visualize heart failure
- **Electrocardiogram (ECG)** to detect the heart's electrical activity
- **Echocardiogram (echo)** to determine the size and shape of the heart and identify poor blood flow or irregular muscle contractions in the heart
- **Computed topography (CT)** scanning to display hardened or narrow arteries in heart
- **Angiography, magnetic resonance imaging (MRI), and positron emission tomography (PET)** to help visualise arterial plague.



Diet

- Anti-inflammatory Diet
- Avoiding food allergies and sensitivities

Beneficial Heart Foods

- Vegetables high in antioxidants
- Fruits especially berries, grapes
- Salmon (high Omega 3s)
- Garlic
- Dark Chocolate
- Beets
- Ginger, tumeric, green tea



Exercise

An appropriate amount of exercise is a viable means to effectively manage the primary risk factors associated with CHD.

- Improvement in muscular function
- Better uptake in oxygen
- Better vascular wall function
- Reduction in blood pressure
- Increase in HDL cholesterol
- Reduction of weight



Stress Reduction

Get enough sleep. Lack of sound sleep can affect your mood, mental alertness, energy level, and physical health.

Learn relaxation techniques. Meditation, progressive muscle relaxation, guided imagery, deep breathing exercises, and yoga are mainstays of stress relief.

Nurture yourself. Treat yourself to a massage. Eat slowly, focusing on each bite of that orange, or soak up the warm rays of the sun or the scent of blooming flowers during a walk outdoors. Take a nap. Enjoy the sounds of music you find calming.



Beneficial Supplementation

Anti-inflammatory

- Omega 3 fatty acids, Fish oil with at least 1500 mg EPA/DHA combined daily
- Proteolytic Enzymes

Arterial cleansing

- Nattokinase, Serrapeptase

Nitric Oxide production

- L-arginine
- Noni Extract



Beneficial Supplementation

Reducing endothelial damage

- Methylating supplements: Folate, Vitamin B6, 12, TMG, SAMe

Anti-oxidants

- Pomegranate, grape seed extract, pycnogenol, resveratrol, green tea extract, quercetin

Vitamins:

- Vitamin K for reducing calcification
- Vitamin D for reducing factors that promote hypertension



Beneficial Supplementation

Endothelial function

- Ginkgo Biloba

Heart health / Hypertension

- Hawthorn berry
- Garlic
- Olive leaf

Lowering Cholesterol

- Magnesium: Activates an enzyme, called LCAT, which activates HDL (good) cholesterol, and reduces LDL (bad) cholesterol and triglycerides.





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