

**Ch. 17: BLOOD**

**Ch. 18: HEART**

**Ch. 19: BLOOD VESSELS**

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# Blood Composition

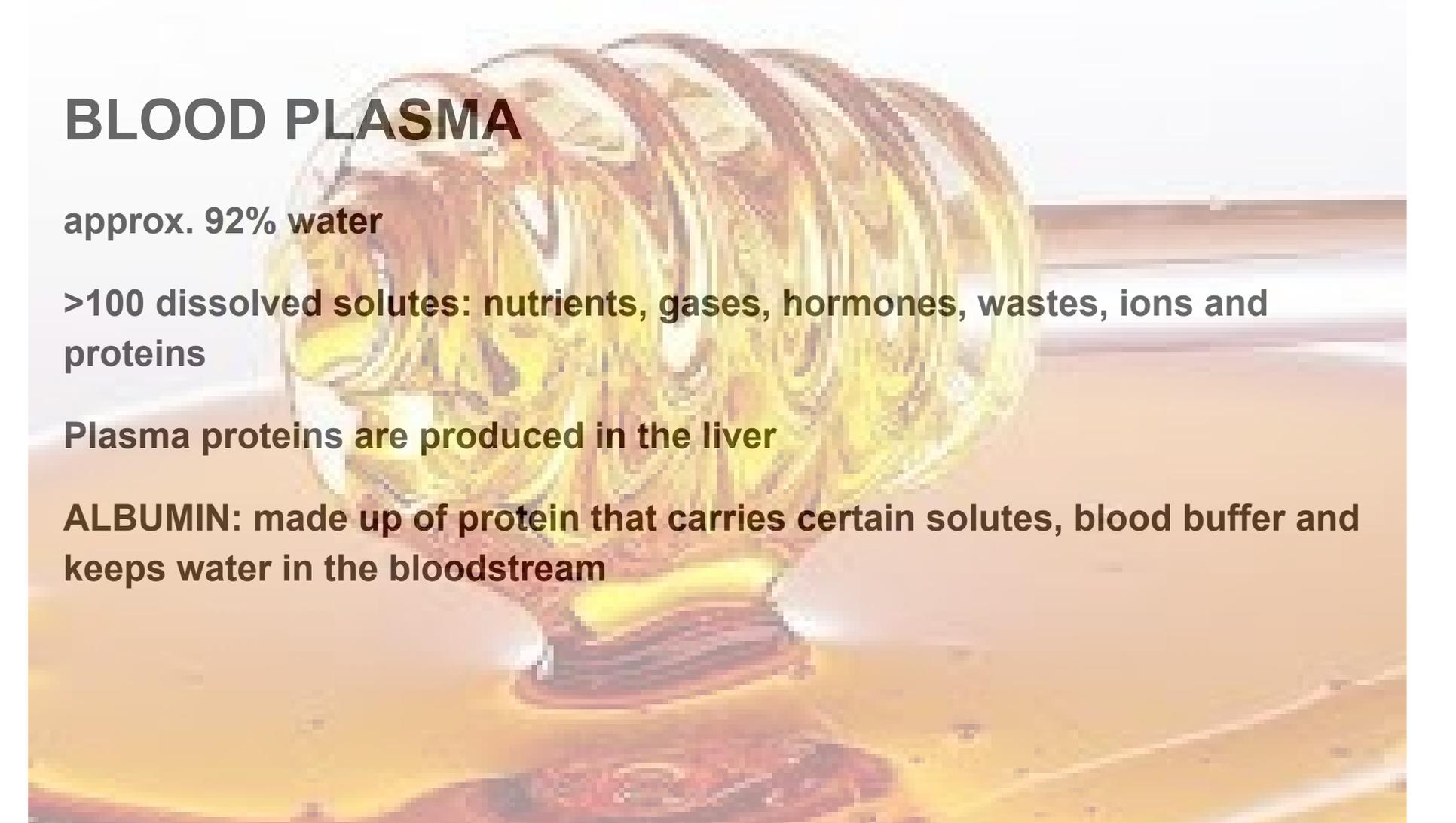
**Connective Tissue made up of Formed Elements and Plasma**

**HEMATOCRIT: 45% RBC + 55% Plasma + <1% leukocytes & platelets**

**Formed Elements: solid portion of blood composed of living cells: RBC, WBC and Platelets**

**Plasma: blood matrix of 92% water; known as the non-living portion**

# **BLOOD PLASMA**

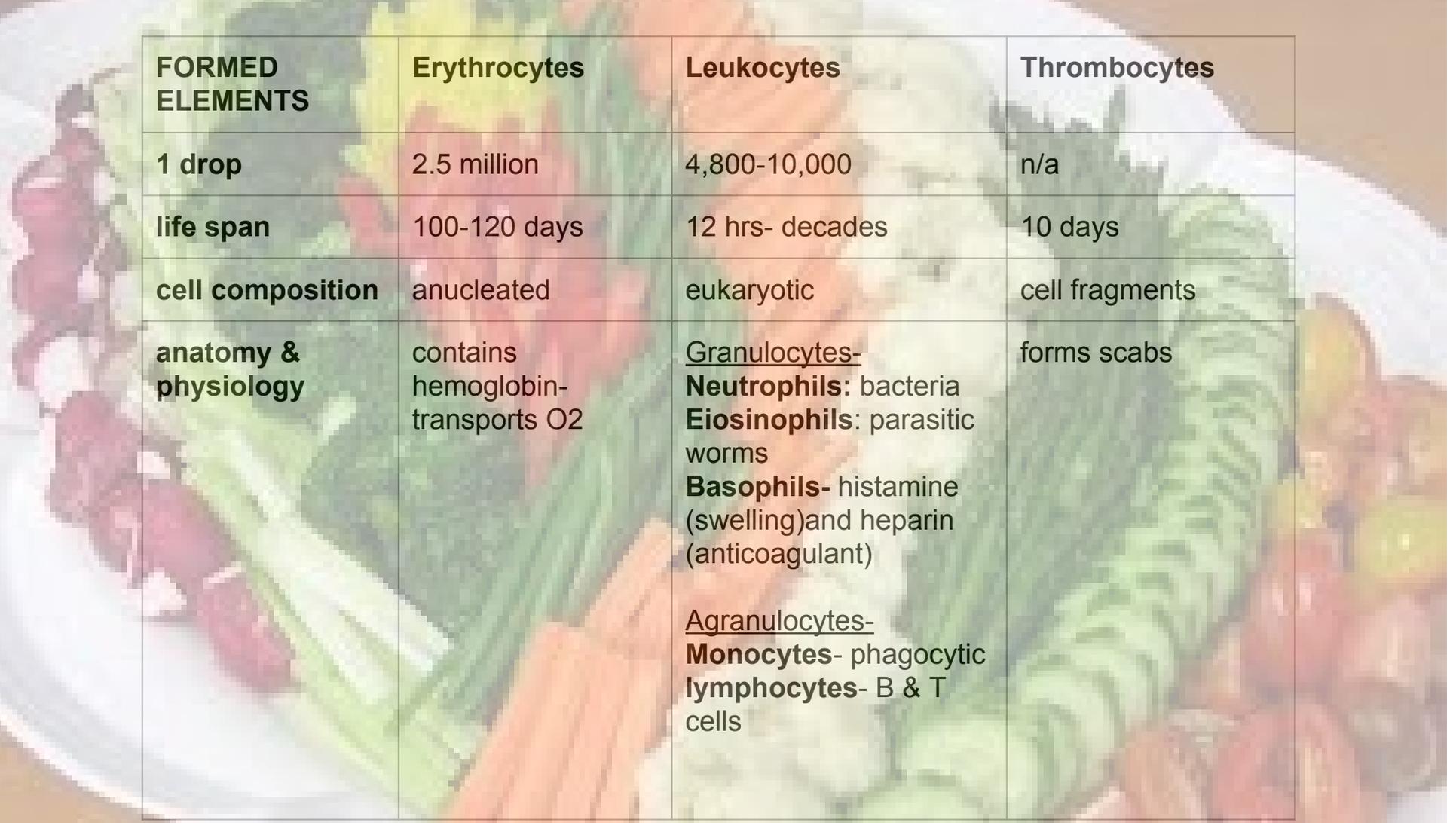


**approx. 92% water**

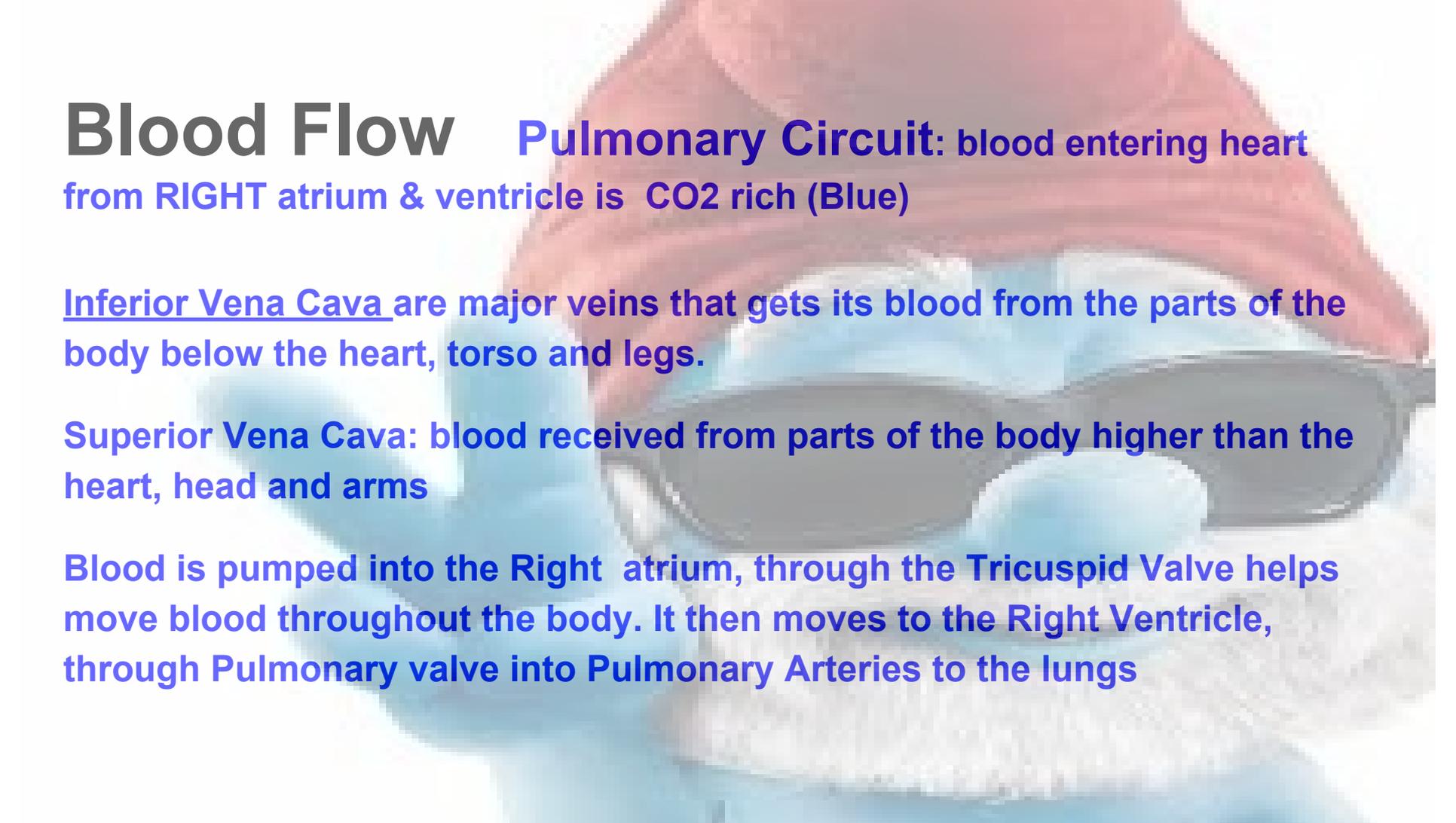
**>100 dissolved solutes: nutrients, gases, hormones, wastes, ions and proteins**

**Plasma proteins are produced in the liver**

**ALBUMIN: made up of protein that carries certain solutes, blood buffer and keeps water in the bloodstream**



FORMED ELEMENTS	Erythrocytes	Leukocytes	Thrombocytes
1 drop	2.5 million	4,800-10,000	n/a
life span	100-120 days	12 hrs- decades	10 days
cell composition	anucleated	eukaryotic	cell fragments
anatomy & physiology	contains hemoglobin- transports O <sub>2</sub>	<u>Granulocytes-</u> <b>Neutrophils:</b> bacteria <b>Eosinophils:</b> parasitic worms <b>Basophils-</b> histamine (swelling) and heparin (anticoagulant)  <u>Agranulocytes-</u> <b>Monocytes-</b> phagocytic <b>lymphocytes-</b> B & T cells	forms scabs

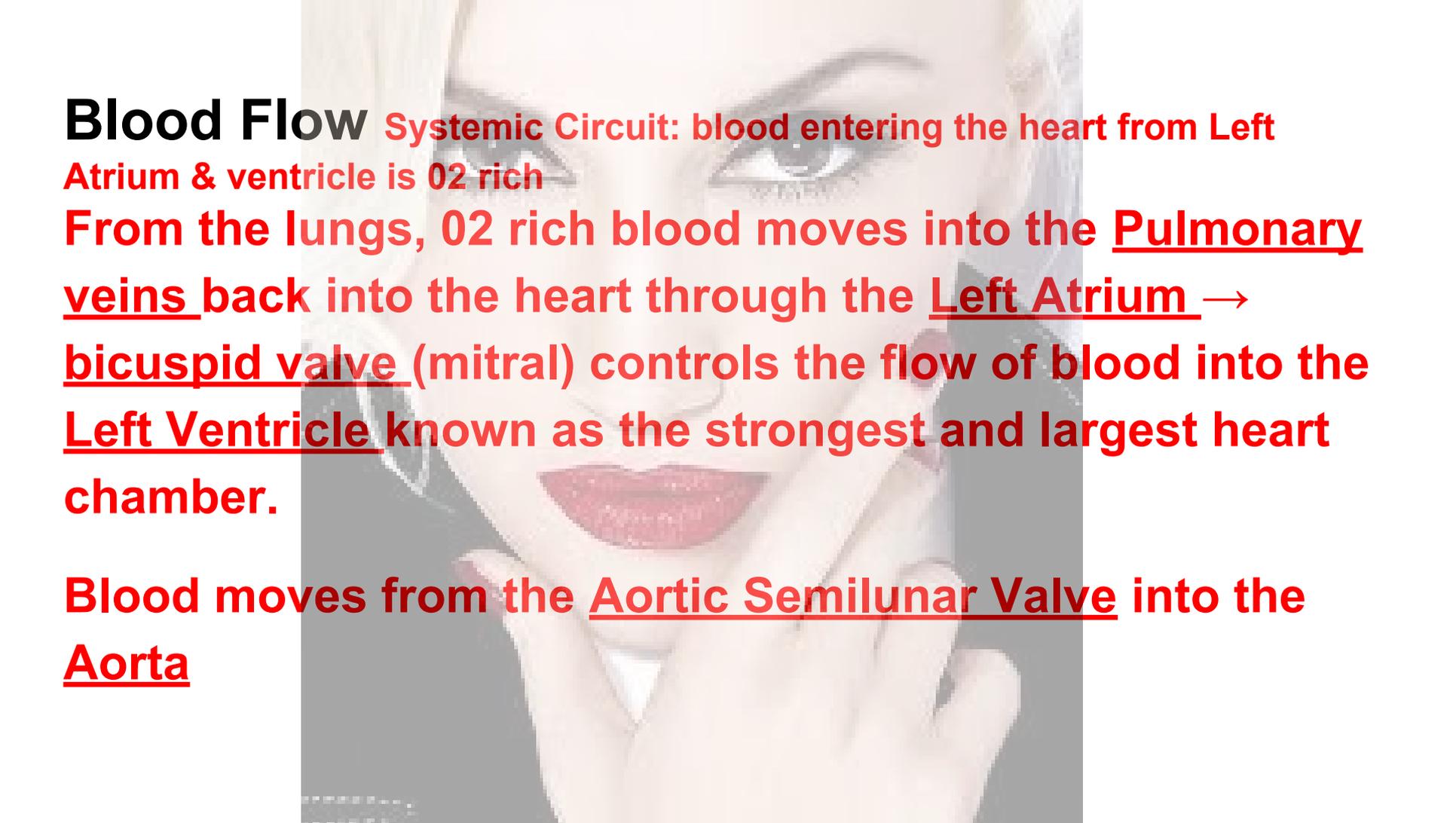


**Blood Flow**    **Pulmonary Circuit:** blood entering heart from RIGHT atrium & ventricle is CO<sub>2</sub> rich (Blue)

Inferior Vena Cava are major veins that gets its blood from the parts of the body below the heart, torso and legs.

**Superior Vena Cava:** blood received from parts of the body higher than the heart, head and arms

Blood is pumped into the Right atrium, through the Tricuspid Valve helps move blood throughout the body. It then moves to the Right Ventricle, through Pulmonary valve into Pulmonary Arteries to the lungs



**Blood Flow** Systemic Circuit: blood entering the heart from Left Atrium & ventricle is O<sub>2</sub> rich

From the lungs, O<sub>2</sub> rich blood moves into the Pulmonary veins back into the heart through the Left Atrium → bicuspid valve (mitral) controls the flow of blood into the Left Ventricle known as the strongest and largest heart chamber.

Blood moves from the Aortic Semilunar Valve into the Aorta



# **Blood Transfusion**

**Whole blood transfusions occur when blood loss is rapid & substantial**

**Donated blood is separated and an anticoagulant (citrate or oxalate salts) is added to prevent binding**

**SHELF LIFE: 35 days**

**PACKED RED CELLS-** is used for restoring oxygen carrying capacity. The plasma is removed

# Human Blood Groups

Incompatible blood can be fatal- antigens will agglutinate and destroy the blood cells.

Blood is identified by their antigens (identify foreign material) and are known as AGGLUTINOGENS

AGGLUTINOGENS- A and B Rh= C,D & E antigens

O- does not have agglutinogens

O= 45%      A= 40%      B=11%      AB=4%      Rh+= 85%

# DONATING BLOOD

Blood donations can be made approx. every 12 weeks

Males- every 3 months      Females- every 4 months

Less than 1 pint (450 ml) is donated (made up within 24 hrs)

Types of donations:

Whole blood and Apheresis (uh-fair-iss-us): blood components (platelets, plasma, RBC)

# Homeostatic Imbalances of Formed Elements

<b>Anemia</b>	<b>blood with low O<sub>2</sub> carrying capacity</b>	<b>Iron supplements</b>
<b>Polycythemia</b>	<b>too many RBC, &gt; viscous</b>	<b>removing rbc &amp; adding saline</b>
<b>Blood doping</b>	<b>removal of rbc and reinjected</b>	<b>get some MORALS</b>
<b>Leukopenia</b>	<b>low wbc count</b>	
<b>Leukemia</b>	<b>red bone marrow becomes filled with cancerous leukocytes</b>	

# When to NOT donate blood....wait!

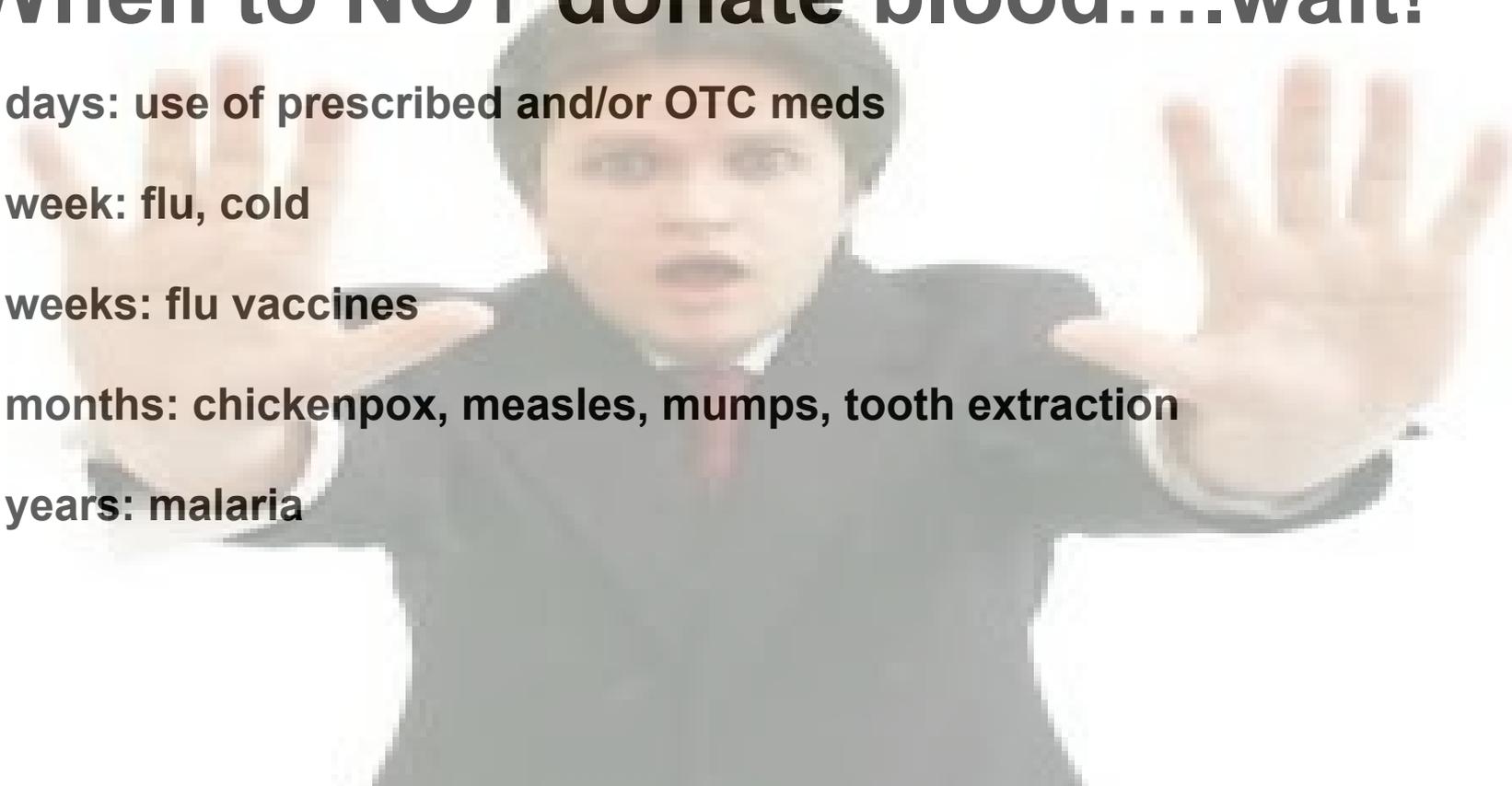
**3 days: use of prescribed and/or OTC meds**

**1 week: flu, cold**

**2 weeks: flu vaccines**

**6 months: chickenpox, measles, mumps, tooth extraction**

**3 years: malaria**



# **Diagnostic Blood Tests**

**Evaluates a person's current state of health**

**Anemia: iron deficiency; irregular shaped RBCs**

**Lipidemia: high fat content**

**WBC count: high # of a particular leukocyte indicates an infection or allergic response**

**SMAC: blood chemistry profile**

**CBC: complete blood count**

# CH 18- The Heart

Size: 250-350 grams (a fist)

Location: medial cavity of the thorax in the **MEDIASTINUM**

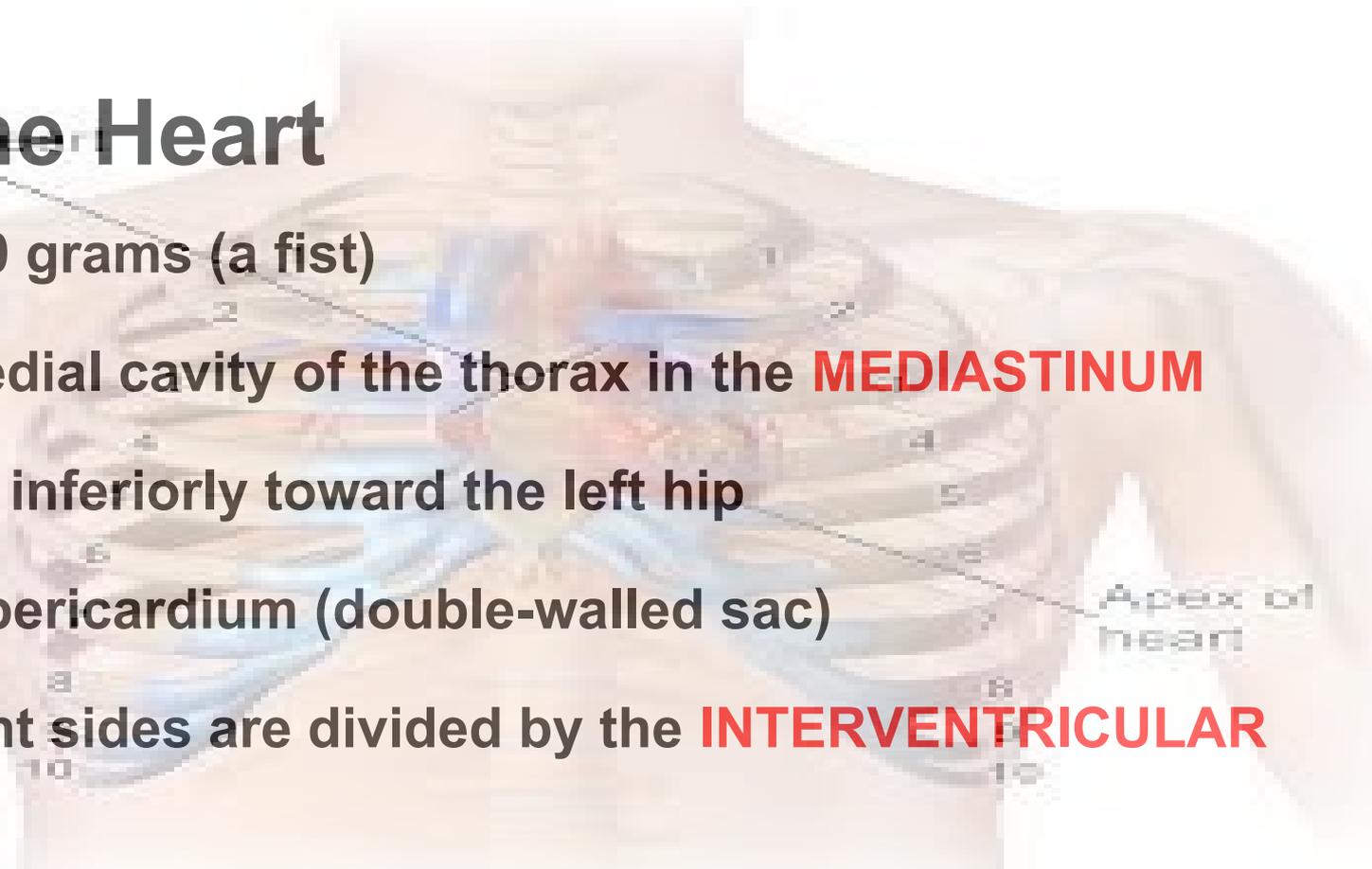
**APEX** points inferiorly toward the left hip

Covered by pericardium (double-walled sac)

Left and Right sides are divided by the **INTERVENTRICULAR SEPTUM**

Apex of heart

Heart Position Relative to the Rib Cage



# Heart Anatomy- Atria: Receiving Chambers

3 VEINS: Superior & Inferior Vena Cava, Coronary Sinus

4 Pulmonary veins are paired on both sides: transport blood from lungs back to the heart

# Heart Anatomy- Ventricles: Discharging Chambers

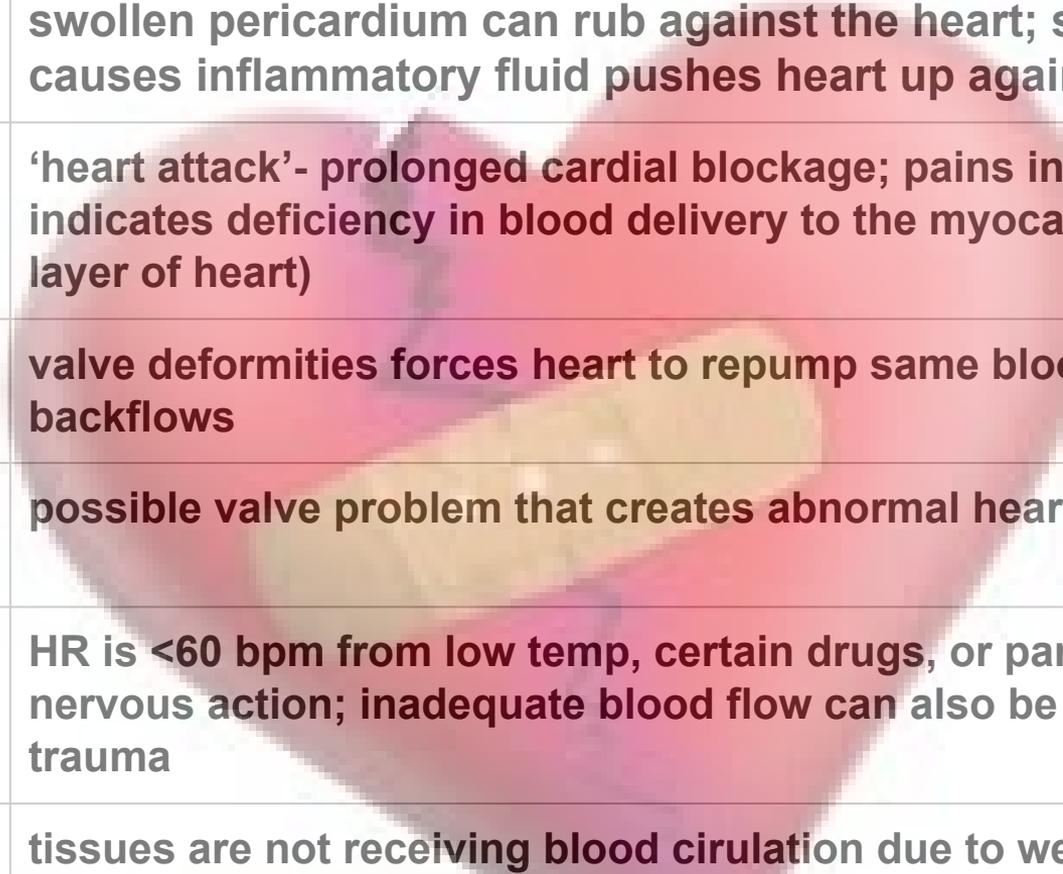
Known as the actual pumps of the heart

Ventricular walls are more massive than the atria.

Right Ventricle pumps blood into the pulmonary trunk → pumps blood to the lungs- CO<sub>2</sub> is unloaded and picks up O<sub>2</sub>

Blood in the Left Ventricles transported into the Aorta

# Homeostatic Imbalances of the Heart



<b>Pericarditis</b>	swollen pericardium can rub against the heart; serious cases causes inflammatory fluid pushes heart up against the wall
<b>Myocardial Infarction</b>	'heart attack'- prolonged cardiac blockage; pains in the chest indicates deficiency in blood delivery to the myocardium (superficial layer of heart)
<b>Leaky valves</b>	valve deformities forces heart to repump same blood over and backflows
<b>Heart Murmurs</b>	possible valve problem that creates abnormal heart sounds
<b>Bradycardia</b>	HR is <60 bpm from low temp, certain drugs, or parasympathetic nervous action; inadequate blood flow can also be a warning of brain trauma
<b>Congestive Heart Failure</b>	tissues are not receiving blood circulation due to weak myocardium from: atherosclerosis, high BP, MI, and weak ventricular muscles

# **Vessels**

## **ARTERIES:**

**Carry blood away from the heart**

**Descriptive: branch, diverge, fork**

## **VEINS:**

**carry blood towards the heart**

**Descriptive: join, merge, converge**

## **CAPILLARIES:**

**has direct contact with tissue cells**

# Ch. 19- Blood Vessels

**3 types: arteries, capillaries and veins**

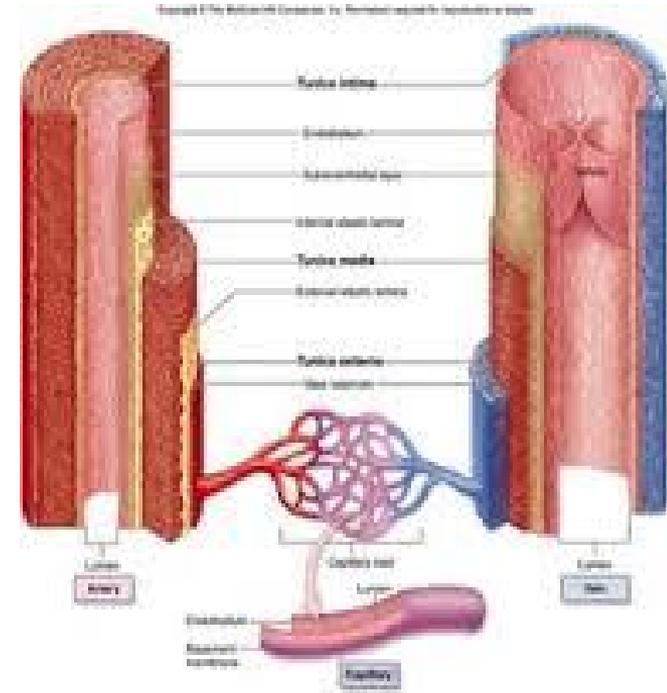
**3 tunics (layers) in arteries and veins**

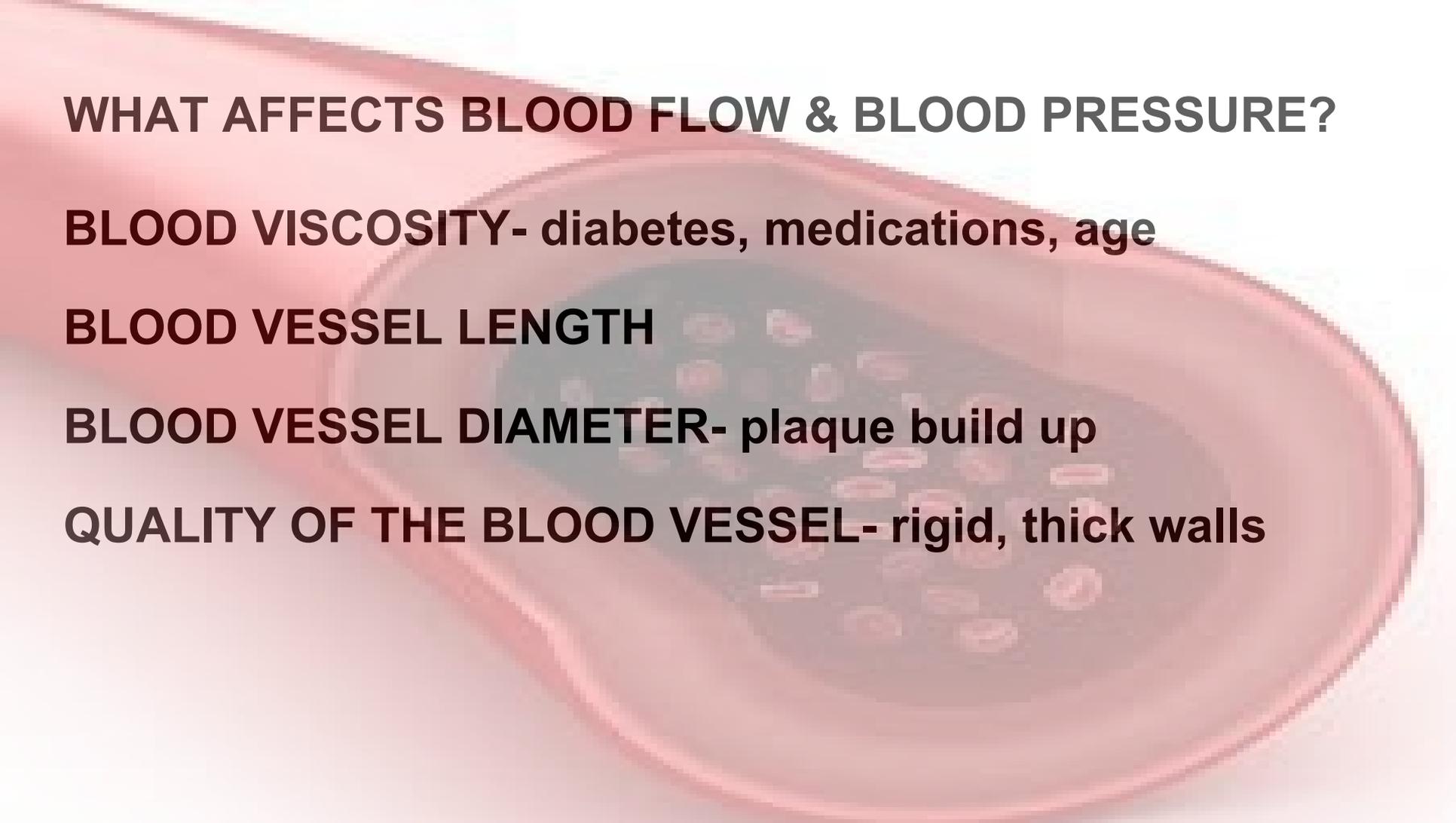
**Tunica Intima**

**Tunica Media**

**Tunica Externa**

**Lumen is the diameter of the tunica intima**





# **WHAT AFFECTS BLOOD FLOW & BLOOD PRESSURE?**

**BLOOD VISCOSITY-** diabetes, medications, age

**BLOOD VESSEL LENGTH**

**BLOOD VESSEL DIAMETER-** plaque build up

**QUALITY OF THE BLOOD VESSEL-** rigid, thick walls

ARNOLD SCHWARZENEGGER

# **Maintaining Blood Pressure- changing levels of CO<sub>2</sub> & O<sub>2</sub>**

**3 VARIABLES affected by the Nervous System:**

**Cardiac Output (CO)- stroke volume x heart rate (5.0-5.5 L/min)**

**Peripheral Resistance- blood vessel diameter**

**Blood Volume- blood distribution**

# Hormonal Controls

**Adrenal medulla hormones: during short-termed stress AND nicotine products, epinepherine and norepinepherine are released**

**Renal hormones: kidneys release renin during low bp**

**Atrial hormone: the atria releases ANP (atrial natiuretic peptide) lowering volum & bp**

**Antidiuretic hormone: produced in the hypothalamus, Vassopressin stimulates kidneys to conserve water.**

# **Why are the kidneys an important role in the Circulatory System?**

**Kidneys regulate blood volume by controlling the plasma volume and in red blood cell mass, which influences the HEMATOCRIT**

**How are the kidneys signaled to make more RBC? detects changes in tissue oxygen**

# **Why is the Spleen the 'Graveyard' for RBC ?**

**The spleen purifies blood by removing microbes and worn out or damaged rbc**

**If the spleen is removed, the liver would take over the spleen's job**

# Where can you take your pulse from.....

\*Superficial temporal artery- temple

\*Brachial artery- opposite of elbow

\*Femoral artery- groin

\*Posterior tibial artery- ankle  
foot

\*Common carotid artery- neck

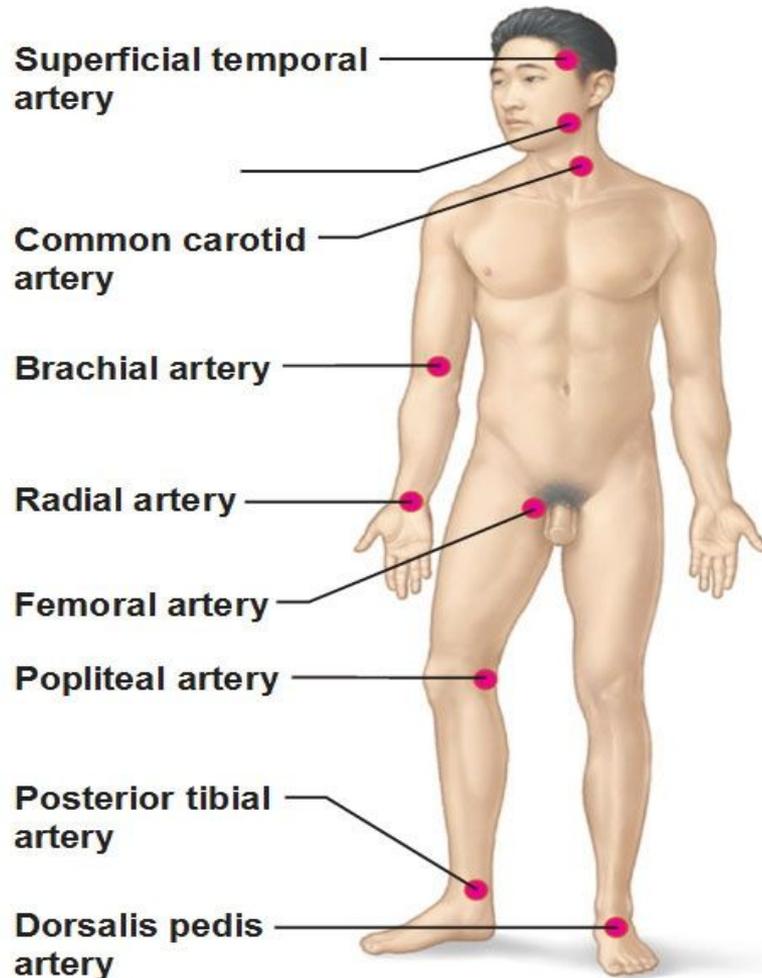
\*Facial artery- near jawline

\*Radial artery- wrist

\*Popliteal artery- behind knee

\*Dorsalis pedis artery- top of  
foot

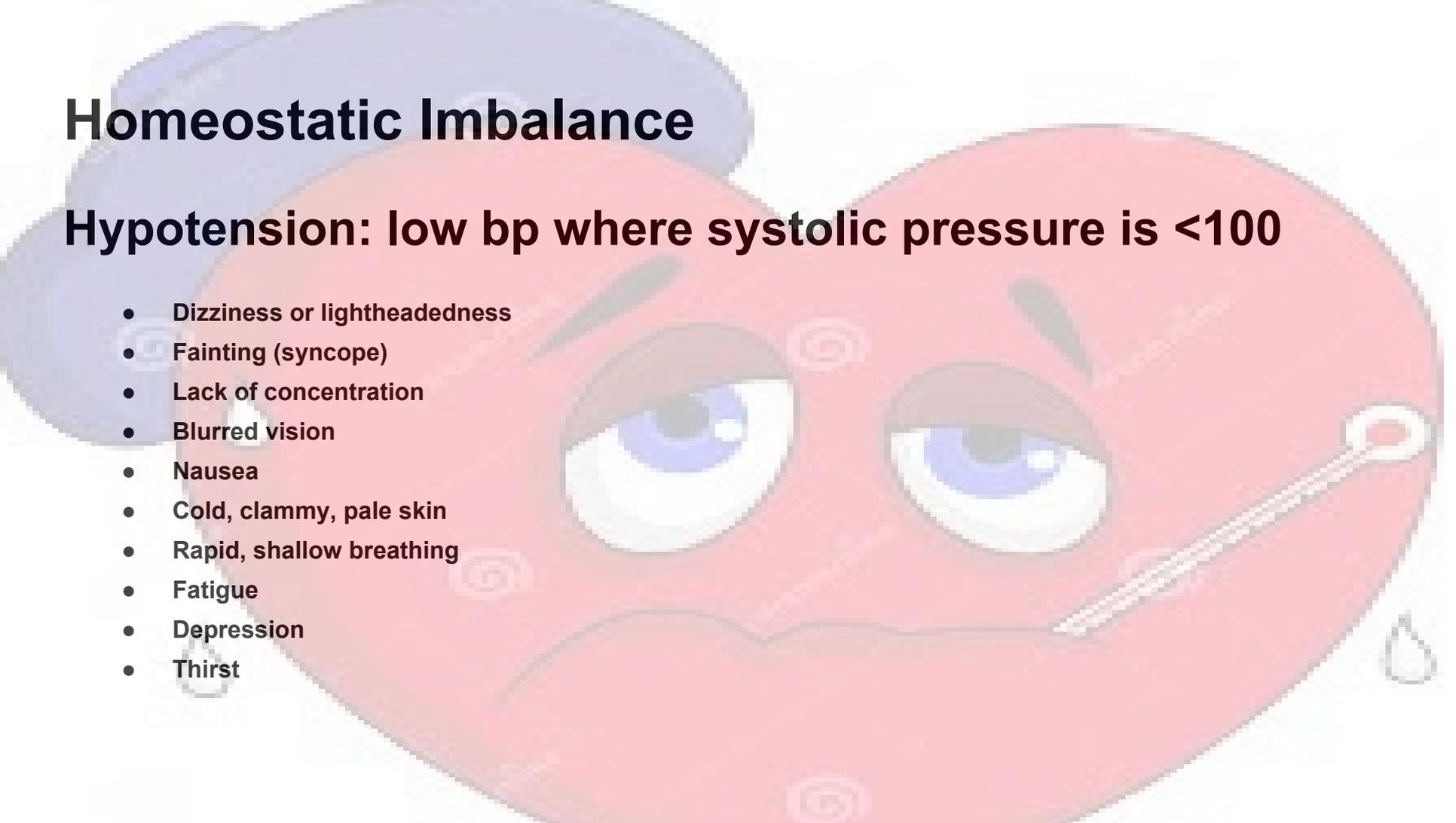
## Pulse Points over Major Arteries



# Homeostatic Imbalance

**Hypotension: low bp where systolic pressure is  $<100$**

- Dizziness or lightheadedness
- Fainting (syncope)
- Lack of concentration
- Blurred vision
- Nausea
- Cold, clammy, pale skin
- Rapid, shallow breathing
- Fatigue
- Depression
- Thirst



# Hypertension

**Primary (essential) hypertension** For most adults, there's no identifiable cause of high blood pressure. This type of high blood pressure, called primary (essential) hypertension, tends to develop gradually over many years.

**Secondary hypertension** Some people have high blood pressure caused by an underlying condition; tends to appear suddenly and cause higher blood pressure than does primary hypertension.

Obstructive sleep apnea

Kidney problems

Adrenal gland tumors

Thyroid problems

Illegal drugs, cocaine or amphetamines

Medications: birth control, cold remedies, decongestants, etc

Chronic/Alcohol abuse

Certain defects in blood vessels you're born with (congenital)