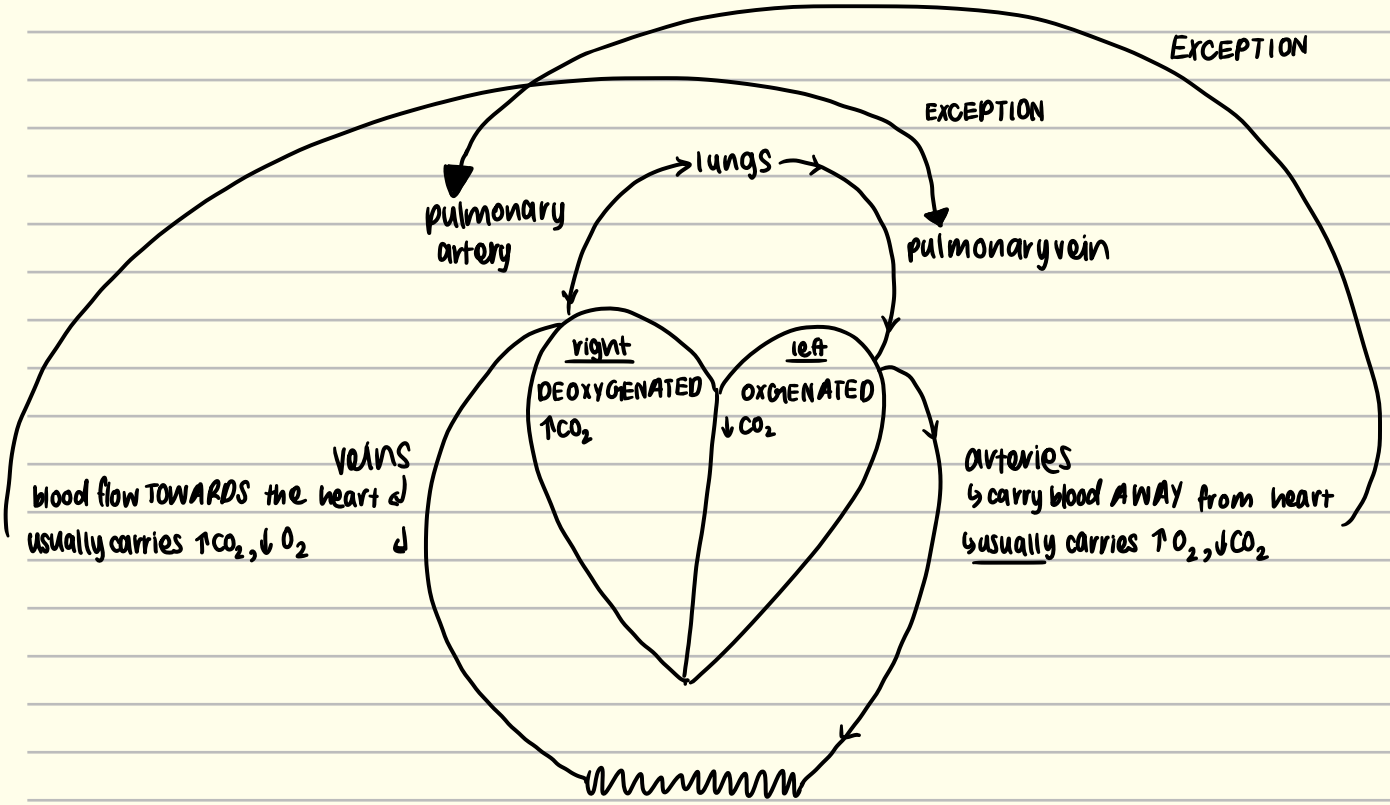
Transport in Humans



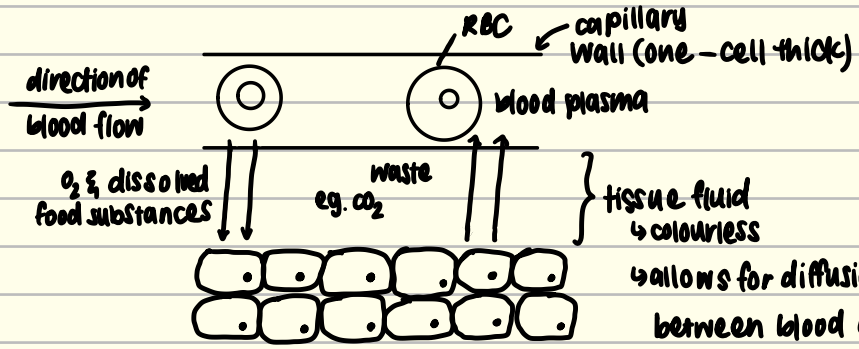
↳ allows for exchanges of substances between body cells and blood

ADAPTATIONS

Veins:
1. has valves
   ↳ low pressure blood has tendency to back flow
2. wide lumen

Capillaries:
1. numerous branches
   ↳ increase SA to ↑ rate of diffusion of substances by lowering blood pressure
2. endothelium consists of single layer of flattened cells
   ↳ ↓ diffusion dist → ↑ rate of diffusion
3. continuous blood flow
   ↳ maintain steep concentration gradient.

Arteries:
1. have thick, muscular and elastic walls
   ↳ withstand high pressure of blood
2. elastic
   ↳ artery wall can stretch and recoil
3. contraction & relaxation of muscles in walls allow for dilation & constriction of arteries
   ↳ homoregulation
4. narrow lumen



↳ allows for diffusion of substances between blood and cells.

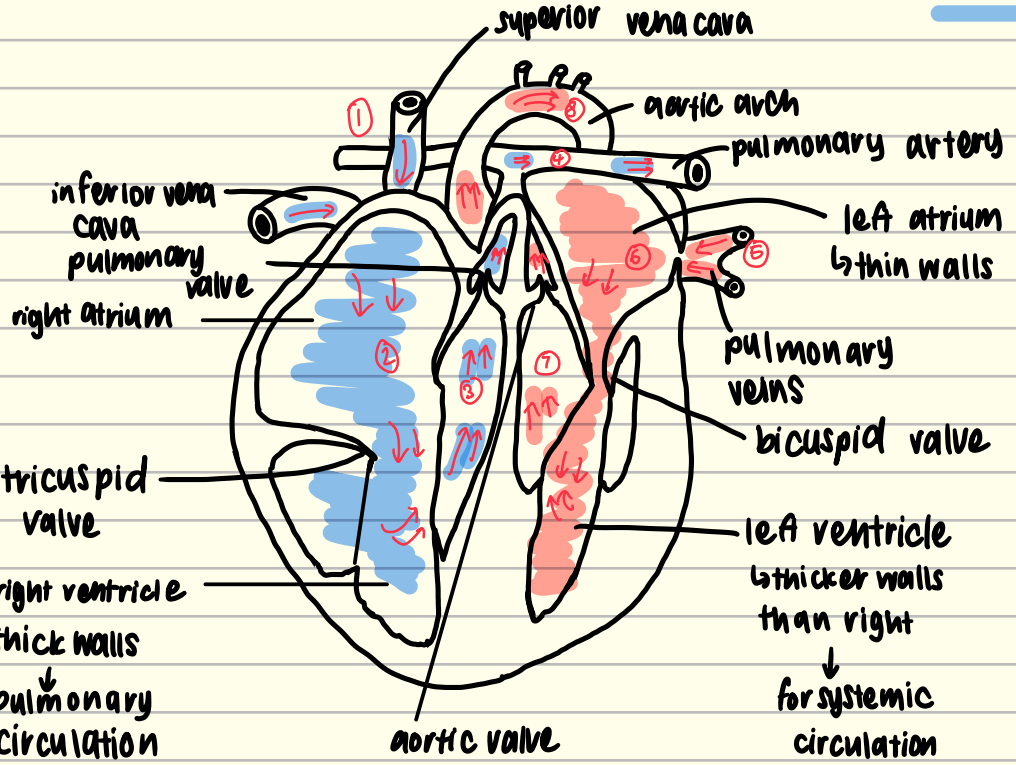
what if we sit for too long?
pressure builds up in veins → poor blood circulation.

Circulation of blood in the body:

lungs → heart → rest of the body

- lungs → for blood to become fully oxygenated (Hence, low pressure) → pulmonary circulation
- heart → oxygenated blood to be quickly distributed to other parts of body (Hence, high pressure) → systemic circulation

→ oxygenated blood
→ deoxygenated blood



hepatic ↔ liver
renal ↔ kidneys

semi-lunar valves: aortic valves + pulmonary valve

Function of valves in the heart:

blood always flows from atria to ventricles ✓ → atrial pressure > ventricular pressure

ventricles → atria X → ventricular pressure > atrial pressure

- ventricular pressure ↓ → ventricular systole
- atrial pressure ↓ → atrial diastole

∴ blood always from ↑ pressure to ↓ pressure

↓ hence

to prevent blood flowing from ventricles (↑ pressure) to atria (↓ pressure)

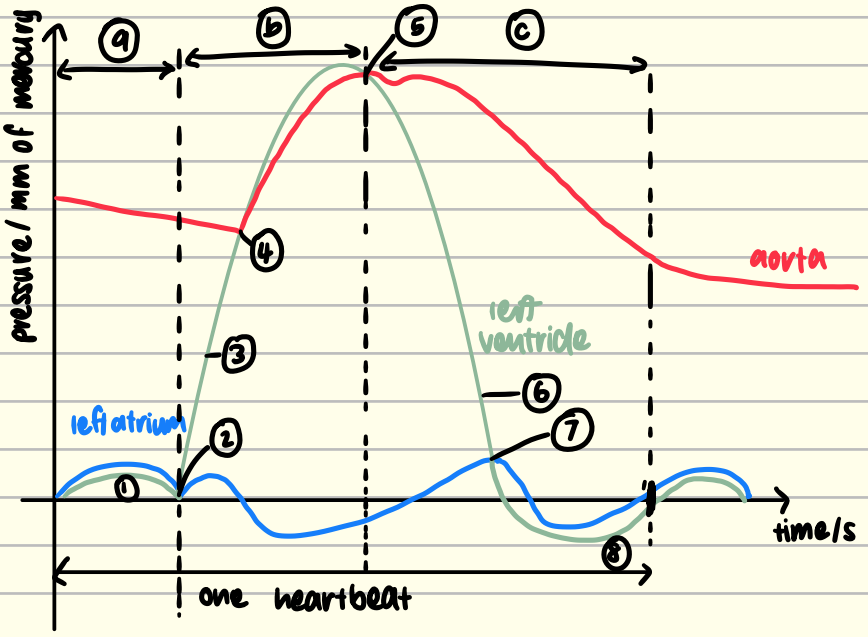
↓

atrio-ventricular valves close to prevent backflow of blood.

Flow of blood in the heart:

① atrial and ventricular diastole (relaxation of muscles)
↳ blood flows in from vena cavae (deoxygenated) and pulmonary vein (oxygenated)
② atrial systole, ventricular diastole (contraction of muscles)
↳ blood flows from atria to ventricles
③ ventricular systole, atrial diastole
↳ blood flows into pulmonary artery (deoxygenated) and aorta (oxygenated)
↳ tricuspid and bicuspid valves close to prevent backflow of blood back into atria (since ventricular pressure > atrial pressure) → 'lub' sound
④ ventricular diastole
↳ ↓ blood in ventricles → ↓ pressure
↳ semi-lunar valves close to prevent backflow of blood back into ventricles (since ventricular pressure < pressure of pulmonary artery and aorta) → 'dub' sound.
↳ blood flows from pulmonary artery to lungs, aorta to rest of the body
⑤ ventricular diastole, atrial diastole
↳ cycle repeats

→ one cardiac cycle



things to remember when doing this graph:
1. blood moves from ↑P → ↓P
2. valves prevent backflow of blood
3. pressure buildsup when heart chamber receives blood

Steps to identify whether valve opens/close:
① determine parts involved
② which has ↑ P?
③ can blood flow in that direction?

ⓐ → atrial systole, ventricular diastole
① blood flows from atrium to ventricle
↳ ↑ P in ventricle
② bicuspid valve closes as ventricular systole begins.
ⓑ → ventricular systole, atrial diastole
③ ventricular systole
④ aortic valves open, blood rushes into aorta
↳ ↑ P in aorta
⑤ aortic valves close
ⓒ → ventricular diastole, atrial diastole
⑥ ventricular diastole

⑦ bicuspid valve opens

⑧ ↑P in ventricles due to flow of blood into ventricles

Coronary heart disease:

coronary arteries → transport O_2 rich blood to tissues of heart

↓ HOWEVER ↙ atherosclerosis

excess cholesterol build up in deposits in artery walls

↓ CAUSING

blockage, disrupting blood flow

↓ AS

lumen of arteries is narrowed

↓

form blood clot, thrombosis when plaque breaks off.

↓

reduced blood flow

↓

less O_2 given to heart tissues need for respiration for energy for contraction of muscles

↓

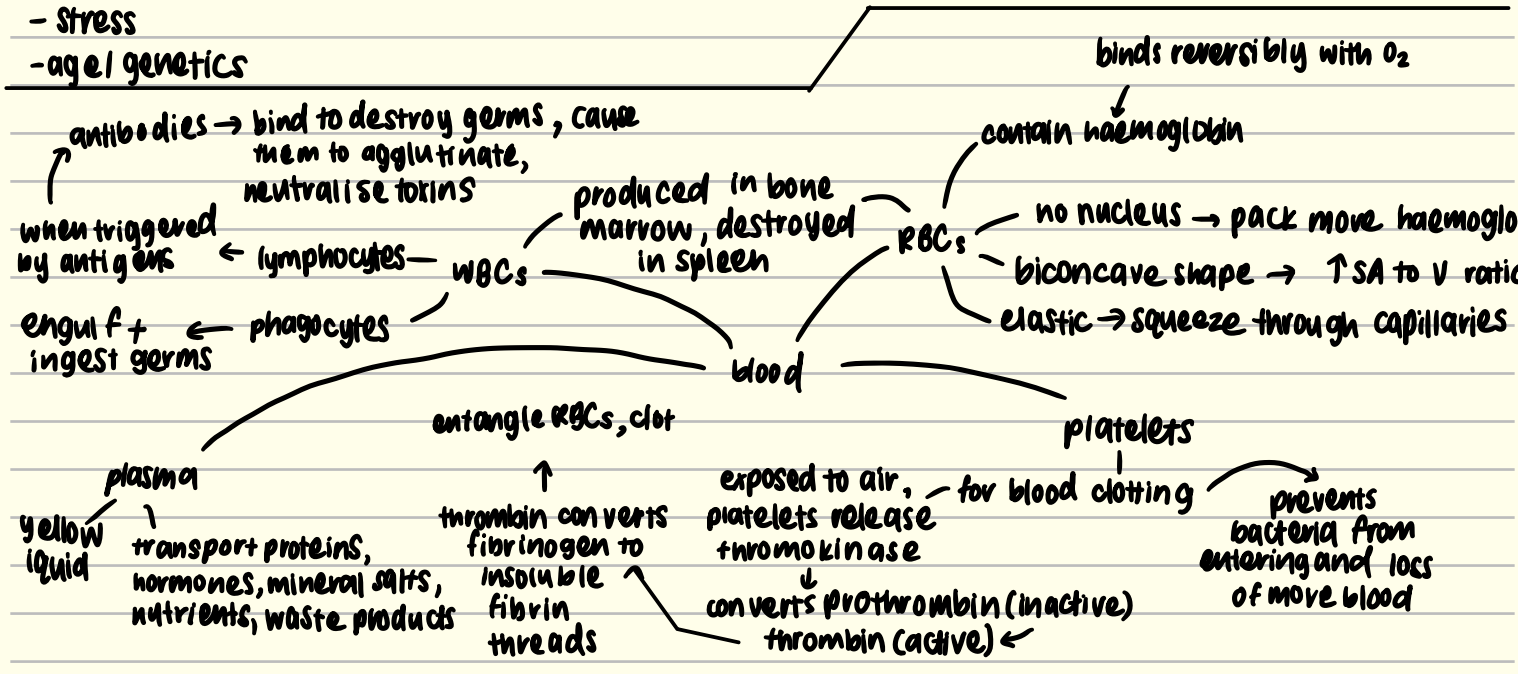
heart attack

CAUSES:

- diet high in cholesterol and saturated fats
- smoking
- sedentary lifestyle
- stress
- age/genetics

HOW TO PREVENT:

- active lifestyle
- manage stress
- healthy, balanced diet



blood type	antigen	antibodies	compatible blood types
A	A	b	A, O
B	B	a	B, O
AB	A, B	–	A, B, AB, O
O	–	a, b	O

O → universal donor
AB → universal recipient.

antigen A will stimulate antibody a to be released
↓
agglutination
↓
kill the patient.