

Transport: Heart & Blood



Why We Need Blood



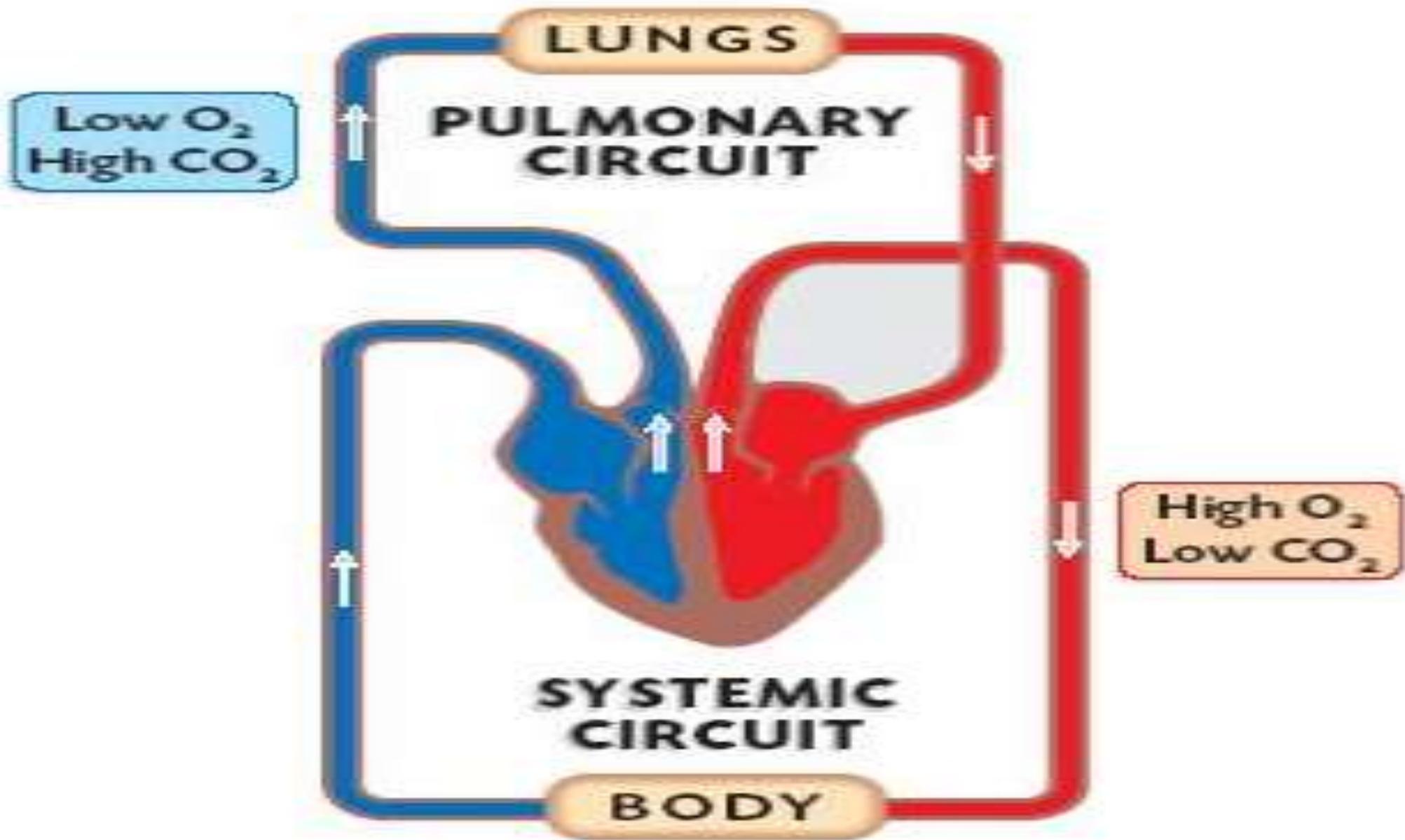
- Each cell in the body needs to get **Food** for energy.
- Each cell in the body needs to get **Oxygen** for Respiration.
- Each cell needs to get rid of **Carbon DiOxide, Nitrogen, and Water**.

Blood carries all these things to (and from) each cell, in each organ, across the entire body.

Double Circulation in Humans



- Our blood needs to go from the heart to the lungs to drop off Carbon DiOxide, and to pick up Oxygen. It then goes back to the heart. This section is called the Pulmonary Circuit. (In Latin, *Pulmo* means *Lung*.)
- It then goes from the heart through the body to swap gases at all the systems in the body (and so this is called the Systemic Circuit). It then returns to the heart. (As it travels, it collects and drops off all the other things it needs to carry as well.)



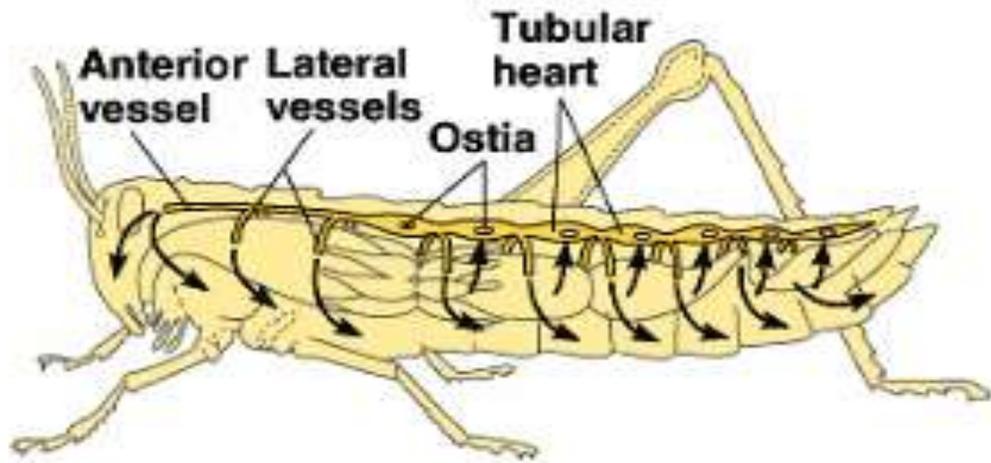
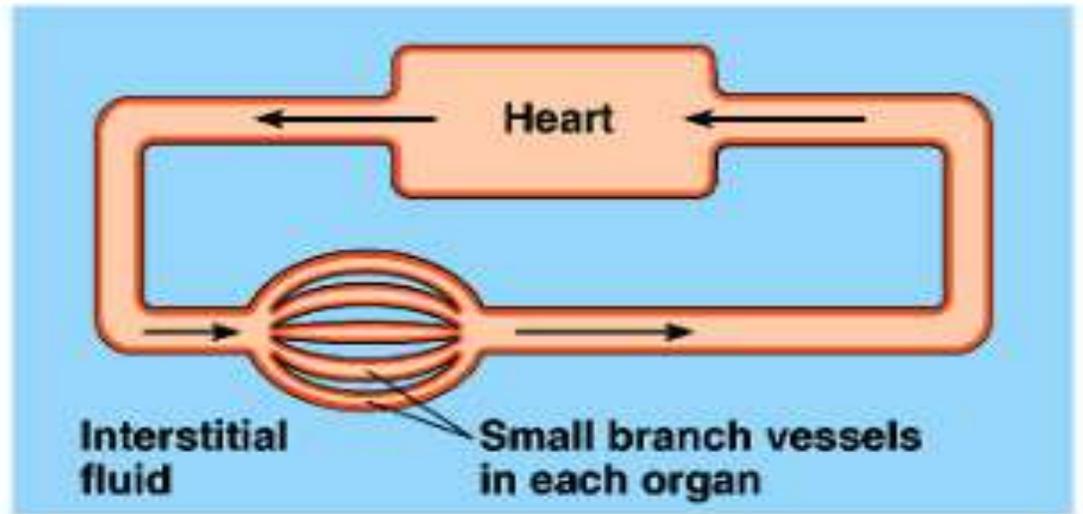
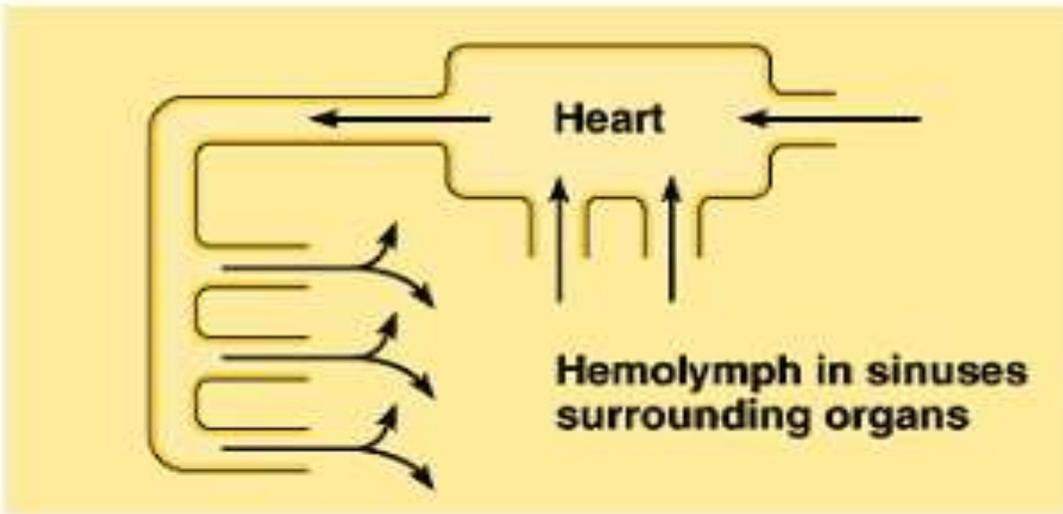
DOUBLE CIRCULATORY SYSTEM



Two Possible Types of Blood Systems

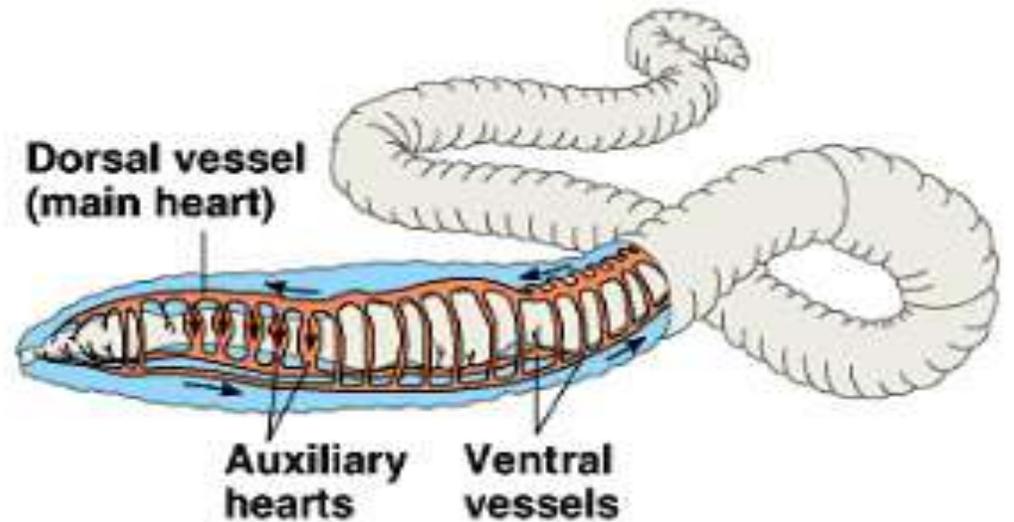


- **Open Circulation** – All the organs of the simple animal are in a big room in its body (called a *HaemoCoel*).
 - This room is also full of blood, so all organs are in open contact with the blood.
 - All the goodies are absorbed **by** the organs **from** the blood, through diffusion.
 - All the baddies are released **into** the blood **from** the cells in the organs – also from simple diffusion.
 - The heart does **circulate** this open system of blood, to keep bringing in the good stuff, and taking out the bad.



(a) Open circulatory system

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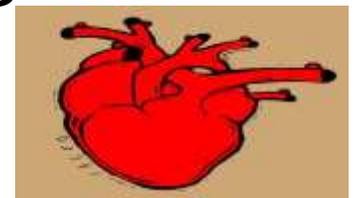


(b) Closed circulatory system

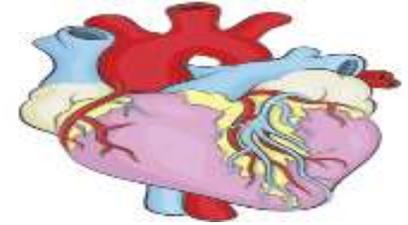
OPEN CIRCULATION

CLOSED CIRCULATION

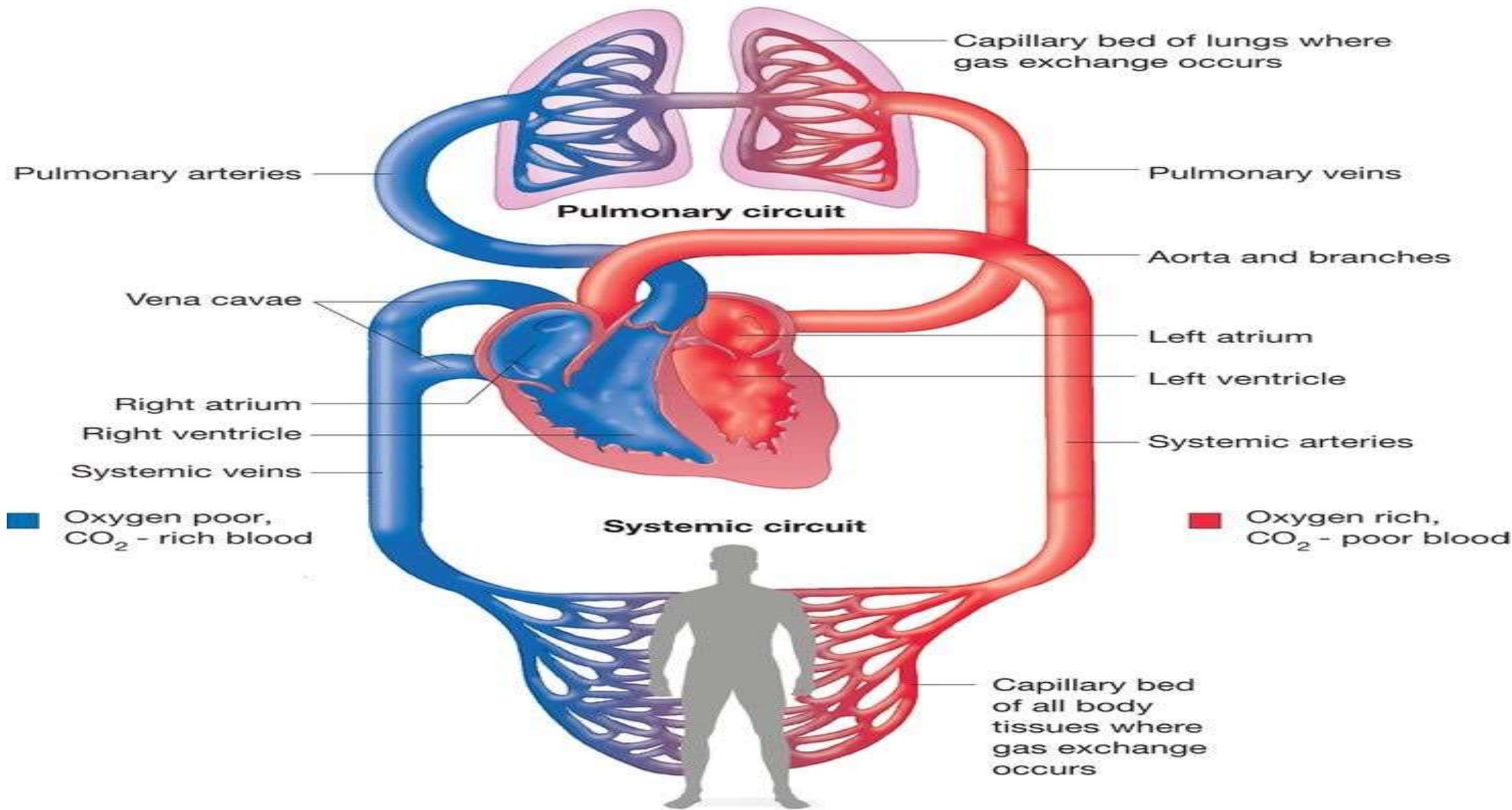
- **Closed Circulation** – more advanced animals have their blood **closed** into a system of tubes – the blood cells never leave these blood vessels.
 - The heart's job is to keep pushing this blood through these vessels – it **circulates** the blood through the body.
 - If the blood is moving Away from the heart, these vessels are called Arteries. (Each Artery will branch into lots of little capillaries called Arterioles.)
 - The vessels that are bringing the blood back towards the heart are called Veins. (Each Vein is formed from lots of little capillaries called Venules joining together to form that vein.)



STRUCTURE of the HEART



- The heart is simply a set of muscles around four little rooms.
- The muscles around the top two rooms relax, and let blood flow in. *One room gets blood sent from the body. The other room gets blood sent from the lungs.*
- These top muscles then contract, and squeeze the blood into the lower two rooms (where the muscles are now relaxed).
- When the bottom muscles contract, they squeeze the blood out of these two lower rooms. *One room sends its blood to the lungs. The other room sends its blood to the body.*



To Explain the STRUCTURE of the HEART



IMPORTANT DETAILS



- **Oxygenated** blood has lots of Oxygen in it.
- **DeOxygenated** blood has lots of Carbon DiOxide in it.
- **Coronary, Cardiac, PeriCardium** all come from the Latin word which means *Heart*.
- **Superior** brings blood from your head (the top) into the *Vena Cava*. **Inferior** = from lower parts.
- **Valves** allow blood to be pushed in, but then they close so that this blood cannot be pushed back out again.
- The **Cardiac Cycle** is one **heartbeat**. The muscles in the top half contracting, followed by those in the bottom half contracting = *lub-dub* = one heartbeat.

The Cardiac Cycle – More Details

- How **quickly** your heart beats is controlled by cells in your right **Atrium**, called the Sino-**Atrial** Nodes.
- The *medulla oblongata* section of your brain controls the beating of your heart. It responds to the amount of Carbon DiOxide in your blood that needs to be excreted from the lungs. (More CO₂ = quicker heartbeat.)
- **SyStole** = Contracting. **DiaStole** = Relaxing.
- Blood Pressure = SyStolic Pressure **over** DiaStolic Pressure (120 *over* 80).

The SphygmoMonoMeter is used to measure this.





POSSIBLE PROBLEMS



1. **Blood Pressure** – it can be too high (**Hyper**Tension) or too low (**Hypo**Tension). *Low Blood Pressure causes you to faint.*
2. **Congenital CardioVascular Defect** – a baby inherits a bad heart, or the mother is affected by drugs (or a *virus*) when pregnant, and this affects the child's heart and lungs.
3. **Stroke** – arteries leading into the brain are blocked, so those brain cells cannot get food or oxygen, and die as a result. It paralyses the side of the body controlled by that brain part.

4. **Heart Attack** – arteries leading into the muscles of the heart are blocked, so those heart muscles cannot get food or oxygen, and cannot operate.



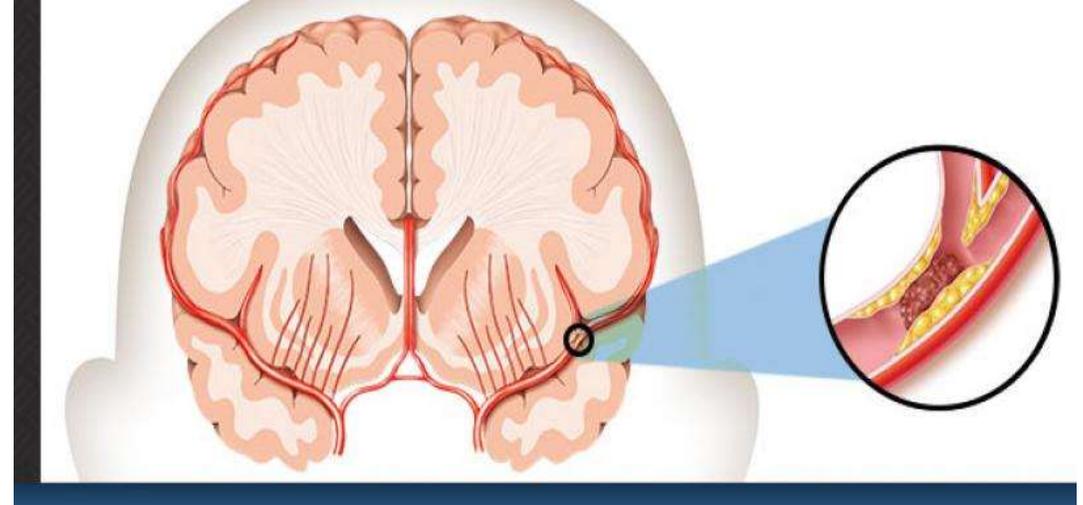
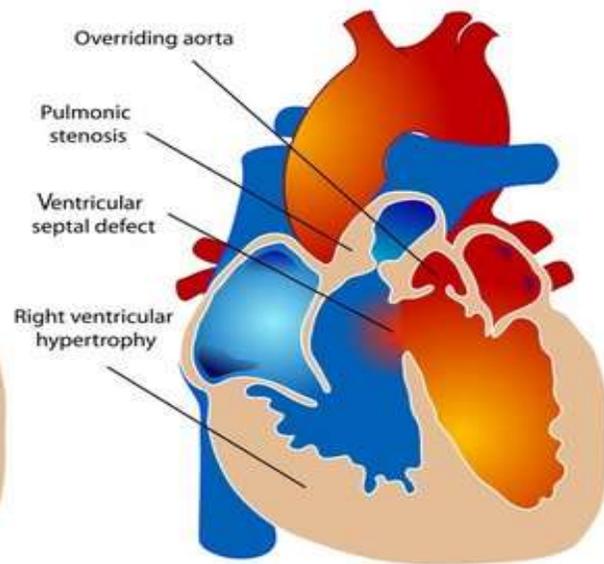
Different **TREATMENTS** are possible for heart attacks:

- A **Stent** is a rubber tube that takes the place of a cardiac artery.
- A **PaceMaker** (driven by a battery) can be connected to the S-A Node in the heart for regular heartbeat.
- A **ByPass** involves putting another artery in, to take the blood to the heart muscle, past the faulty artery.
- A **Valve** can be **Replaced** if faulty, with an artificial valve.
- **Heart Transplant** is when the heart is cut out, and a heart from a dead person is put in, and activated.

Normal heart

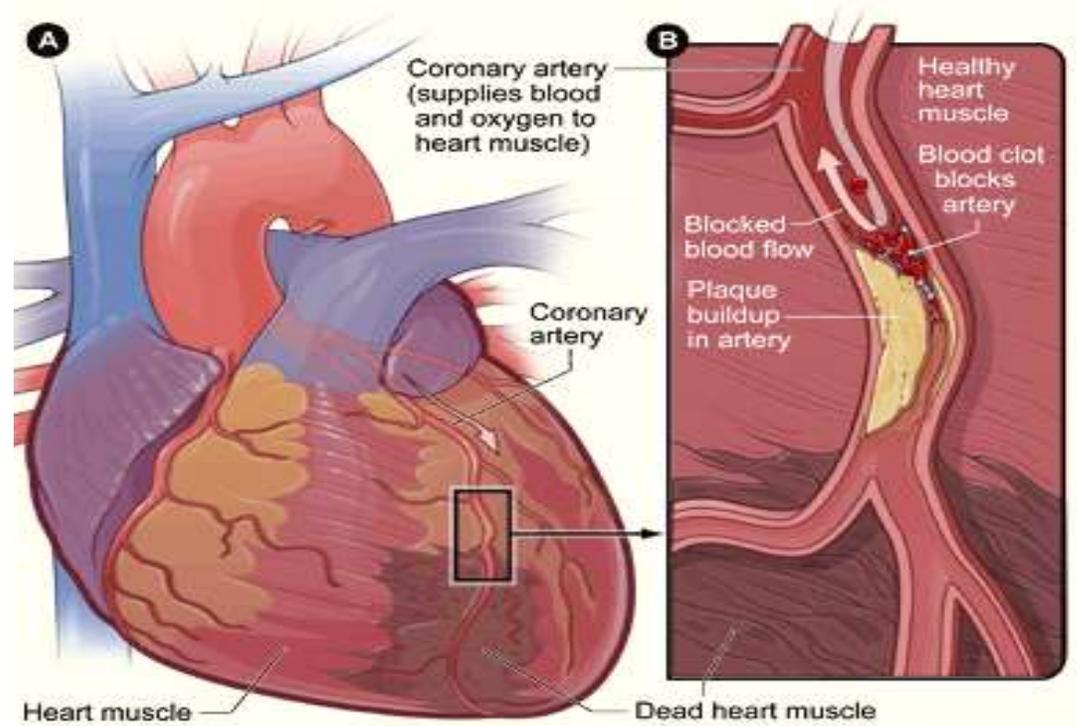


Tetralogy of Fallot

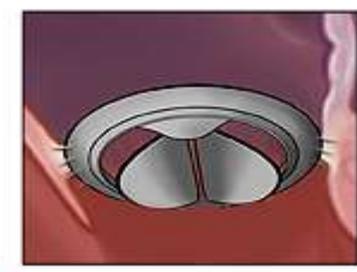
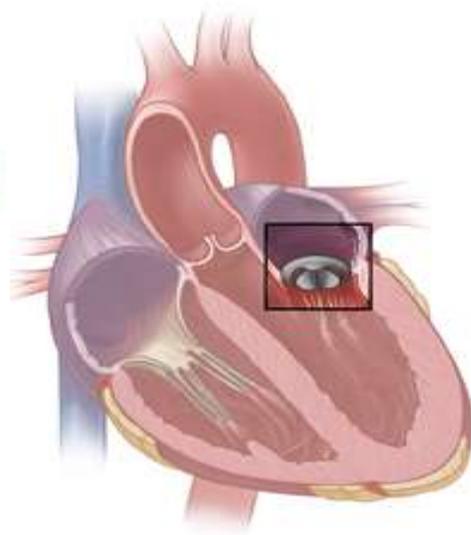
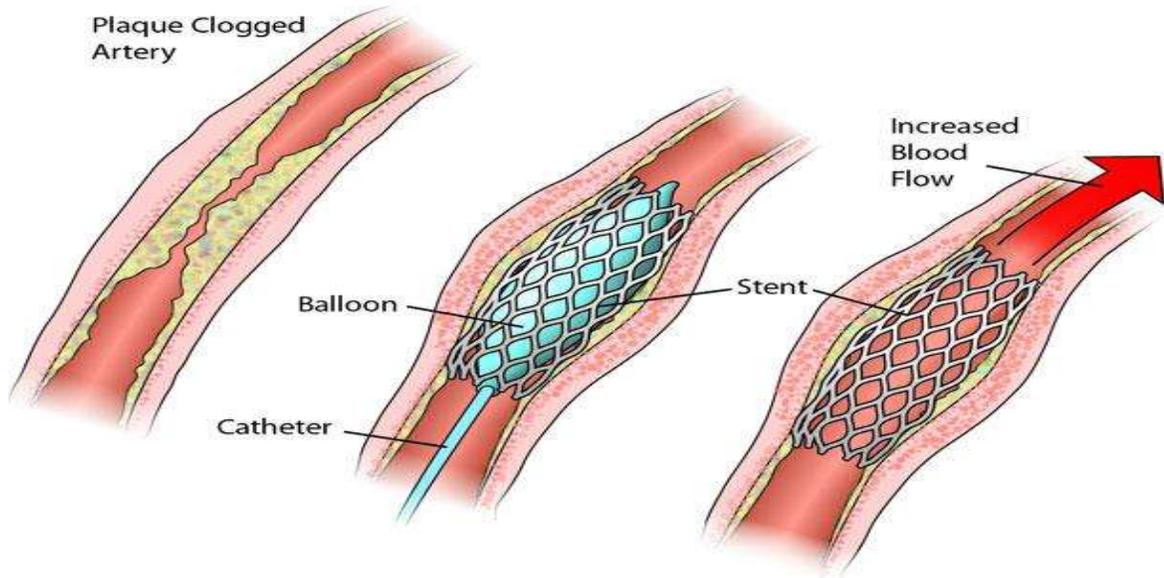


Hypotension Symptoms

Many people with low pressure don't have any symptoms. Others have dizziness, fainting, sleepiness, palpitation, confusion, blurred vision, nausea, clammy skin, shallow breathing, fatigue & depression.

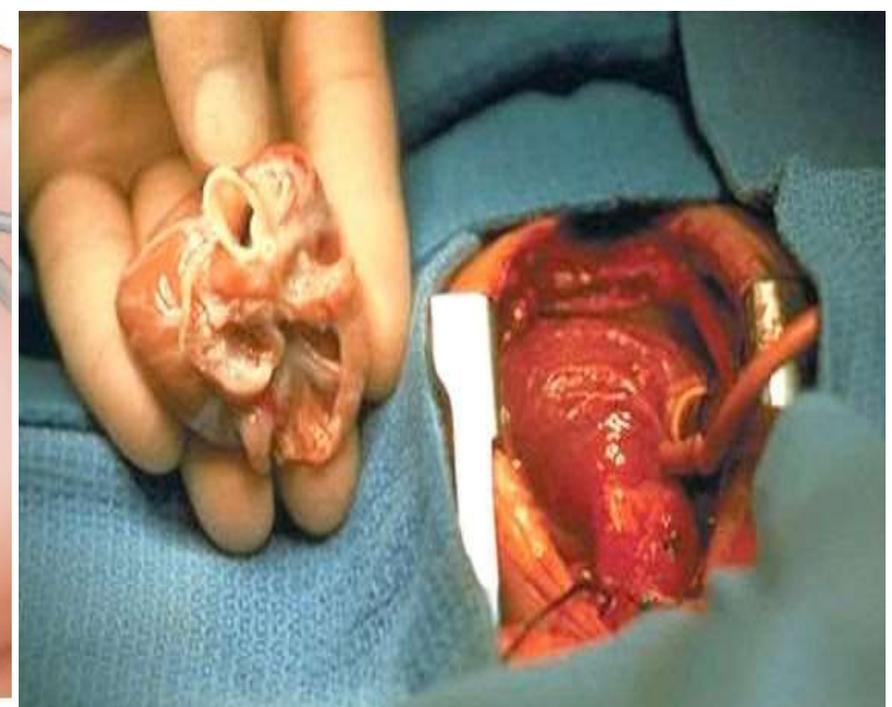
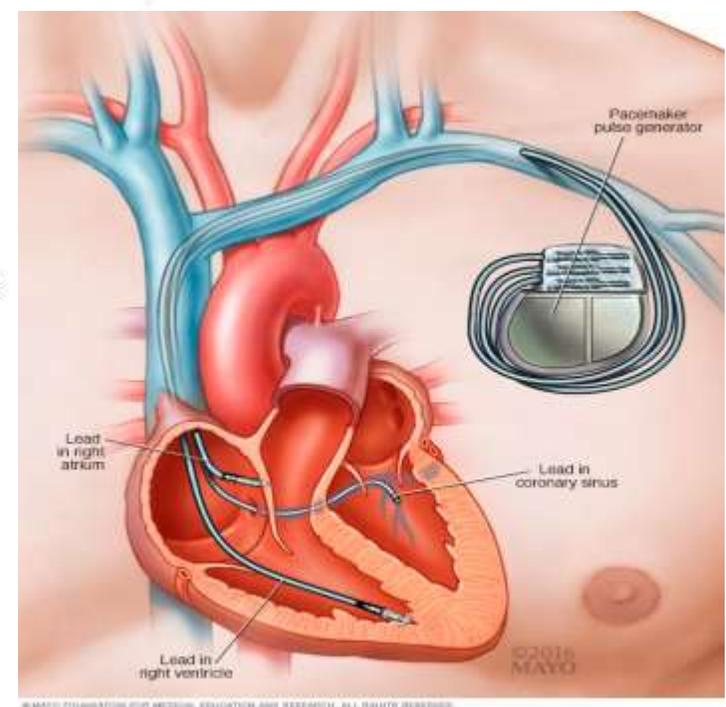
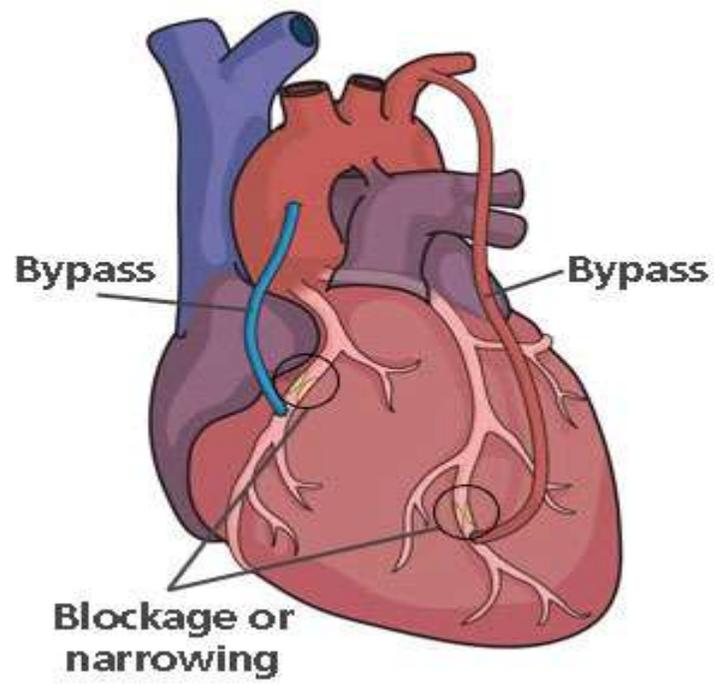


POSSIBLE PROBLEMS



Mechanical replacement valve

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DIFFERENT TREATMENTS for HEART ATTACK