Cheatography

Cardiac Muscle - NPB 101 Cheat Sheet

by beepboop1273 via cheatography.com/213561/cs/46489/

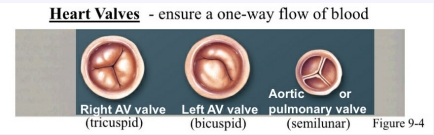
Key Anatomy of the Heart

4 Chambers:

Right Atria & Right Ventricle (Responsible for pumping **oxygen-poor** blood to the lungs.)

Left Atria & Left Ventricle (Responsible for pumping **oxygen-rich** blood to the body tissues.

Types of Valves



The Flow of Blood

Deoxygenated blood flows into *right atrium* from the body.

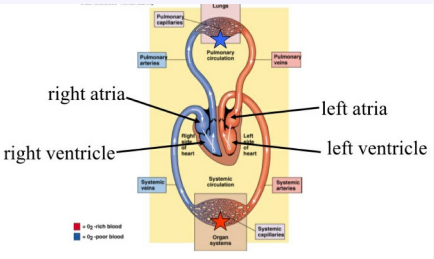
Then from the *right atrium*, **deoxygenated** blood flows into the *right ventricle* via the **atrioventricular valve** (AV valve)

From *right ventricle* the blood flows to the lungs to become **oxygenated** via the **pulmonary valve**

Oxygenated blood is then pumped into the *left atrium* where it can then flow into the *left ventricle* via another **AV valve**

From *left ventricle* the **oxygenated** blood is then pumped through the **aortic valve** into rest of body

Diagram of Ventricles



(Blue = oxygen-poor blood, Red = oxygen-rich blood)

Diagram of Blood Flow Through the Heart

Structure of Heart Walls

Endocardium - thin layer of endothelial tissue that lines the **inside** of each chamber

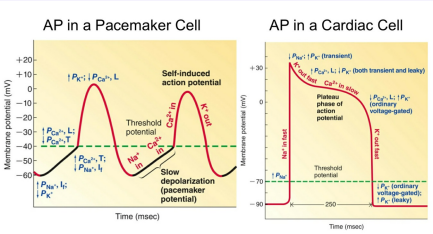
Myocardium - middle layer of heart wall consisting of *desmosomes* and *gap-junctions*

Desmosomes help hold things together so the heart doesn't rip apart, *Gap-Junctions* allow the cardiac muscle to form a **functional syncytium**

Epicardium - thin **external** membrane that covers the heart and filled with *pericardial fluid* to prevent friction.

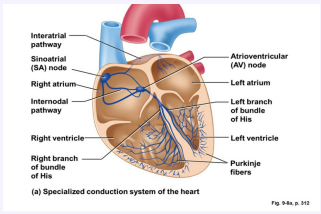
Fun Fact!
99% of cardiac cells are contractile and require an outside source to activate an action potential. While 1% of the remaining cardiac cells are auto-rhythmic and initiate their own action potentials!

Comparison of 2 Types of Cardiac Action Potentials



Action Potentials in Pacemaker Cells

Pacemaker Cells



Electrical Activity within the Heart

Nodes - groups of specialized cardiac cells capable of pacemaker activity

Different Types of Nodes

Sinoatrial (SA) Node

Located in wall of *right atrium*, exhibits an autorhythmicity of **70** AP/minute. This is the fastest node and it leads the activity of other pacemaker structures.

Atrioventricular (AV) Node

Located at base of the *right atrium*, exhibits autorhythmicity of **50** AP/minute.

Bundle of His

Tract of specialized, cardiac pacemaker cells. Starts at AV Node and divides into the left and right ventricles.

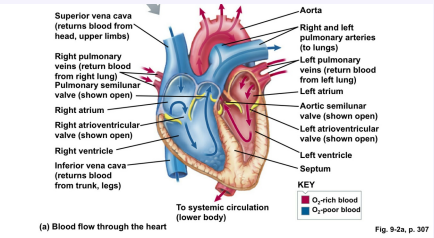
Purkinje Fibers

Terminal fibers that extend from bundle of His and spreads throughout the ventricular myocardium.

Sequence of Current Flow Through the Heart Wall

SA Node -> AV Node -> Bundle of His -> Right & Left Bundle of His Branches -> Purkinje Fibers

Action Potentials in Cardiac Cells



3 Channel Types

I_f = Funny Channels

T = Transient-type (short time) Ca^{2+} channels

L = Long-lasting Ca^{2+} channels

Pacemaker Activity

Resting Potential = -60mV

K^+ Channels are closed and I_f channels allow for concentration of Na^+ to increase in the cell. (Na^+ in)

T channels open and Ca^{2+} is let into the cell, allowing the potential to reach threshold. (Ca^{2+} in)

Once threshold is reached, L channels open to create the action potential. (More Ca^{2+} in)

At the peak of the action potential, K^+ channels open, and L channels close, creating the *falling phase*. (K^+ out)

Cycle repeats

Threshold = -70mV

Resting Potential = -90mV

Fast Na^+ channels open, creating a fast rising phase. (Na^+ in fast)

Na^+ channels inactivate and transient K^+ channels open. L-type Ca^{2+} channels open and K^+ channels (transient & leaky) slowly close. (K^+ out fast, Ca^{2+} in slow)

Voltage-Gated K^+ channels open and L-type Ca^{2+} channels close resulting in a rapid falling phase. (K^+ out fast)

Resting potential maintained by closing of VG K^+ channels and opening of leaky K^+ channels

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