

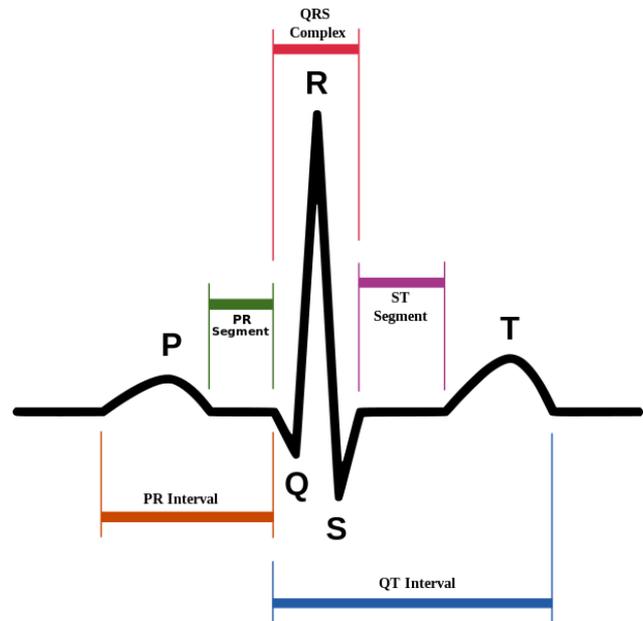


EKG

An electrocardiogram EKG is a graphical recording of electrical activity of the heart.

The muscle fibers of the heart produce electrical voltages that can be recorded by electrodes on the skin of the chest or the wrists.

Each heart beat is initiated by the pacemaker in the right atrium (the sinoatrial node, SA) where an impulse starts and an action potential spreads through both atria. One group of atrial muscle fibers conducts the action potential directly to the atrioventricular node (AV node). The AV node is located in the right atrium. From the AV node the action potential spreads into muscle fibers called the AV bundle. The AV bundle divides with each one branch in the ventricle. Eventually the impulse reaches through the ventricular muscle fibers and the ventricles contract.



A typical EKG pattern
(source: www.wikipedia.org)

One heart cycle is represented by a group of waveforms beginning with the P wave, followed by the QRS wave complex, and ending with the T wave. The P wave is caused by a spread of depolarization through the atria, prior to contraction of the atria.

The QRS consists of three waves, which appear approximately 0.16 seconds after the P wave as a result of depolarization of the ventricular muscles just before contraction of these muscles.

The time between the P wave and the QRS waves is called the P-R interval. It represents the time between atrial and ventricular contraction. The last T wave is usually represented by a positive deflection and represents the depolarization of the ventricular muscles when they begin to relax.

In modern EKG monitoring equipment the EKG signal is conducted to the computer via optical coupling. During the recording of the EKG, the subject is electrically isolated from the computer.

Pupils with unusual EKGs

Since the electrodes are placed on the wrist (and not on the chest, which is the method of recording an EKG used in hospitals) the height of the individual waves may differ from person to person, but all EKGs should show the PQRST-pattern. The equipment used in schools does not meet medical quality standards. For this reason heart defects cannot be discovered with this EKG monitoring equipment. It is important that before the start of the measurements it is explained that unusual EKGs produced during the experiments are caused by limitations of the equipment used.

Biofeedback

When these experiments are performed there is a small safety concern that subjects will be able to reduce their heart rate during the measurement. The phenomenon is called biofeedback. Since the experiments last only five or ten second biofeedback is highly unlikely. However, in order to avoid all risks is it recommended that the subject not be allowed to watch the screen of the computer on which the EKG is displayed during the measurement.

