

## **Сердце (интересные факты)**

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## **THE HEART (INTERESTING FACTS)**

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The heart is a muscular pump which has four chambers: right and left atria and right and left ventricles. The pumping actions of the heart constitute the Cardiac cycle. The cycle begins with a period of ventricular relaxation, which is called diastole and ends with a period of ventricular contraction, which is called systole. The heart chamber consists of three layers: endocardium, myocardium and epicardium. Heart is located in middle mediastinum and is enclosed by pericardium. It is composed of two parts. The tough, outer fibrous pericardium stabilizes the heart and helps it to prevent from over dilating. Within the fibrous pericardium is a double layer sac, the serous pericardium. The average human heart beat at 72 beats per minutes.

Development: Early development. At 21 days after conception, the human heart begins beating at 70 to 80 beats per minute and accelerates linearly for the first month of beating. The human embryonic heart beating about 21 days after conception, or five weeks after the last normal menstrual period (LMP), which is the date normally used to date pregnancy. The human heart begins beating at a rate near the mother's, about 75-80 beats per minute (BPM). The embryonic heart rate (EHR) then accelerates linearly for the first month of beating, peaking at 165-185 BPM during the early 7<sup>th</sup> week (early 9<sup>th</sup> week after the LMP). This acceleration is approximately 3.3 BMP per day, or about 10 BPM every three days, an increase of 100 BPM in the first month. Before birth the valve of inferior vena cava directs most of the oxygenated blood returning from placenta by way of umbilical vein and inferior vena cava towards the foramen ovale in the interatrial septum, through which it passes into left atrium. The foramen ovale has a valve that permits right to left shunt of blood but prevents from left to right shunt. After birth, the foramen ovale closed as its valve fuses with intra atrial septum. The closed foramen ovale is represented in the interatrial septum by the depressed fossa ovale. The border of the fossa ovale surrounds the fossa. The floor of the fossa is formed by the valve of foramen ovale. The rudimentary inferior vena cava valve, a semilunar crescent of tissue, has no function afterbirth.

In the human body, the heart is usually situated in the middle of the thorax with the largest part of the heart slightly offset to the left (although sometimes it is on the right, see dextrocardia), underneath the breastbone. Dextrocardia is associated with mirror image positioning of the arch of the aorta. Due to abnormal folding of the embryonic heart, the position of the heart may be completely reversed so that the apex of the heart is directed to the right instead of left. This anomaly may be part of a general transposition of the thoracic and abdominal viscera, or the transposition may affect only heart (isolated dextrocardia). In cardiac defects the heart usually functions normally, however in isolated dextrocardia the congenital anomaly is complicated by severe cardiac anomaly such as transposition of great arteries. The heart is usually felt to be on the left side because the left heart (left ventricle) is stronger (it pumps to all body parts). The left lung is smaller than the right lung because the heart occupies more of the left hemithorax. The heart is enclosed by a sac known as the pericardium and is surrounded by the lungs. The pericardium comprises of two parts: the fibrous pericardium, made of dense fibrous connective tissue; and a double membrane structure containing a serous fluid to reduce friction during heart contractions (the serous pericardium). The mediastinum, a subdivision of the thoracic cavity, is the name of the heart cavity. The apex is the blunt point situated in an inferior (pointing down and left) direction. A stethoscope can be placed directly over the apex so that the beats can be counted. It is located posterior to the 5<sup>th</sup> intercostal space in the left mid-clavicular line. In normal adults, the mass of the heart is 250-350 g (9-12 oz), or about three quarters the size of a clenched fist, but extremely diseased hearts can be up to 1000 g (2 lb) in mass due to hypertrophy. It consists of four chambers, the two upper atria (singular: atrium) and the two lower ventricles.

Functioning. Start in the right atrium, the blood flows through the tricuspid valve to the right ventricle. Here it is pumped out the pulmonary semilunar valve and travels through the pulmonary artery to the lungs. From there, blood flows back through the pulmonary vein to the left atrium. It then travels through the bicuspid valve to the left ventricle and on to through the aortic semilunar valve the aorta. The aorta forks, and the blood is divided between major arteries which supply the upper and lower body. The blood travels in the arteries to the smaller arterioles, then finally to the tiny capillaries which feed each cell. The (relatively) deoxygenated blood then travels to the venules, which coalesce into veins, then to the inferior and superior venae cavae and finally back to the right atrium where the process began. The heart is effectively a syncytium, a mesh work of cardiac muscle cells interconnected by contiguous cytoplasmic bridges. This relates to electrical stimulation of one cell spreading to neighboring cells. Basis for naming the cusps of the aortic and pulmonary walls. The truncus arteriosus, the common arterial trunk from both ventricles of the embryonic heart, has four cusps. The truncus arteriosus divides into two vessels, each with its own valve (pulmonary and aortic), that has three cusps. The heart undergoes partial rotation so that

its apex becomes directed to the left. So the cusps are named according to their embryological origin, not their postnatal anatomical position. Thus the pulmonary valve has right, left and anterior cusps, and the aortic valve has right, left and posterior cusps. The posterior cusp and sinus does not give rise to any coronary artery, thus it is also referred to as non-coronary cusps. Surgical significance of the transverse pericardial sinus. The transverse pericardial sinus is a specially important to the surgeons, after the pericardial sac is opened anteriorly, a digit can be passed through the transverse pericardial sinus posterior to the aorta and pulmonary trunk. By passing a surgical clamp or placing a ligature around these vessels, inserting the tubes of a coronary bypass machine, and tightening the ligature, surgeons can stop or divert the circulation of blood of these large arteries while performing cardiac surgery such as coronary artery bypass grafting.

The bare facts. A heart attack, also called coronary thrombosis or myocardial infarct, occurs when there is an obstruction to the flow of blood in one of the two branches of the coronary arteries. Any substantial disruption to the flow of oxygen and nutrients to the heart muscle interferes with heart function and can threaten the survival of heart tissue itself. Obstruction of the coronary arteries occurs when a blood clot forms because of a buildup of fatty, roughened plaque containing cholesterol and other material called atheroma, in the inner lining of the arteries. Narrowing and thickening of the arterial wall is called arteriosclerosis. Coronary heart disease is responsible for about half of all deaths in Western countries. Men are at greater risk than pre-menopausal women. There are certain conditions that can increase your chances of developing heart disease. They are obesity, smoking, diabetes, lack of exercise, high blood pressure, high blood cholesterol, stress, a family history of heart disease, age and gender. Although we have little control over some of these conditions our lifestyle does have a big influence. Stopping smoking, a balanced diet and regular exercise are recognized as highly effective protective mechanisms. High cholesterol, high blood pressure and smoking can double your chances of a heart attack. If you have all three risk factors then you can be eight times more at risk than someone with none of them!

Signs and Symptoms of Heart Attacks. There is evidence that up to 20 per cent of people who have attacks only experience mild symptoms, some symptoms or no symptoms at all. Most people experience some or all of the following: severe chest pain (angina); tightness, heaviness, or pressure or a squeezing feeling in the chest; a faint and often an irregular pulse; shortness of breath; restlessness; fear; heart facts. Your system of blood vessels – arteries, vein and capillaries – is over 60,000 miles long. That's long enough to go around the world more than twice! The adult heart pumps about 5 quarts of blood each minute – approximately 2,000 gallons of blood each day – throughout the body. When attempting to locate their heart, most people place their hand on their left chest. Actually, your heart is located in the center of your chest between your lungs. The bottom of the heart is tipped to the left, so you feel more of your heart on your left side of your chest. The

heart beats about 100,000 times each day. In a 70-year lifetime, the average human heart beats more than 2.5 billion times. An adult woman's heart weighs about 8 ounces, a man's about 10 ounces. A child's heart is about the size of a clenched fist; an adult's heart is about the size of two fists. Blood is about 78 percent water. Blood takes about 20 seconds to circulate throughout the entire vascular system. The structure of the heart was first described in 1706, by Raymond de Viessens, a French anatomy professor. The electrocardiograph (ECG) was invented in 1902 by Dutch physiologist Willem Einthoven. This test is still used to evaluate the heart's rate and rhythm.