published in Reader's Digest,
25 May 2015

link to Reader's Digest article [1]

heart [2] wonder [3]



The heart is the hardest working muscle in your body. It beats more than 2.5 billion times during an average lifetime, that's 100,000 times day. How does it keep going without ever getting tired?

The natural pacemaker

Sitting on the upper right side of the heart is an amazing cluster of cells called the sinoatrial node, about 8mm long and 2mm thick. Unlike any other cell in the body, these ‘pacemaker’ cells keep sending out electrical impulses, more than once a second, to make the rest of the heart contract and pump out blood.

Even when the heart is removed from the body for transplant, these cells carry on working.

In 1979, Oxford and Italian scientists Brown, Noble and DiFrancesco discovered an electrical current made up of sodium and potassium that drives these cells. “We termed it the funny current because of its odd properties” said DiFrancesco, and the name has stuck. More recently scientists at Oxford and Auckland Universities [4] are using supercomputers to further understand the mechanisms involved.

An excellent supply of fuel

All muscles require a steady supply of blood to provide them with fuel (oxygen and nutrients), and this is especially true of the tireless heart which consumes huge amounts of energy. Even when resting, the heart consumes twenty times more oxygen than a resting skeletal muscle.

To meet this demand the heart has its own unique blood supply, known as the coronary circulation, which encircles the heart, supplying all parts abundantly, with roughly one capillary for each cardiac cell. Remarkably, when the heart needs more oxygen, such as during exercise, the blood vessels widen allowing more fuel in, preventing the heart from tiring out.

Once fuel reaches the heart, small 'powerhouses' inside the cell (known as mitochondria) convert it into energy. Heart cells, even more than other muscle cells, are packed full of mitochondria allowing huge amounts of energy production to keep the heart beating.

Adrenaline boost

When we get tired, we might reach for an energy drink to revive us. When the heart needs to beat stronger and faster during exercise or stress it is flooded with adrenaline from nerve endings on its surface, and as a hormone from the adrenal glands.

Not to be taken for granted

The untiring heartbeat is awesome, but there are times when disease, lifestyle, genetics or infection render the heart unable to pump enough blood around the body resulting in breathlessness, tiredness and leg swelling. This condition is known as heart failure and affects up to 2 per cent of the population [5].

When the heart does fail, many drugs are available, or cardiac surgery in severe cases. Astoundingly, scientists are even working on totally artificial hearts with some success, with 1400 patients having received the SynCardia artificial heart. However, none will ever match the amazing human heart.

MEDICAL JOURNALISTS' ASSOCIATION

Source URL:https://www.helencowan.co.uk/how-does-heart-keep-beating-without-getting-tired

Links
[1] http://www.readersdigest.co.uk/health/health-centre/how-does-heart-keep-beating-without-getting-tired [2] https://www.helencowan.co.uk/../tags/heart [3] https://www.helencowan.co.uk/../tags/wonder [4] http://cardiovascres.oxfordjournals.org/content/47/4/658 [5] http://www.hriuk.org/about-heart-disease/heart-facts/