

## **WHY EXERCISE IS GOOD FOR THE HEART.**

**By**

**William Reville, University College, Cork.**

I think it was Oscar Wilde who remarked, 'Whenever I feel like exercise, I lie down until the feeling passes'. The idea that strenuous exercise is good for you is a very modern development. We now know that physical exercise has many positive benefits, probably the most important of which is that it is good for the heart.

Heart attacks kill one in four people in industrially developed countries. Everyone knows that a heart attack means a failure of the heart, but most people don't understand why or how this failure comes about.

The body is composed of cells and every cell needs access to flowing blood in order to survive. The function of the heart is to pump blood around the body, through the arteries and veins, supplying oxygen and other nutrients to all the cells and removing waste products from them. The heart is primarily a blood-pumping muscle and the muscle cells are called myocytes. The myocytes contract and relax in a synchronous and automatic fashion causing the heart to beat, or pump, about 70 times per minute, thereby keeping the blood circulation flowing. The pressure wave accompanying each beat travels down the arteries and can be felt as a pulse. Over a 70 year life-span, the human heart beats about two and a half billion times.

The heart operates as two pumps working in parallel. The right side of the heart receives oxygen-depleted blood from all over the body and pumps it to the lungs for oxygenation. The left side of the heart receives oxygenated blood from the lungs and pumps it around the body.

The myocytes must also be supplied with blood, just like the cells of any other organ. This is done through the main coronary arteries that enter the walls of the heart, branching again and again, forming a complicated web of blood vessels - the coronary vasculature. The heart cells must be supplied with a lot of blood. The heart uses between 4 and 5 per cent of total body blood flow, but, on average, it only makes up 0.5 per cent of the body's weight. Only the brain comes close to the heart in its appetite for blood per unit mass of tissue.

The heart is particularly sensitive to having its blood supply interrupted. When a part of the heart loses its blood supply it is said to become ischaemic, and its ability to work as a pump falls within seconds and fails within minutes. Ischaemia is usually caused when an artery that serves a particular area of the heart becomes clogged. Ischaemic heart disease is the underlying cause of most heart attacks.

The coronary network of blood vessels is very adaptable. It can grow and adapt itself to fit the needs of the body and can readapt and reshape itself to meet changed needs, provided there is appropriate vasculature to build on and time to do the building. The trigger that starts the growth of new vasculature is need. While an organism is growing the extension of the vasculature is driven by the growth of the tissue that demands more blood. But, in a mature organism the vasculature can still grow if it is prompted by a steady high demand for oxygen. The vasculature of the heart can be maintained and expanded by carrying out aerobic exercise which puts the heart under regular moderate strain.

The coronary arteries are particularly prone to developing the disease of atherosclerosis. This is

a slowly developing condition in which fatty growths on the artery walls gradually constrict and choke off the flow of blood. The great majority of heart failures are associated with atherosclerosis, which causes the ischaemia described earlier. Atherosclerosis affects not only the heart, but also large and medium-sized arteries throughout the body. For example, most strokes are caused by atherosclerosis in cerebral arteries.

The gradual narrowing of a coronary artery is likely to cause angina. This is a crushing chest pain that often feels like a band around the chest. It usually occurs when the subject starts a physically demanding activity, when the narrowing artery doesn't allow sufficient blood flow to fuel the extra work of the heart. In cases of severe artery-narrowing or blockage a coronary artery bypass graft is often performed. The surgeon removes part of a vein or artery, usually the saphenous vein in the leg, and joins it to the blocked coronary artery before and after the blockage, creating a bypass. A patient may receive a single, double, triple or quadruple bypass, depending on how many main coronary arteries are blocked.

A normal youthful coronary vasculature has considerable reserve capacity to provide enhanced blood flow to meet the demands of sudden heavy activity. Atherosclerosis can gradually reduce this reserve capacity over the years to the point where, if the heart is suddenly called on to work at maximum effort, the vasculature cannot deliver the blood flow necessary to keep it working. This is when a spontaneous game of football with the grandchildren could have disastrous consequences.

The important reserve capacity of the vasculature of the heart can be slowly eroded over the years by atherosclerosis without sending out any warning signals. If one leads a sedentary life style the heart can retain sufficient reserve capacity to meet the very occasional sudden demand without going into distress. However, if atherosclerosis is developing, the day will probably come when a serious problem suddenly announces itself without prior warning. On the other hand, if as a young adult one cultivates a regular habit of moderate aerobic exercise, this will maintain a healthy reserve capacity in the vasculature of the heart and will also help to retard the progress of atherosclerosis.

*(This article first appeared in The Irish Times, March 30, 1998.)*