Activity 1.12 Sudden death in athletes

Purpose

- To illustrate how the predisposition for cardiovascular disease can be inherited.
- To apply knowledge of atherosclerosis and blood clotting.

Procedure

The article describes how possession of one gene can increase the risk of developing the disease without the presence of other risk factors.

Read the article and then answer the questions that follow.

Sudden Death in Athletes

by Warren Dolphin, Iowa State,

In November, 1995, Sergei Grinkov, an Olympic gold medalist in pairs figure skating, collapsed and died of sudden cardiac arrest while training at Lake Placid, NY. An abbreviated necropsy report appears in the June 29 issue of the medical journal *Lancet*. Grinkov had such severe cardiovascular disease that his coronary arteries looked like those of a 70-year-old. Although Grinkov had never complained of any chest pain, evidence indicated that he had a heart attack about 6 hours before his death. What is puzzling about this sudden death is that Grinkov was an athlete in good physical condition, did not smoke or use drugs, did not have high blood pressure or diabetes mellitus, nor did he have high cholesterol levels. However, his family medical history was significant: his father had died suddenly at age 52.

Researchers at Johns Hopkins University read about Grinkov's death in the newspapers and wondered if it had any relationship to a genetic flaw they had just described. Samples of Grinkov's blood were obtained and DNA was extracted from the white blood cells. Analysis of the DNA indicated that Grinkov had inherited a form of a gene, called the platelet antigen gene, which greatly increased his chances of heart attack. This form of the gene causes platelets to be overly active in forming blood clots and may cause cholesterol to bind to endothelial cells lining blood vessels. The Johns Hopkins researchers speculate that Grinkov's coronary arteries were narrowed by accumulation of fatty substances and that a blood clot formed and completely blocked a coronary artery, resulting in his death. Further information about the gene can be obtained from an article in the April 25 issue of *The New England Journal of Medicine*.

It is estimated that about 20% of individuals in the US population carry the harmful form of the platelet antigen gene. The presence of this gene will not necessarily cause a heart attack, but it does increase the probability of attack. If researchers can devise a simple test for the presence of this gene, then those identified as carrying it may be able to adjust their lifestyles to reduce the risk of cardiovascular problems.

In a large study of athletic death, Barry Maron, a cardiologist at the Minneapolis Heart Institute Foundation, and his colleagues collected information on 158 deaths in young athletes from 1985 to 1995. His group's report in the *Journal of the American Medical Association* indicated that the most common cause of death among young athletes was a condition known as hypertrophic cardiomyopathy (HCM) caused by mutations in any one of several genes. The effect of these mutated genes is to produce an abnormally thick wall in the left ventricle. Only about 2% of those in his study were thought to carry the gene for the abnormal platelet antigen, indicating that sudden cardiac failure may be due to a number of factors.

Questions

Q1 Explain in detail how possession of this form of the anti-platelet antigen gene affects the process of atherosclerosis and can result in sudden death

Q2 Why might having an abnormally thick left ventricle wall create a problem? To find out more information about cardiomyopathy you can visit the Cardiomyopathy Association website. See the weblinks for this activity.

To explore the personal side of this tragedy, use a search engine to look for references to Sergei Grinkov. You should receive a listing of several hundred documents describing this obviously well-liked person and the tragedy of his death.