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Review Article

Free Radicals Cause Coronary Artery Disease Cholesterol does Not

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Abstract

Coronary artery disease is caused by free radical damage to tumor suppressor genes, which mutation allows cells to proliferate out of control to create benign mini tumors between the endothelium lining and the smooth muscle walls of arteries. As these tumors grow, they cause tiny tears in the endothelium that are patched with interlacing filaments of fibrin. This rough scar tissue traps minerals (especially calcium), heavy metals, macrophages, and cellular debris. The final smooth layer of cholesterol that is applied over this arterial plaque plays no causal part in its development. Recent studies indicate that nearly 75 percent of patients hospitalized for a heart attack had cholesterol levels which indicate they were not at high risk for a cardiovascular event, according to current national cholesterol guidelines. Thus, there is no causal relation between serum cholesterol levels and coronary artery disease.

Keywords: *Coronary Artery Disease; Cardiology; Atherosclerosis; Arteriosclerosis; Free Radicals; Cholesterol*

Background

Heart disease was an uncommon cause of death in the U.S. at the beginning of the 20th century, a time when meat and butter were mainstays of the American diet [1]. Beef, bacon, sausages, and pork were consumed in relatively large quantities. Thus, there is no known causal link between the consumption of cholesterol and the etiology of coronary artery disease.

A national study indicates that nearly 75 percent of patients hospitalized for a heart attack had cholesterol levels that would indicate they were not at high risk for a cardiovascular event, according to current national cholesterol guidelines [2]. Thus, there is no causal link between serum cholesterol levels and coronary heart disease.

The aim of this study is to determine the true causative agent for coronary artery disease. The methodology used is a critical review of existing literature.

Cholesterol is a Vital Bodily Substance

Cholesterol is a waxy substance that is essential to life. It is a primary component of the membrane that surrounds all human cells. The body uses cholesterol to make hormones (cortisol, estrogen, progesterone, testosterone), to produce vitamin D under the skin in response to sunlight, and to produce bile acids for emulsifying fats for digestion [3].

Although the brain is only from two to three percent of body weight, 25 percent of bodily cholesterol is found in the brain. In the elderly, the best memory function has been observed in those with the highest level of cholesterol [4]. Low cholesterol is associated with an increased risk for depression and even death.

Cholesterol is so important to health that the liver and intestines produce about 80 percent of it endogenously. Only about 20 percent of bodily cholesterol comes from dietary sources [5]. Vegans, who consume no animal products, produce 100 percent of their bodily cholesterol internally.

The Cholesterol Myth

In 1908 and 1913, Russian researchers fed rabbits diets high in saturated fats and cholesterol [6, 7].

Because rabbits are vegetarians, their bodies do not have the enzymes required for metabolizing cholesterol. The blood cholesterol readings in these animals rose to values 10 to 20 times higher than the highest values ever noted in human beings. The entire body of the rabbit becomes overwhelmed with cholesterol that it can neither metabolize, store, nor excrete. It dies not from a heart attack but from starvation. Cholesterol deposits appear in different places in rabbits' blood vessels and have an entirely different structure. There are no hemorrhages, no clefts, and no thrombus formation as there are in human coronary artery disease [8].

In 1953, Ancel Keys published a report allegedly showing a correlation between the consumption of saturated fats and cholesterol in the incidence of heart disease in six countries [9]. Keys committed selection bias, however, because he had data from 22 countries but chose only those six which supported his foregone conclusion. One of the countries he excluded was France, which has both a high consumption of fat and a low incidence of heart disease. Had Keys plotted all 22 sets of data, there would have been no correlation whatsoever, simply random points on a graph.

A meta-analysis of 26 randomized and controlled cholesterol-lowering trials concluded that there is no significant difference in outcomes from lowering cholesterol, whether by diet or by drugs [10].

- Fatal heart attacks were the same in treatment and control groups (2.9%);
- Number of deaths was slightly higher in treatment groups (6.1% vs. 5.8%); and
- Number of nonfatal heart attacks was slightly lower in treatment groups (2.8% vs 3.1%)

Free Radical Hazards

A free radical is a renegade molecule containing an unpaired electron in its outer orbit [11]. The odd number of electrons of a free radical makes it unstable, short lived, and highly reactive. A first free radical instantly pulls an electron from a molecule, thus turning it into a second free radical that begins a chain reaction cascade that finally damages the living cell [12]. Cascading free radicals can alter DNA, creating mutant cells that proliferate out of control causing tumors throughout the body and bulges inside artery walls. Free radical exposure is thus associated with both cancer and coronary artery disease [12, 22].

Exogenous sources of free radicals include environmental pollution, tobacco smoke, industrial solvents, radiation (X-rays, gamma rays), ozone, and chlorinated drinking water and swimming pools [12]. Dietary sources of free radicals include fried foods, polyunsaturated vegetable oils, and nitrite food preservatives [13-15]. Polyunsaturated oils are chemically unstable because they have multiple loose double carbon bonds in their chemical structure. When subject to heat, polyunsaturated molecules oxidize rapidly to form hazardous free radicals.

The intake of polyunsaturated vegetable oils began to increase starting in the early 1900s, at a time when the consumption of butter and lard was on the decline. Unstable linoleic acid, the predominant polyunsaturated fat in vegetable oils, now makes up about 10 percent of total energy intake in the American diet [14].

Historically, the largest increase in mortality from coronary artery disease parallels increased consumption of unstable polyunsaturated oils. In 1955, stable animal fats became increasingly abandoned in favor of polyunsaturated oils [34]. By 1960, coronary heart disease was killing one in three Americans [36].

In 1961, polyunsaturated soybean oil became the predominant oil ingredient in processed foods [35]. Mortality from coronary artery disease peaked in the mid-1960s [36].

The Structure of Arterial Plaque

There is just as much cholesterol circulating through veins as through arteries. However, plaque builds up only in arteries and never in veins. This is further evidence that cholesterol is not a causative factor in coronary artery disease.

Free radicals attack the smooth muscles in artery walls [16-21, 23-25]. There are no muscles in veins, which factor makes them immune to free radical attack.

Tumor suppressor genes are proteins that regulate cells during division and replication [33]. When a tumor suppressor gene in an arterial muscle is mutated by free radicals, it allows cells to proliferate out of control thus creating a benign tumor between the endothelium lining and the smooth muscle wall of that artery.

As the tumor grows, tiny tears develop in the endothelium. The first visual evidence of this arterial damage are streaks of foam cells in the arterial wall just beneath the endothelium. Over time these streaks can develop into atherosclerotic plaques, or they can remain stable or even regress [26].

Foam cells are swollen lipid laden macrophages that have become trapped in rough scar tissue caused by the healing of tiny cuts or tears in the arterial lining [17, 27]. When foam cells die, their contents are released and attract more macrophages thus creating an extracellular lipid core near the center to inner surface of each atherosclerotic plaque. The outer, older portions of the plaque become calcified [28].

When a blood vessel is injured, platelets adhere to each other and the edges of the injury to form a plug that covers the area. This activates the coagulation mechanism by depositing fibrin, a clotting protein. The resulting plug that is formed acts like a scab which retracts to stop the loss of blood.

Fibrin is a whitish protein that is deposited as fine, interlacing filaments containing entangled red and white blood cells and platelets, the whole forming a coagulum or clot [18]. Fibrinogen is the protein in blood plasma that is converted into fibrin by the action of thrombin and in the presence of calcium ions. In other words, fibrin acts like a scab to prevent a cut or tear from bleeding out or hemorrhaging and traps calcium ions before they can form lumps of calcium that would plug arteries and capillaries. This rough scab-like structure on the artery wall becomes a matrix which traps minerals (especially calcium), heavy metals, macrophages, and cellular debris [29-31]. These are all substances that could not possibly adhere to the smooth lining of a healthy artery.

To prevent obstruction from additional debris becoming trapped in the burgeoning atherosclerotic matrix, the body covers it over with a smooth layer of cholesterol. Note that cholesterol is the last substance laid down in the arterial plaque and not the first.

This outer layer of cholesterol tends to become oxidized from further free radical attack [32]. Cholesterol thus appears to serve a dual protective role: (1) to improve blood flow by adding a smooth surface to the damaged arterial wall; and (2) to prevent free radicals from causing further damage to the artery itself.

Conclusion

Coronary artery disease is caused by free radical damage to tumor suppressor genes, which mutation allows cells

to proliferate out of control to create benign tumors between the endothelium lining and the smooth muscle walls of arteries. As these mini tumors grow, they cause tiny tears in the endothelium that are patched with interlacing filaments of fibrin. This rough scar tissue traps minerals (especially calcium), heavy metals, macrophages, and cellular debris. The final smooth layer of cholesterol that is applied over this arterial plaque plays no causal part in its development. Statins may reduce excess cholesterol levels; however, they can do nothing for the true cause of coronary artery disease.

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable

Competing interests

There are no competing interests.

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Author's contribution

DR is the sole author who has read and approved this manuscript.

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