LDL Cholesterol: "Bad" Cholesterol, or Bad Science?

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ABSTRACT

The belief that low-density lipoprotein (LDL) cholesterol causes atherosclerosis and subsequent heart disease is a fundamental precept of modern medicine. Therapies aimed at reducing serum LDL cholesterol are currently considered to be an essential element of any attempt to prevent coronary heart disease (CHD).

While it currently enjoys widespread acceptance among health authorities and medical practitioners, numerous lines of evidence raise questions about the LDL hypothesis. Native LDL cholesterol is a vitally important substance and is not in any way atherogenic. Statin drugs, the only LDL-lowering agents shown to have clinical benefit in reducing the incidence of heart disease, have been shown to exert their benefits via mechanisms totally unrelated to LDL cholesterol reduction.

A potential causative role in atherosclerosis and heart disease has indeed been detected for oxidized LDL, but this form of LDL shows no correlation with serum levels of native LDL. Rather, individual antioxidant status appears to be a key factor influencing serum concentrations of oxidized LDL.

Background

For the last four decades, the mainstream medical establishment has maintained that elevated serum cholesterol levels are a primary instigator of atherosclerosis and coronary heart disease (CHD). Millions of people worldwide have been convinced by extensive promotional campaigns that that the key to avoiding CHD is to reduce cholesterol levels by using lipid-lowering drugs and diets low in saturated fats. This campaign has produced billions in profits for drug companies and the manufacturers of low-fat food products. The world's current top-selling pharmaceutical, for example, is Pfizer's cholesterol-lowering drug atorvastatin (Lipitor), which amassed $10.9 billion in sales in a single year, 2004.[1]

While the war on cholesterol has proved to be extremely lucrative for the food and drug industries, it has delivered no benefit to public health. CHD is still the leading cause of death in Western countries. While the number of deaths from CHD has indeed decreased since the late 1960s, total incidence of CHD has not declined.[2-5] If cholesterol reduction were effective in preventing CHD, then it would surely lower both fatal and nonfatal CHD. This has not happened. Modern medicine has made significant advances in extending the lives of those who have already had heart attacks, but it has failed to help people avoid CHD in the first place.

In addition, the relentless drive to steer people to low-fat, high-carbohydrate diets has been accompanied by a marked increase in the prevalence of obesity and diabetes.[6] This increase has been so large that some predict the steady rise in life expectancy enjoyed by Americans during the last century may soon come to an end.[7]

Critical Importance of Cholesterol

Cholesterol, contrary to its popular image as a potent enemy of health and longevity, is actually a crucial substance that performs innumerable vital functions in the body. Cholesterol is needed for the synthesis of bile acids, which are essential for the absorption of fats, and of many hormones such as testosterone, estrogen, dihydroepiandrosterone, progesterone, and cortisol.[8] Together with sun exposure, cholesterol is required to produce vitamin D.[9] Cholesterol is an essential element of cell membranes, where it provides structural support and may even serve as a protective antioxidant.[10,11] It is essential for conducting nervous impulses, especially at the level of the synapse.[12]

The False Dichotomy of "Good" vs "Bad" Cholesterol

Because cholesterol is water-insoluble, it must be transported inside lipoproteins. Various types of lipoproteins exist, but the two most abundant are low-density lipoprotein (LDL) and high-density lipoprotein (HDL). The main function of LDL is to transport cholesterol from the liver to tissues that incorporate it into cell membranes. HDL carries "old" cholesterol that has been discarded by cells back to the liver for recycling or excretion.

Recognizing that cholesterol serves a number of important functions, purveyors of the cholesterol hypothesis have modified their theory to incorporate the "good cholesterol, bad cholesterol" paradigm, in which LDL cholesterol forms "fatty deposits" in arterial walls, which become plaques that grow, rupture, and stimulate the formation of artery-blocking blood clots. HDL cholesterol, on the other hand, is the "heart-friendly" lipoprotein that counters the action of LDL by removing cholesterol from the arteries and transporting it back to the liver for safe disposal. This paradigm is overly simplistic and not supported by the evidence.

If LDL cholesterol "causes" atherosclerosis, logic dictates that there should be a strong correlation between blood levels of LDL cholesterol and atherosclerosis. Proponents of the LDL hypothesis have repeatedly maintained that this is true. However, a review of the available evidence suggests otherwise.

The Composition of Atherosclerotic Plaques

Despite popular perception, atherosclerotic plaques are not simply big wads of fat and cholesterol that have stuck to the walls of arteries like mud inside a pipe. The growth of atherosclerotic plaques takes place primarily inside the artery wall, between the inner and

outer layers.[13] The plaques are complex entities with numerous components, including smooth muscle cells, calcium, connective tissue, white blood cells, cholesterol, and fatty acids. Proliferation of plaques may occur, not because of simple elevations in blood cholesterol, but because of unfavorable physiological conditions that damage or weaken the structure of the arterial wall. These factors include nutrient deficiencies,[14] poor glycemic control,[15] cigarette smoking,[16] homocysteine,[17] psychological stress,[18] nitric oxide depletion,[19] high iron levels,[20] microbial infection,[21,22] dietary trans fatty acids,[23] excessive refined carbohydrate intake,[24] and excessive omega-6 fatty acid intake and/or deficient omega-3 fat intake.[25] All of these factors have been shown to exert an atherogenic effect unrelated to serum cholesterol elevation.

Damage to the arterial wall triggers an inflammatory state in which the body recognizes injury and sets about to repair it.[13] This response-to-injury scenario is well accepted by the vast majority of cardiovascular researchers, although many of them continue to promote the hypothesis that LDL cholesterol is involved in triggering or aggravating the inflammatory state that eventually leads to heart disease or stroke. There is little evidence to support such a contention. In fact, cholesterol, like other components, may be present in atherosclerotic plaque as part of the repair mechanism.

LDL and Oxidized LDL

It is imperative to distinguish between "standard" and "modified" LDL cholesterol. The former is the type of LDL that the body produces daily in normal metabolic function. The latter has undergone some sort of deleterious alteration; the most widely studied example is "oxidized" LDL.

During the 1980s, some researchers began to recognize that LDL itself was not a reliable independent risk factor for CHD; half of those who suffer CHD have LDL levels within normal limits. Among the 28,000-plus participants of the Women's Health Study, for example, 46% of first cardiovascular events occurred in women with LDL cholesterol levels less than 130 mg/dL—the "desirable" target for primary prevention set by the National Cholesterol Education Program (NCEP).[26]

Research in both animals and humans has shown that oxidized LDL is a better predictor of atherosclerosis and cardiovascular disease than regular LDL cholesterol. Whether or not oxidized LDL is a direct contributor to the atherogenic process cannot be determined with any certainty based upon the available evidence. The stronger association between oxidized LDL and cardiovascular disease suggests, however, that a person's antioxidant status is a far more important determinant than LDL levels of the risk of developing advanced plaques.

In animal studies, administration of antioxidant drugs like probucol impairs LDL oxidation and arterial plaque formation, even when there is no change in blood cholesterol levels.[27-31] In fact, administration of the antioxidant butylated hydroxytoluene (BHT) significantly reduces the degree of atherosclerosis in the aorta of rabbits, even though it raises LDL cholesterol levels.[30]

A similar phenomenon is observed in humans. Among elderly Belgians, higher levels of oxidized LDL were accompanied by a significantly increased risk of heart attack, regardless of total LDL levels.[32,33]

In Japanese patients undergoing surgery to remove plaque from their carotid arteries, blood levels of oxidized LDL were significantly higher than those measured in healthy controls. Advanced carotid plaques removed from these patients showed far higher levels of oxidized LDL than neighboring sections of artery that were disease-free. Elevated oxidized LDL was also associated with an increased susceptibility of plaque rupture. However, there was no association between oxidized LDL concentrations and total LDL levels.[34]

Von Shacky and coworkers, in a 2-year double-blind trial in patients with CHD, found that daily fish-oil supplementation increased the incidence of atherosclerotic regression, and decreased the loss in minimal luminal diameter, as assessed by quantitative coronary angiography. Fish-oil recipients also experienced fewer cardiovascular events. LDL cholesterol levels tended to be greater in the fish-oil group.[35]

The lack of importance of total LDL levels was further underscored by two recent trials that examined the impact of LDL-lowering therapy on calcified coronary plaque progression. In the first of these studies, patients given aggressive LDL cholesterol-lowering treatment (statins plus niaicin) were compared with those receiving less aggressive treatment (statins alone). Despite greater LDL reductions in the former group, there were no differences in calcified plaque progression as detected by electron beam tomography. The authors concluded: "… with respect to LDL cholesterol lowering, 'lower is better' is not supported by changes in calcified plaque progression."[36]

In the Scottish Aortic Stenosis and Lipid Lowering Trial, patients with calcific aortic stenosis were randomly assigned to receive either 80 mg of atorvastatin daily or placebo. After 25 months, serum LDL concentrations remained at an average 130 mg/dL in the placebo group but fell significantly to 63 mg mg/dL in the atorvastatin group. Despite the fact that LDL levels were reduced by more than half in the atorvastatin subjects, there was no difference in aortic-jet velocity or progression in aortic-valve calcification between the treatment or placebo groups.[37]

Plaque Rupture

It is well-established that plaque rupture is a major trigger of acute coronary events.[38] Analysis of the lipid portion of atherosclerotic plaques shows they contain a disproportionately high concentration of the omega-6 fatty acid linoleic acid, and that plaque content of linoleic acid correlates with dietary intake.[39,40] Higher plaque concentrations of linoleic acid are also associated with an increased likelihood of plaque rupture.[41] The major sources of linoleic acid in Western diets are "heart-healthy" polyunsaturated vegetable oils that have been heavily promoted because of their clinically demonstrated ability to lower total and LDL cholesterol levels.[42]

Serum LDL vs Antioxidant and Fatty Acid Status

In 1997 Swedish researchers published a comparison of CHD risk factors among men from Vilnius in Lithuania and Linkoping in Sweden. These two groups were selected because the former had a four-fold higher death rate from CHD than the latter. Very little

difference in traditional risk factors existed between the two groups, except that the men from CHD-prone Vilnius had lower total and LDL cholesterol levels.

According to common wisdom, the lower total and LDL cholesterol of the Lithuanian men should have placed them at reduced risk of heart disease. When the researchers probed further, they discovered that the men from Vilnius had significantly higher concentrations of oxidized LDL.[43] They also displayed significantly poorer blood levels of important diet-derived antioxidants such as beta carotene, lycopene, and gamma tocopherol (a form of vitamin E).[44] Blood levels of these particular nutrients are largely determined by dietary intake, especially from the consumption of antioxidant-rich fruits, nuts, and vegetables. So while the Lithuanian men had lower LDL levels, they were more prone to the formation of oxidized LDL owing to what appeared to be a poorer intake of antioxidant-rich foods.

This may well have explained their greater susceptibility to cardiovascular disease; in tightly controlled clinical trials, discussed below, individuals randomized to increase their intake of fruits and vegetables have experienced significant reductions in cardiovascular and all-cause mortality.

LDL Theory on Trial

No tightly controlled clinical trial has ever conclusively demonstrated that LDL cholesterol reductions can prevent cardiovascular disease or increase longevity.

In the large GISSI-Prevenzione trial in Italy, the mortality benefits of omega-3-rich fish oil appeared early on in the study—as did an increase in LDL cholesterol levels. Mean LDL levels in the subjects given fish oil rose from 136 mg/dL at baseline to 150 mg/dL after 6 months, before gradually returning to initial levels at 42 months. A similar pattern was observed in the control group. This extended period of elevated LDL levels did not prevent the fish-oil patients from experiencing significantly more favorable cardiovascular and mortality outcomes.[45]

In the Lyon Diet Heart Study, an experimental group advised to increase consumption of root vegetables, green vegetables, fish, fruit, and omega-3 fatty acids also experienced greatly improved cardiovascular and survival outcomes. The study was originally intended to follow the patients for 4 years, but death rates diverged so dramatically early on that researchers decided it would be unethical to continue, and called an end to the trial. After an average follow-up of 27 months, the all-cause death rate of the control group was more than twice that of the experimental group.

One little-publicized finding from this well-known trial was that the total and LDL cholesterol levels of the treatment and control groups were virtually identical throughout the study. Those in the treatment group, however, did show significantly higher blood levels of omega-3 fatty acids and antioxidants.[46]

Statins and Mortality

According to medical "opinion leaders," recent trials with statin drugs have proven that LDL reduction is beneficial. Allegedly, these trials have also shown that the greater the LDL reductions, the better.

First, it must be emphasized that statin drugs have only been shown to exert consistent mortality-lowering benefits in a select group of patients; namely, middle-aged males with existing CHD. Statins may also lower mortality in diabetic patients.[47]

Trials with men free of heart disease have not shown any consistent and significant mortality-lowering benefit from the use of statin drugs.[48-52] In women of any age, statins have not been shown to exert any reduction in cardiovascular or all-cause mortality whatsoever when used for primary prevention, and no reduction in all-cause mortality when used for secondary prevention.[53] The only study to date focusing on elderly subjects, the PROSPER trial, did find a reduction in cardiovascular deaths, but this was negated by a similar increase in cancer mortality.[54] Rarely mentioned are two studies showing that lovastatin was associated with increased all-cause mortality in healthy hypercholesterolemic males and females.[48,50]

In those trials showing decreased mortality with statins, the reduction in death rates are no greater than, and often inferior to, that seen with other less toxic interventions, such as omega-3 fatty acid supplementation, fruit-and-vegetable-rich diets, and exercise.[45, 46, 55, 56]

Secondly, the claim that LDL reduction is responsible for any statin-induced reduction in cardiovascular events or mortality rates is unsupported.

Effects of Statins

Statin drugs exert their lipid-lowering effect by blocking 3-hydroxy-3-methylglutaryl (HMG) coenzyme A reductase, an enzyme in the liver that is involved in the early stages of cholesterol synthesis. Statins inhibit the synthesis not only of cholesterol, but of many important intermediate metabolites, including, but not limited to, mevalonate pyrophosphate, isopentanyl pyrophosphate, geranyl-geranyl pyrophosphate, and farnesyl pyrophosphate. Inhibition of these compounds means that statins exert a plethora of effects unrelated to cholesterol lowering. *In vitro*, animal and human studies show that these pleiotropic actions possess beneficial cardiovascular effects that occur independently of cholesterol reduction.[57,58] Some of these cholesterol-independent effects include:

Impairment or reversal of atherosclerotic plaque formation: Statins reverse or impede the progression of atherosclerosis in rabbits, without any accompanying change in serum cholesterol.[59,60]

Improvements in arterial function: In elderly diabetic patients, cerivastatin increased dilation of the brachial artery (improved blood flow) after only three days, before any change in cholesterol levels had occurred.[61] In healthy young males with normal cholesterol levels, improved endothelial function was observed within 24 hours of treatment with atorvastatin; again, this improvement preceded any drop in serum cholesterol levels.[62]

Longer-term improvements in arterial function: In human volunteers with slightly elevated cholesterol, researchers found that 4 weeks of simvastatin therapy significantly enhanced forearm blood flow. The improvement increased with continued administration of simvastatin despite no further reduction in serum cholesterol, and there was no relation between the decrease in cholesterol and improvement in endothelial function.[63]

Anti-clotting effects: Statins have been shown to reduce platelet production of thromboxane, an eicosanoid that encourages blood clotting. This effect was not seen with older drugs that lowered total or LDL cholesterol such as cholestyramine, cholestipol, and fibrates.[64] Puccetti et al. observed that simvastatin,

atorvastatin, and fluvastatin reduced platelet reactivity before significant reductions in LDL cholesterol occurred.[65,66]

Anti-inflammatory effects: In research with mice, statins markedly reduce measures of both inflammation and atherosclerosis, despite little change in serum cholesterol levels.[67] In humans, statin therapy produces significant reductions in C-reactive protein, a marker of inflammatory activity that has repeatedly been associated with increased cardiovascular risk. This statin-induced reduction in CRP levels is not correlated with any decrease in LDL cholesterol levels.[68-71] Statins also reduce the effects of adhesion molecules and chemoattractants, which play a key role in the inflammatory process and plaque formation by promoting migration of leukocytes and their adherence to the arterial wall plaque.[72] Weitz-Schmidt and coworkers have shown that statins exert anti-adhesion properties *in vitro*. In an important experiment, this group produced a specially modified form of lovastatin with no inhibitory effect on HMG-CoA reductase. This "designer statin" still possessed potent anti-adhesive, anti-chemoattractant effects, despite complete disablement of its cholesterol-lowering actions.[73]

Antioxidant effects: In animal studies, statins reduce various measures of oxidative stress, even when cholesterol levels remain unchanged.[74-76] In humans, a mere nine days of atorvastatin administration (20 mg/day) significantly decreased platelet levels of oxidized LDL. These changes were observed before any noteworthy drop in LDL cholesterol was evident.[69] In patients randomly assigned to receive 10 mg of pravastatin or 20 mg of fluvastatin for 12 weeks, significant reductions in oxidized LDL occurred in both groups. The reduction was significantly higher in the fluvastatin group than in the pravastatin group (47.5% vs 25.2%, respectively). Reductions in total and LDL cholesterol, however, did not differ between the two groups.[77]

Inhibition of the migration and proliferation of smooth muscle cells seen during plaque formation:[78,79] This phenomenon, which is independent of lipid-lowering, was first confirmed when researchers observed that addition of mevalonate, geraniol, farnesol and geranylgeraniol, but not LDL, prevented the anti-proliferative effect of statins.[80,81] Animal research also shows a disconnect between the lipid-lowering and anti-proliferative effects of statins. When collars were placed around one of the carotid arteries in rabbits, treatment with lovastatin, simvastatin, and fluvastatin significantly reduced intimal lesion formation, despite no change in the animals' cholesterol levels.[60]

Prevention of atherosclerotic plaque rupture: Plaque rupture is believed to be the instigating factor in a significant portion of acute coronary events.[38] In patients with symptomatic carotid atherosclerosis, 40 mg/d of pravastatin reduced the lipid and oxidized LDL content but increased the collagen content of plaques as compared to control subjects. These changes are like those seen in stable plaques that are less prone to rupture.[82] In apolipoprotein E–deficient mice, simvastatin significantly increased serum cholesterol levels, but induced a 49% reduction in the frequency of intraplaque hemorrhage and a 56% reduction in the frequency of calcification—both markers of advanced and unstable atherosclerotic plaques.[83] Compared to controls, adult male monkeys fed an atherogenic diet and given pravastatin or simvastatin showed significantly reduced inflammatory activity in plaques, while markedly increasing their collagen content. This effect was independent of cholesterol reduction; blood lipid levels in the animals were kept stable by manipulating dietary cholesterol intake.[84] (Unlike in humans, dietary cholesterol levels can significantly influence serum cholesterol concentrations in monkeys.)[85]

***Prevention of cardiac hypertrophy*:** Takemoto and coworkers demonstrated the ability of statins to prevent cardiac hypertrophy in mice. This benefit occurred despite no change in serum cholesterol levels. Research by these and other researchers suggests the antihypertrophic effect of statins may derive from their antioxidant properties.[86,87]

The numerous actions of statins unrelated to lipid lowering are no doubt a major reason why almost all of the major controlled, randomized trials with these drugs have shown no association between the degree of total or LDL cholesterol lowering and the CHD survival rate.[50, 88-92] In most of these studies, the risk of a fatal heart attack was similarly reduced whether total or LDL cholesterol levels were lowered by a small or large amount.

There are two exceptions to this phenomenon: the PROSPER trial, which recorded the highest survival rates in both the treatment and control groups among those with the highest LDL levels,[54] and the Japanese Lipid Intervention Trial (J-LIT). In the latter, a 6-year study of more than 47,000 patients treated with simvastatin, those with a total cholesterol level of 200-219 mg/dL had a lower rate of coronary events than those whose levels were above or below this range. The lowest all-cause mortality rate was seen in the patients whose total and LDL cholesterol levels were between 200-259 mg/dL and 120-159 mg/dL, respectively.[93]

Selective Citation and Contradictory Evidence

When confronted with nonsupportive evidence, the anticholesterol mainstream typically engages a two-pronged strategy. First, it simply ignores contradictory evidence. Second, it simultaneously seeks out supportive evidence, no matter how flimsy, and then embarks on an aggressive propaganda campaign to "educate" as many people as possible about it. The end result is that the public receives a distorted picture of the existing evidence.

A classic example of this process occurred in April 2004, when the results of the Pravastatin or Atorvastatin Evaluation and Infection Therapy trial (PROVE-IT) were published. The PROVE-IT researchers randomized patients who had recently been hospitalized for an acute coronary event to either 40 milligrams of pravastatin (Pravachol) or 80 milligrams of atorvastatin daily. Not surprisingly, median LDL cholesterol levels were lowered to a greater extent on high-dose atorvastatin. After an average follow-up of 2 years, the high-dose atorvastatin group enjoyed a 30% reduction in CHD mortality and a 28% decrease in all-cause mortality.[94]

In the media barrage about the trial, "medical opinion leaders" asserted that PROVE-IT finally "proved" that the lower the LDL level, the better. Actually, PROVE-IT proved no such thing. Neither did TNT (Treating New Targets), the vigorously promoted study published in March 2005, which also allegedly proved the value of aggressive LDL lowering. In this study, 10,001 CHD patients with LDL cholesterol levels of less than 130 mg/dL were randomly assigned to either 10 or 80 milligrams of atorvastatin daily. In those receiving low-dose atorvastatin mean LDL

cholesterol levels were reduced to 101 mg/dL, compared to 77 mg/dL in those taking the high dose.

After a median follow-up of 4.9 years, 2.5% of the low-dose group had died from coronary causes, compared to 2% in the high-dose group, a 20% reduction in relative risk (RR).[95] Again, leading proponents of the lipid hypothesis dominated the subsequent extensive media coverage, enthusiastically hailing these results as triumphant confirmation of the PROVE-IT findings. According to these prestigious commentators, the "lower is better" era of LDL reduction had officially arrived. The fact that all-cause mortality did not differ between the two groups, owing to an increase in noncardiovascular deaths among the high-dose subjects, evidently escaped notice.

Explaining Favorable Cardiovascular Outcomes

That statins exert a whole host of biochemical effects beyond mere lipid lowering is beyond question. It is entirely possible, therefore, that the statins' pleiotropic effects—and not LDL lowering—produced the favorable cardiovascular outcomes seen in PROVE-IT or TNT. To claim otherwise, especially when little attempt was made to measure the impact of these lipid-independent effects, is somewhat illogical.

C-reactive protein (CRP) has gained much attention since a large study published in 2002 suggested that it was a significantly better predictor of future cardiovascular events than LDL cholesterol.[26] While it is not yet clear whether CRP itself is directly atherogenic, it is well-known that CRP serves as a marker for inflammation.

In January 2005, the *New England Journal of Medicine* published two studies examining the interplay between statin use, CRP levels, and subsequent coronary event rates. The first of these, using data from the PROVE-IT study, found: "Patients who have low CRP levels after statin therapy have better clinical outcomes than those with higher CRP levels, regardless of the resultant level of LDL cholesterol."[96]

In the second study, researchers used intravascular ultrasonography to examine the association of LDL and CRP with the continued development of atherosclerosis in 502 CHD patients. They found: "Atherosclerosis regressed in patients with the greatest reduction in CRP levels, but not in those with the greatest reduction in LDL cholesterol levels."[97]

These two studies were not the only ones to reinforce the importance of inflammation, and to show a disconnect between statins' anti-inflammatory effects, their lipid-lowering actions, and clinical outcomes. Among postinfarction patients in the CARE (Cholesterol and Recurrent Events) trial, subjects with the highest levels of CRP and serum amyloid A (another inflammatory marker) had a higher risk of subsequent coronary events and benefited more from pravastatin therapy than those without elevated levels of these inflammatory markers. The relative risk of a recurrent coronary event was reduced by 54% and 25% in the two groups, respectively, compared with placebo.

At baseline, both groups had nearly identical plasma lipid and lipoprotein profiles. Although baseline median CRP levels for active treatment and placebo were similar, the median level after 5 years was 21.6% lower in the pravastatin group than in the placebo group. The change in CRP levels associated with pravastatin treatment was not correlated with the reduction in LDL cholesterol levels.[98]

In the Effects of Atorvastatin vs Simvastatin on Atherosclerosis Progression (ASAP) study, baseline CRP values were similar among patients given either simvastatin (40 mg/d) or atorvastatin (80 mg/d), but declined over the next 2 years to a greater extent in the latter group. A significant correlation was found between the decrease of CRP and reduction in intima media thickness (IMT) of carotid artery segments. No correlation was observed between change in CRP and change in lipids.[99]

Conclusion

The concept that LDL is "bad cholesterol" is a simplistic and scientifically untenable hypothesis.

The inordinate focus on cholesterol, a perfectly natural substance that performs many crucial functions in the body, has taken and continues to take valuable resources and attention away from factors more closely related to heart disease.

Independent-thinking practitioners must look at the readily available evidence for themselves, instead of relying on the continual stream of anticholesterol propaganda emanating from "health authorities." By doing so, they will quickly realize that the LDL hypothesis is aggressively promoted for reasons other than public health.

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