Improving HDL Cholesterol: How, Why and NOW!

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Cardiovascular disease, the number one cause of mortality with men and women in the U.S., is a cluster of problems of the heart and blood vessels that are related to the development of atherosclerosis. Atherosclerosis is a condition that progresses when plaque builds up on the walls of arteries. This buildup narrows the arteries, making it more difficult for blood to flow through them. Coronary heart disease (CHD) is a type of cardiovascular disease, which includes atherosclerotic plaque build up in the coronary arteries, heart attack, and angina pectoris (or chest pain). High-density lipoprotein cholesterol (HDL-C) can be a negative risk factor for CHD. This is often confusing to grasp, but necessary to understand and be able to explain to clients. A risk factor, which is either positive or negative, is something that is associated with ill health. A positive risk factor promotes or enhances ill health. For example, smoking is a positive risk factor as it increases the risk of CHD 2-4 times when compared to non-smokers (AHA, 2011). A negative risk factor negates or minimizes the ill health. HDL-C levels greater then 60 mg/dL provide a protective effect when evaluating someone's risk to heart disease, thus negating the risk. This is why HDL-C is referred to as the 'good' cholesterol. There are several meaningful strategies exercise professionals can incorporate with their clients' exercise training and lifestyle behavior change plans that will raise HDL-C, and thus serve as principal prevention measures to lower CVD risk. This article will explain the metabolic mechanism of HDL-C, specifically discuss its unique effects in women, and provide HDL-C raising guidelines for personal trainers to utilize with their clients to lessen the risk of CVD.

HDL—The Reverse Cholesterol Transporter

Although HDL and HDL-C are used interchangeably, HDL is the specific protein-enhanced lipoprotein (contains proteins and lipids) particle while HDL-C refers to its measured level

(Miller, 2003). HDL's main role in metabolism is to transfer cholesterol from plaque depots (called atherosclerotic plaque) in blood vessels to the liver for excretion, which is called reverse cholesterol transport (See Figure 1). Other lipoproteins deposit cholesterol while HDL-C helps to remove it from accumulating plaque sites on blood vessel walls. The HDL particle is comprised of a cholesterol core surrounded by an outer shell of phospholipids (specific type of lipid attached to a phosphate group and nitrogen base) and apolipoproteins (proteins that bind to lipids). HDL particles are further classified into HDL2 and HDL3 subfragments. HDL2 is the larger of the two particles, but has less density (weight). The HDL2 is believed to be more active in the reverse cholesterol transport process (Eapen et al., 2009).

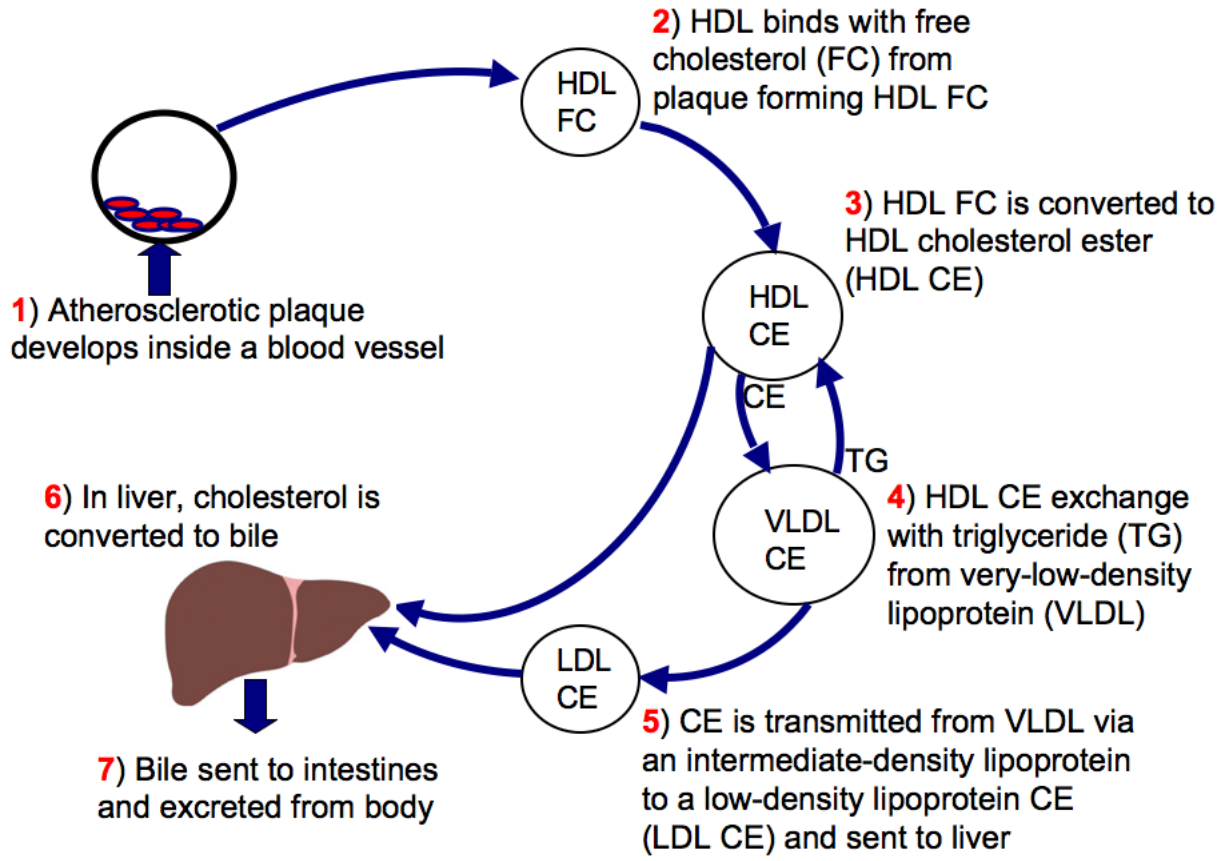

Figure 1. Overview of the Steps in Reverse Cholesterol Transport Metabolism by HDL
Source: Adapted from Miller (2003).

It has been shown that male and female patients with low HDL-C levels (<35 mg/dL; and with normal total cholesterol levels) have more cardiovascular events (such as heart attacks and unstable chest pain) as compared to their adult counterparts with high HDL-C levels (Eapen et al., 2009). As well, the risk for CHD drops 2% for every 1 mg/dL increase in HDL in men and 3% in women (Eapen et al., 2009). Commonly, premenopausal women have higher HDL cholesterol levels than men (of the same age) due to higher levels of estrogen.

Women, HDL-C and Coronary Heart Disease

CHD is the leading cause of death in American women (Eapen, 2009). Although statin therapy (lipid lowering drugs that help to reduce death from heart attack and stroke) is the primary intervention for CHD (in women and men), 65% to 75% of cardiovascular events still occur with adults on these medications (Eapen et al., 2009). Therefore, there is a need for the committed exercise professional to offer other non-pharmacological CHD interventions to clients, most notably some specific HDL raising strategies. In women, Eapen et al. highlight that several investigations have shown that low HDL-C levels are actually the best predictor of CHD risk, regardless if the LDL-C ('lousy' cholesterol) levels and triglycerides (blood fats) are elevated. According to the authors, data from the famous Framingham Heart study showed that the women in the lowest one-fifth of the subjects in HDL-C levels had a relative risk to CHD three times higher then those in the highest one-fifth. Estrogen usually raises HDL cholesterol, which reaches it peak during the childbearing years.

Eapen et al. (2009) summarize that the research indicates that menopause is particularly associated with large reductions in HDL-C levels. In particular, during menopause there is a reduction of the HDL2 particles, the more active subfractions in the reverse cholesterol transport

pathway (Eapen et al., 2009). Thus post-menopause women experience a drop off in the praiseworthy effects of HDL cholesterol.

What are the Best HDL-C Raising Strategies?

The effective lifestyle changes that elevate HLD-C levels include aerobic exercise, smoking cessation, moderate alcohol consumption, and lifestyle eating choices (Eapen, 2009). Personal trainers should inform their clients that when combined together, these non-pharmacological interventions raise HDL-C even more successfully.

Aerobic Exercise

Aerobic exercise has been shown to significantly increase (9%) HDL-C levels while also causing statistically significant decreases in blood triglycerides (11%) (Kelley et al., 2006). Kelley et al. also note that the higher a person's aerobic capacity (or VO2max) the stronger the association with elevated HDL-C levels. Kodama, et al. (2007) conclude from their meta analysis review that the minimum threshold needed to raise HDL-C is 120 minutes per week (or approximately 900 kcals/week in aerobic exercise). The authors affirm that greater durations of cardiovascular exercise elicit impressive improvement of HDL-C levels, although at this time an optimal training dose (in minutes or kcals/wk) has not been identified.

Diet:

To improve HDL-C, the American Heart Association (2011) recommends a diet low in saturated fat, trans fat, cholesterol and sodium, and rich in fruits, vegetables, whole-grain and high-fiber foods, and fat-free and low-fat dairy. 'Oily' fish (such as salmon, trout, sardines, mackerel or haddock) are rich in omega-3 fatty acids and are encouraged to be eaten twice a week. Other food sources of omega-3 fatty acids include flaxseed oil, green leafy vegetables and walnuts. It is interesting to observe that a Mediterranean diet (which emphasizes healthy fats, fruits, nuts, fish

and vegetables) is abundantly rich in omega-3 fatty acids and thus an optional lifestyle eating plan to help raise HDL-C. The weight loss that often accompanies this type of eating lifestyle (in conjunction with the exercise program discussed above) further helps to improve HDL-C levels in men and women (Miller, 2003).

Moderate Alcohol Intake:

Moderate alcohol intake has been shown to increase HDL-C**.** On the other hand, heavy alcohol consumption leads to fatty acid accumulation in the blood. It also impairs the removal of triglyceride-containing lipoproteins from the blood, thus elevating the risk of CVD.

Smoking Cessation:

The more a person smokes, the more deleterious the effect on HDL-C (Eapen et al., 2009). That great news, however, is that when a person stops smoking his/her HDL-C levels will start to rise in as little as two weeks (Eapen et al.).

HDL Cholesterol Conclusions

A low HDL-C is the most common cholesterol abnormality in people with CHD (Miller, 2003). Exercise professionals are in a leading position to help clients combat this disease. Even as new medical modalities are tested and introduced for low HDL-C, doing aerobic exercise and altering lifestyle behaviors is a decisive and consequential intervention. Do it NOW!

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