THE CHOLESTEROL STORY: ARE YOU FIGHTING HEART DISEASE?

By John Clark M.D. NorthernLightsHealthEducation.com

WHY HIGH CHOLESTEROL?

Believe it or not, cholesterol is your body's soap! Your body runs on water, you are about 70% water, and when you eat fat or oil, it takes lots of soap for those dietary fats (saturated fats, trans fats, refined fats, high fat diet) to become soluble in the water environment of your body.[1] If you are accustomed to washing dishes at home by hand, I am sure you find some fats harder to "wash" off your plates than others. Just realize that the fats that are the hardest to wash off your dishes are also the fats that will take the most cholesterol "soap" to dissolve in your body. Cholesterol dissolves the fats or oils you eat into the water environment of your blood. Hard fats, like animal shortening, hydrogenated vegetable oils and oils that have been browned by heating, are more difficult for the body to dissolve. These fats cause the liver to make more cholesterol "soap". This ultimately results in increased blood stream cholesterol.[2,3,4] The more fat of any kind you eat, the more cholesterol it will take for your body to process it. For each additional 1% of fat you include in your diet, your total cholesterol will go up 1½ points.[5]

ENTEROHEPATIC CIRCULATION: THE LIVER SOAP CYCLE

The source of cholesterol "soap" is the liver, and the soap bottle or reservoir is the gallbladder. The cholesterol soap mixture is called bile. This bile is squirted into the small intestine when the need for soap is detected, i.e., fat in the digestive tract. This "soap" then tries to make the fat compatible with absorption into your water-based blood stream. The cholesterol component of the "soap" is re-absorbed in the small intestine and returned to the liver for processing. There are several things that can reduce "soap"/cholesterol in the system. Eat less fat, so less "soap" is called for. Eat more fiber, which will soak up some of the "soap" and carry it out in your stools so less "soap" is reabsorbed and returned to the blood stream and liver. Eat more plants that are high in sterols. These plant sterols compete with "soap" for re-absorption, thus reducing "soap" re-absorption.

CHOLESTEROL IN MANY FORMS

Cholesterol is cholesterol, but its packaging tells you its role. LDL or low-density lipoprotein is the packaging marked for export from the liver to the tissues. HDL or high-density lipoprotein is the clean-up crew that takes cholesterol from the tissues back to the liver. LDL trucks it out into circulation and HDL retrieves it, removing it from the blood and tissues. As you might imagine, low HDL is predictive of mortality from heart disease—without sufficient clean-up crews working, junk piles up.[6]

Recently there has been discussion about the size of LDL and the impact of that size on health. Larger LDL particle size is associated with greater longevity.[7] Small, dense, LDL particles have been shown to be associated with an increased risk of cardiovascular events.[8] While all this size discussion makes for more laboratory testing, positive lifestyle approaches to heart disease risk factors can improve LDL particle size, which will reduce heart attack risks.[9,10,11,12]

THE FATS WE EAT

Trans-fat, a by-product of hydrogenation of vegetable oils,[13] increases the risk of high cholesterol by 65%.[14] In one study, heart attack victims had 13% more trans-fat in their cell walls.[15] Trans-fat lowers the "good" HDL-cholesterol more than saturated fat and decreases antioxidant activity in the body, and makes patients more susceptible to

atherosclerosis and heart attacks. Additionally, trans-fat increases the harmful LDL cholesterol.[16] You may not be aware of where the trans-fat in your diet is coming from. Sources of trans-fat in the American diet by percentage include cakes, cookies, crackers, pies, and bread 40%; animal products 21%; margarine 17%; fried potatoes (like French fries and hash browns) 8%; potato chips, corn chips, popcorn 5%; household shortening 4%; other (breakfast cereals, candy, etc.) 5%.[17] Avoiding trans-fat may take some investigation on your part.

The saturated fat found in milk, cheese, egg yolks, meat and sausage has an even more deleterious effect on cholesterol and coronary heart disease than trans-fat.[18] A diet high in saturated fat can raise total cholesterol by 23%.[19] When cholesterol is a part of the diet, the total blood cholesterol will be worse if the other fats in the diet are saturated than if they are unsaturated.[20] For example, because of its high fat and cholesterol content, 40gm of butter per day will raise your cholesterol by 20 points.[21] Palm oils differ little from other saturated fats in raising blood stream cholesterol.[22,23] Compared to the harder fats, monounsaturated oils tend to lower cholesterol.[24] Polyunsaturated fats tend to favorably affect cholesterol, but be less resistant to oxidation.[25]

Compared to vegetarians, animal product users (meat, eggs and dairy) eat 50% more fat, have 30% higher total cholesterols, have 42% higher LDL cholesterols, have 38% higher triglycerides.

Another factor, which is often overlooked, is the form of the fat or oil consumed. Refined oils absorbed early in the small intestine are esterified with cholesterol and enter the lymphatics to be deposited in the heart. Oils residing naturally in whole foods are digested and absorbed later in the small intestine as phospholipids and enter the portal circulation where they are conducted directly to the liver. Thus, they have less of an impact on total blood cholesterol.[26]

ANIMAL PRODUCT CONSUMPTION AND CHOLESTEROL

People who consume animal products every day experience higher cholesterols, and have on average, a total cholesterol of 255 mg/dL. Those who limit their consumption of animal products to once weekly have a total cholesterol of around 205 mg/dL.[27] Compared to vegetarians, animal product users (meat, eggs and dairy) eat 50% more fat, have: 30% higher total cholesterols, have 42% higher LDL cholesterols, have 38% higher triglycerides, have 32% higher blood sugars, and are five times more likely to have high blood pressure.[28] People who drink cow's milk or eat dairy products such as yoghurt and cheese everyday have 7 mg/dL higher total cholesterols and 5 mg/dL higher LDL cholesterols.[29] A diet with animal protein and low fiber intake has been shown to significantly increase cholesterol levels.[30] Casein, the protein in milk, makes your liver produce more cholesterol.[31,32] People on a unrefined, high fiber, high carbohydrate diet have significantly lower LDL cholesterols than those on a refined carbohydrate diet or a low carbohydrate, high protein diet.[33] On the other hand, substituting 30 to 50 grams of soy protein for animal protein in the daily diet produces a 13% reduction in LDL, 10% reduction in triglycerides, 9% reduction in cholesterol, and a 2.4% increase in HDL.[34] This nutritional advice has also been shown to be helpful in cases considered to have a “genetic” predisposition to high cholesterol.[35]

REFINED FOODS FOR REFINED PEOPLE?

Refined (processed) foods tend to make your blood sugar rise precipitously, making it go very high at a very rapid a rate. We categorize foods by their effect on the blood sugar according to the “glycemic index”.[36] Glycemic load quantifies the amount of a high glycemic food you eat. High glycemic index or load foods make your blood sugar rise higher and faster than low glycemic index or load foods. Most refined foods are high glycemic load foods. High glycemic load diets drive LDL cholesterol up and HDL down.[37,38] On the other hand, reducing the glycemic load, by eating more whole plant foods, has the effect to reduce LDL levels.[39] We recommend a high complex carbohydrate diet, a diet without refined/processed foods.

DISEASE AND ELEVATED CHOLESTEROL

The more cholesterol you harbor in your blood stream, the higher will be your risk of dying of a heart attack.[40,41,42,43] In fact, one high blood cholesterol measurement in your lifetime can mean a higher risk of coronary heart disease the rest of your life![44] The more cholesterol you carry in your blood the sicker your heart becomes.[45] When your cholesterol goes up, cells lining the blood vessels, called macrophages, fill up with fat and contribute to plaque

formation.[46] When you lower the fat (cholesterol and triglycerides) in your blood it virtually halts the progression of lesions in your blood vessels.[47] People with genetically low LDL live 5-12 years longer and almost never have heart attacks.[48],[49] The more fat and cholesterol you tolerate in your blood stream the shorter your life will be.[50,51] Here are some numbers that illustrate increase in risk: Cholesterol above 280 mg/dL increases likelihood of angina 5 ½ times.[52] Cholesterol above 240 mg/dL increases the risk of death from heart attack by 350%.[53] On the positive side, each 2 mg/dl drop in cholesterol reduces the risk of heart attack by 1%.[54] One of the reasons for this rise in heart disease and fatal heart attacks with increased blood cholesterol, besides the obvious increase in atherosclerosis, is that when your cholesterol goes up it impairs the heart's ability to form collateral blood vessels which could help you survive a heart attack.[55]

Triglycerides also play a role. Elevated triglycerides are associated with increased risk of heart attack and death.[56,57] Triglycerides greater than 200 mg/dL significantly increase the risk of stroke or transient ischemic attack.[58,59]

Cholesterol levels are not lowered when you replace beef, lamb, or pork in the diet with chicken or fish. Why? Because poultry's proportion of cholesterol is similar to that of red meat.

Caldwell Esselstyn, Jr., MD, of the Cleveland Clinic has shown on angiography that blockages in coronary arteries can be reversed by changes in diet. "The optimal diet", according to him, "consists of grains, legumes, vegetables, and fruit, with 10%-15% of its calories coming from fat." He goes on to say that "This diet minimizes the likelihood of stroke, obesity, hypertension, type 2 diabetes, and cancers of the breast, prostate, colon, rectum, uterus, and ovary."[60] Did Medicare ever promise anything like that? This sounds like a real insurance program!

What about cancer and cholesterol? Elevated cholesterol and triglycerides significantly increase breast cancer risk.[61] The risk of breast cancer rises 88% when one eats foods with cholesterol, 125% for high intake of animal protein, 143% for high saturated fat intake, and 169% if you eat more calories than you need![62] Pancreatic cancer is the fourth leading cause of cancer death with a five-year relative survival rate of 4%, making it one of the most fatal cancers. Eating cholesterol increases the risk of pancreatic cancer 50%. Eggs, a rich source of cholesterol, increase the risk by 60%.[63]

Other disease risks escalate with cholesterol. Elevated cholesterol and triglycerides together with low HDL significantly increase the risk of autoimmune inflammatory arthritis like rheumatoid arthritis.[64] High cholesterol is a significant risk factor for macular degeneration and resultant blindness.[65,66,67,68] A cholesterol of 240 mg/dL increases the risk of macular degeneration by 80%.[69] A cholesterol level of 220 mg/dL or more increases the risk of migraine by 280%.[70] Having elevated cholesterol levels increases the risk of high blood pressure 90%.[71] Even hypothyroidism can result from elevated cholesterol levels.[72,73]

The brain and nerves are not happy when cholesterol increases. Hypertension and hypercholesterolemia work together to increase brain dysfunction.[74] When rabbits, confirmed herbivores, consume cholesterol, they develop Alzheimer's disease-like lesions in their brains.[75] Patients with elevated LDL Cholesterol have a 106% higher risk of cognitive impairment.[76] Obesity and high triglycerides produce cognitive impairment.[77] Elevated triglycerides predict increased peripheral neuropathy in diabetics.[78] Elevated cholesterol levels are significantly associated with major depression.[79,80] Lowering cholesterol levels through lifestyle changes, has been shown to decrease depression, hostility, and severity of psychological symptoms.[81]

DIETARY CHOLESTEROL: THE CHOLESTEROL ENTERING OUR MOUTHS

When you eat cholesterol, eventually some of it will end up in your blood stream. It has been said, "we are what we eat." However, cholesterol is the soap, so, while eating cholesterol does not raise the soap level dramatically like eating fats does, dietary cholesterol still results in increased blood stream cholesterol.[82] Eating 100 mg of cholesterol per day can increase total cholesterol concentrations by 2.2 mg/dL.[83] Most people eat far more than 100 mg of cholesterol per day.

What foods have cholesterol? Nearly all animal foods have some cholesterol in them, some have more than others. Plant based foods do not have cholesterol. This is because it takes a liver to produce cholesterol and plants do not have livers! Fruits and vegetables, nuts and seeds, beans and grains do not contain cholesterol. One cup of 2% Milk has 18 mg of cholesterol. One half cup of ice cream has 29

mg, most of which is oxidized. One tablespoon of butter would have 31 mg, and 3 ounces of clams 57 mg. In a 3-ounce serving, chicken breast has 73 mg, pork 76 mg, sirloin beef 80 mg, oyster 84 mg, shrimp 165 mg, one large egg 213 mg, beef liver 410 mg, and beef brains, which often end up as animal shortening, 1697 mg.[84] Your body does not need a dietary source of cholesterol, it makes its own, fresh.

Cholesterol levels are not lowered when you replace beef, lamb, or pork in the diet with chicken or fish. Why? Because poultry's proportion of cholesterol is similar to that of red meat.[85]

DIETARY CHOLESTEROL AND DISEASE

Dietary cholesterol together with elevated blood cholesterol dramatically increase oxidized cholesterol. Oxidized cholesterol results in increased whole body inflammation, atherosclerosis and plaque formation.[86,87] The more cholesterol you eat, the more calcified plaque you can expect in your coronary arteries.[88] When you make cholesterol a part of your diet, it increases inflammation in: the lungs leading to asthma;[89,90] the liver leading to non-alcoholic fatty liver diseases and cirrhosis;[91,92,93] and the prostate leading to pain, enlargement and cancer.[94,95] Cholesterol in the diet can bring about permanent microscopic damage to the kidneys causing them to lose 6 times more protein in the urine than acceptable levels.[96,97,98] "But I was eating the extra animal products to increase my protein intake…." When you stop eating cholesterol, blood vessel inflammation actually does subside and coronary artery plaques become more resistant to rupture.[99]

Need osteoporosis? A high-cholesterol diet stimulates bone resorption causing osteoporosis.[100]

Dietary cholesterol seriously decreases mental performance.[101,102] Six hours after consuming a high fat meal the brain oxygen falls below 70%. What's more, it does not return to normal for 3 whole days—which means some people have never had fully functioning brains![103]

OXIDIZED CHOLESTEROL IN THE BLOOD

"Why me?" a gentleman in his late 50s asked me. "My total cholesterol has always been around 140 and my HDL is usually very good." He had had a heart attack and cardiac bypass surgery and was now wondering what he could do to avoid a repeat. As I got to know the gentleman better it became very apparent that the source of his cholesterol included foods high in oxidized cholesterol such as ice cream, pizza, and processed foods, while his diet was not high in fruit and vegetables. For the same cholesterol level, people who eat fewer fruits and vegetables have a higher risk of a fatal heart attack.[104] This is because of the effects of oxidized cholesterol. Oxidized cholesterol can be stabilized by the antioxidants found in fresh fruits and vegetables.

"Why me?" a gentleman in his late 50s asked me. "My total cholesterol has always been around 140 and I had a massive heart attack and cardiac bypass surgery."

My uncle died of heart disease at age 39. He was an anesthesiologist at the University of Texas. He left a wife and two teenage sons behind. His nightly supper: ice cream. Within 24 hours of eating oxidized cholesterol, rabbits and monkeys develop vascular lesions which, if not repaired, would lead to arthrosclerosis and heart attacks.[105,106,107,108] Common sources of oxidized cholesterol include custard mixes such as ice cream, pancake mixes, because dried eggs are included,[109] Parmesan cheese, and any food where cholesterol, or oils for that matter, come in contact with air and/or oxygen.[84 110] Serum oxidized cholesterol markedly accelerates atherosclerosis.[111,112,113] Arterial injury caused by oxidized cholesterol leads to arterial wall cholesterol accumulation and plaque enlargement.[114]

Cholesterol oxidized by the body is negligible compared to oxidized cholesterol obtained from the diet.[115,116] Oxidized dietary cholesterol increases blood stream cholesterol and is the predominant source of tissue oxidized cholesterol.[117,125] Oxidized cholesterol favors platelet clot and plaque formation.[118,119] The more LDL is oxidized, the more cholesterol it transports to the tissues. The more HDL is oxidized, the less cholesterol it removes from the tissues.[120,121] Oxidized cholesterol markedly delays the clearance of chylomicrons, which transport cholesterol from the intestine to the liver, from the blood.[122] The more fast foods, cheese puffs, potato chips, and hydrogenated fat you eat, the worse your cholesterol will be, both in oxidation and in quantity.[123] Cheese contains high levels of oxidized cholesterol.[124,125] Compared to vegetable oils, butter and cheese are very atherogenic, causing heart disease.[126] Frying, grilling, even just cooking foods with high cholesterol content, such as meat, egg yolk and full fat dairy

products, creates massive cholesterol oxidation.[127,128] As prepared consumer foods are becoming increasingly popular, the consumption of higher levels of oxidized cholesterol in foods is inevitable. Processes, such as pre-cooking, freeze-drying, dehydration, and irradiation, have all result in increased production of oxidized cholesterol. Factors known to oxidize cholesterol in foods include: heat, light, radiation, oxygen, moisture, low pH, pro-oxidizing agents, and storage of food at room temperature.[129] Cigarette smoke increases LDL cholesterol oxidation and lipid peroxidation.[130]

THE DISEASES OF OXIDIZED CHOLESTEROL

Oxidized lipids are associated with earlier and more severe atherosclerosis especially in the presence of dietary cholesterol.[131,132] Atherosclerosis is not limited to the heart, it can occur anywhere there are blood vessels, like the penis. Every 1 mg/dL increase in total cholesterol increases the risk of erectile dysfunction by about 1%.[133,134,135,136] The brain suffers, too, because lipid oxidation increases Alzheimer's disease risk.[137]

A high cholesterol diet depresses natural killer cells activity by 75%, making cholesterol a dangerous food if you want your immune system to fight off viruses responsible for pandemic flu, cancer, or autoimmune diseases.[138] In fact, oxidized cholesterol increases the risk of skin cancer, colon cancer,[139,140] ulcerative colitis leading to cancer, breast disease leading to cancer, and prostate hyperplasia leading to cancer.[141]

The blood is usually anti-inflammatory; Relatively brief periods (days) of elevated cholesterol can result in the blood becoming pro-inflammatory increasing the risk of autoimmune diseases like Multiple Sclerosis.[142,143]

Gallstones are increased by oxidized cholesterol.[144,145]

DRUG PITFALLS

Caffeine, 200 mg intake of per day, (about 2 cups of coffee) can increase total cholesterol by 11 mg/dL.[146,147]

Daily caffeine consumption also increases LDL,[148] increases triglycerides,[149] increases the risk of heart attack,[150] and decreases HDL.[151]

"Pack a day" smokers can expect: 18 mg/dL triglycerides increase per pack, 3.5 mg/dL HDL decrease per pack.[152,153] Second hand smoke also lowers HDL similarly.[154]

Triglycerides can be elevated by even small amounts of alcohol; one drink per day increases triglycerides by 10 mg/dL.[152]

Use of oral contraceptives has been shown to increase LDL by 47% and VLDL by 57%.[155,156]

Cholesterol drugs (statins): are they safe? Some of the most noted problems with the statins are muscle pains, rhabdomyolysis (a disintegration of the muscles) and liver toxicity.[157,158] Not all brain failure is due to aging or high cholesterol, statins have been found to play a role as well. Statins have been found to cause cognitive impairment[159] and memory loss.[160,161] Statins also seriously decrease coenzyme Q10,[162,163,164] a powerful anti-oxidant involved in prevention of heart disease.[165] This may also be why statins can worsen congestive heart failure.[166] Statins are such powerful suppressors of the immune system[167] that they are being tested and considered for use in organ transplant immunosuppressive chemotherapy[168,169] and for autoimmune diseases.[170,171,172] Most things that suppress the immune system leave way for the development of cancer:

> "In some randomized trials, notwithstanding their short duration, statins have been found to increase cancer incidence especially in the elderly and women. In these situations, the decrease in cardiovascular mortality can be matched by an equal increase in cancer mortality, leaving all-cause mortality unchanged."[173]

Dietary/lifestyle interventions (diet high in plant sterols, soy protein, fiber, and almonds) have been shown to lower cholesterol by 28%.[174] Compared to lifestyle interventions, statin drug therapy offers no cholesterol lowering advantage.

LIFESTYLE CAUSED THE PROBLEM, WHY NOT TRUST LIFESTYLE TO FIX IT?

Choosing a high complex carbohydrate, whole plant food diet over the typical American diet has been shown in studies to lowered total cholesterol by 30 mg/dL and LDL cholesterol by 26 mg/dL.[175,176] One such diet is the Hawaii Diet. Based on their traditional foods, it is high in complex carbohydrate (77% of calories), low in fat (12% of calories), moderate in protein (11% of calories), and it lowers cholesterol by 50 points.[177] Incidentally, just replacing white rice with whole grains and beans in coronary artery disease patients increases fiber intake by 25%, vitamin E intake by 41%, other antioxidants by

11%-40%; and reduces: lipid peroxidation and oxidative stress by 28%, homocysteine concentrations by 28% and blood sugars by 24%.[178]

Restriction of fat intake, especially saturated fat and dietary cholesterol, has been shown to reduced total cholesterol by 20 mg/dl, triglycerides by 40 mg/dl, and increase HDL-cholesterol by 5 mg/dL.[179] Patients with lower blood antioxidants levels have more atherosclerosis.[180] Lifestyle modifications have been shown to increase antioxidant levels and reduce oxidative stress in coronary artery disease patients.[181]

There are plant nutrients that can block the re-absorption of "soap" (cholesterol) from the small intestine. These nutrients in plants are called sterols, or, phytosterols, since they come from plants.[182] Two grams of phytosterols can lower LDL cholesterol by 10%.[183,184,185] Foods highest in these phytosterols include: Nuts such as brazil, pecan, pine, pistachio, cashew,[186] macadamia,[187] walnuts, almonds, and hazelnuts;[188] Seeds—sesame seeds are very high in phytosterols;[189] Beans, such as soybeans and peas; Whole grains like Amaranth;[190] Fruit such as navel oranges, tangerines, and mangos; and vegetables such as, cauliflower, broccoli, and romaine lettuce.[191] Refining and/or processing foods decrease their phytosterol content making hypercholesterolemia more likely.[192]

GOOD OILS AND GOOD STEROLS

Avocados are an excellent source of monounsaturated fat and have been shown to significantly lower total cholesterol, LDL and triglycerides.[193,194] Walnuts lower total cholesterol and LDL while fish raise total cholesterol and LDL.[195] Daily consumption of 80 gm of walnuts for two months can reduce LDL levels by 16%.[196] Raw almonds, 100mg of per day, can reduce total cholesterol by 20 mg/dL.[197] Pistachios improve HDL lipid ratios.[198] Sunflower seeds are high in natural occurring unsaturated oils and have been found to lower cholesterol levels.[199,200,201]

Avocados are an excellent source of monounsaturated fat and have been shown to significantly lower total cholesterol, LDL and triglycerides. Walnuts lower total cholesterol and LDL while fish raise total cholesterol and LDL.

Does something seem "fishy" about salmon oil capsules for cholesterol problems? Salmon oil capsules are less effective than olive oil in preventing lipid peroxidation, hypercholesterolemia and arteriosclerosis.[202,203] Daily fish oil supplementation can raise your total cholesterol by 9.1% and LDL by 4.8%.[204,205] Olive oil, a source of omega-3s and phytosterols, increases HDL-cholesterol levels, while decreasing LDL-cholesterol levels, LDL susceptibility to oxidation and lipid peroxidation.[206] I recommend getting your olive oil by eating the actual olive not the factory produced oil.

Flax, a rich source of omega-3 monounsaturated oil, helps lower cholesterol.[207] Omega-3s, 1.5 mg per day, have been shown to lower triglycerides by 37%.[208] Maybe you have been trying to lower your cholesterol through the use of omega-3 oils but seem to be making no progress. If your still eating cholesterol, omega-3s won't lower your LDL.[209]

Replacing cheese with vegetable fat can lower: Total cholesterol by 23 mg/dL, and LDL by 17 mg/dL. Replacing cheese with nuts can lower: Total cholesterol by 41 mg/dL, and LDL by 33 md/dL.[210] Eating whole plant foods is the most effective way of lowering cholesterol.

ABSORBENTS

Cholesterol can be adsorbed from the intestine by certain foods and substances. These adsorbents carry cholesterol out in the stool so that it does not get re-absorbed into the body. Charcoal is one of these. As a supplement, it has been shown to significantly lower cholesterol.[211,212] Eight grams three times per day can lower total cholesterol by 25% and LDL by 41%, while raising HDL by 8%.[213,214]

Fiber absorbs cholesterol in the intestine preventing its re-entry into the body. Each additional gram of water-soluble fiber in the diet lowers total cholesterol by 1.1 mg/dL.[215] For each gram of a particular fiber, total cholesterol decreases by; 1.0 mg/dL for guar gum, 1.1 mg/dL for psyllium (e.g., Metamucil), 1.5 mg/dL for oat bran, and 2.7 mg/dL for fruit pectin.[216] Each addition of 10 g of fiber to the diet reduces the risk of dying of a heart attack by 17%.[217]

There are many good sources of fiber. Grains are high in fiber that absorb cholesterol. Oats and oat bran contain fiber and phytochemicals that adsorb bile salts and cholesterol from the intestines carrying them out in the feces. Twelve weeks of 14 g/d oat bran can lower LDL by 2.5% and triglycerides by 6.6%.[218] Barley contains approximately 10% dietary fiber[219] that can significantly reduce cholesterol and triglycerides.[220,221] Rice bran not only lowers cholesterol, it also has some antioxidants that reduce oxidized cholesterol.[222] Regular buckwheat consumption reduces cholesterol.[223,224] One caveat, while whole wheat products may be considered a valuable source of fiber, for some reason a diet high in wheat products has been shown to raise total cholesterol by about 10 mg/dL.[225]

There are other good plant sources of cholesterol lowering fiber. Prunes lower total and LDL cholesterol,[226,227] decrease oxidative stress, fight inflammation and have been discovered to decrease atherosclerotic plaque in blood vessels.[228,229] Grapefruit, especially red grapefruit, contain bioactive compounds which lower cholesterol.[230] Four weeks of grapefruit pectin can lower LDL cholesterol by 11%.[231] Grapefruit pectin also lowers the risk of arteriosclerosis by 50%.[232] Beet fiber, 30 g/day can lower cholesterol by 10%.[233] Psyllium (e.g., Metamucil), 5.1 g twice daily, can lower total cholesterol 8.9% and LDL-cholesterol 13.0%.[234]

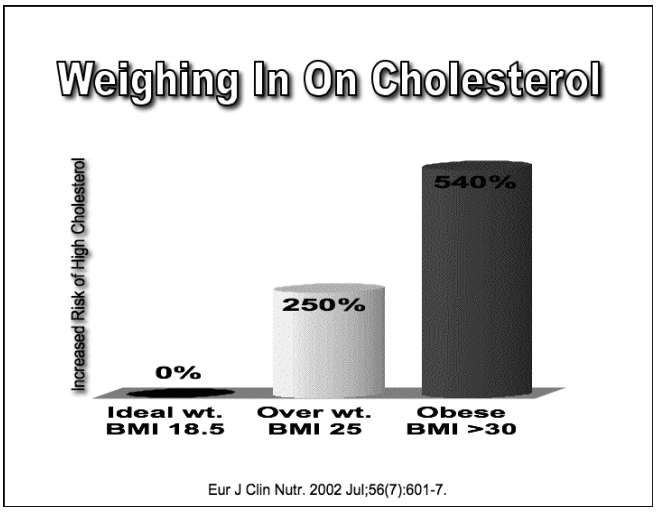
The combined effects of plant sterols, vegetable proteins, and fiber have been shown to reduce LDL by 29.0% and the ratio of LDL to HDL by 26.5%. Near maximal reductions have been seen in two weeks.[235] What if I don't get results in two weeks? Maybe you are cheating? One high fat food item eaten during those 2 weeks will reset the liver's soap factory back to maximal production! This is a lifestyle change commitment, not a short-term quick-fix diet.

BEANS (BESIDES SOY MENTIONED EARLIER)

Beans, 120 g per day, can lower cholesterol and triglyceride concentrations by 10.4%.[236] Four cans of garbanzos per week can reduce total cholesterol by 8 points and LDL by 7.[237]

VEGETABLES

Vegetables have lots of fiber and antioxidants such as carotenoids, polyphenols, and vitamin C. This explains their protective effects against cardiovascular diseases. Carrots have been shown to lower cholesterol, triglycerides, reduce cholesterol re-adsorption in the bowel, and improve blood stream antioxidant status.[238] Garlic counteracts atherosclerosis and lipid oxidation.[239] Regular garlic consumption can reduce total cholesterol by 7%,[240,241] and reduce blood lipid peroxidation.[242] Red onions are more effective than garlic at lowering blood lipids.[243] Daily onion consumption can reduce plasma triglyceride levels by as much as 15%.[244] Turmeric is an effective antioxidant in combating lipid peroxidation.[245] Studies show that alfalfa sprouts reduce cholesterol levels both in the blood and in the liver where it is



produced and stored.[246,247] Celery consumption has been found to significantly reduce total cholesterol, LDL, and triglycerides.[248,249,250]

FRUIT

Low dietary vitamin C intake has been shown to result in increased blood cholesterol levels[251,252] and increased risk of heart disease.[253] On the other hand, increased dietary vitamin C intake has been shown to lower blood cholesterol levels.[254,255] Foods high in vitamin C include strawberries, bell peppers, chives, red cabbage, broccoli, pineapple, oranges, lemons, kale, cauliflower, peas, etc. (Notice no fish, coffee or tea are on the list. If you're eating foods that are totally deficient in a vital nutrient, your body must draw from its own reserves just to survive and in time you will totally deplete your own hard-earned supplies!)

There are many helpful fruits we could mention in addition to the ones already talked about. Pomegranates help combat lipid peroxidation and cholesterol oxidation.[256] Apples contain quercetin,[257] a phytochemical, that helps combat heart disease by reducing the effects of oxidized cholesterol on blood vessels.[258]

SUGAR/REFINED CARBOHYDRATES AND CHOLESTEROL

Increased blood sugar, combined with increased blood cholesterol, multiply the risk of atherosclerosis.[259] Elevated blood sugars (as seen in diabetics) lead to elevated triglycerides.[260] A rise in blood insulin is followed by a rise in cholesterol production and this increases the risk of coronary artery disease.[261,262] Elevated insulin also lowers HDL.[263] Elevated HbA1c levels correlate with elevated cholesterol and triglycerides.[264,265] Eliminating all foods with refined sugars from your diet can reduce triglycerides by 20%.[266,267]

Fructose, a sugar often obtained from corn, is a very dangerous chemical. Dietary fructose specifically increases: LDL by 14%, oxidized LDL cholesterol by 13%, total cholesterol by 10% and visceral fat by 9%.[268,269] Soda pop is often sweetened with this chemical. Soda consumption, one or more cans per day, increases risk of: metabolic syndrome 45% (diabetes is included in this syndrome), low HDL by 32%, central obesity 30% and high triglycerides 25%.[270]

Honey does not carry the health risks of sugar, high fructose corn syrup and highly refined, high glycemic index foods. Compared to these, honey can reduce; total cholesterol by 3%, LDL 6%, triglycerides 11%, blood sugar 4%, inflammation 3%, and increased HDL by 3%.[271]

Carbohydrates fried with oil create Advanced Glycation End Products (AGEs), toxins which activate the body's inflammatory mediators.[272] Advanced Glycation End Products, are chemical combinations of sugars with fats or proteins, and they accelerate atherosclerosis via enhancement of oxidative stress.[273,274] Some foods have far more of these dangerous chemicals, for example, a slice of 100% whole wheat bread has 536 units of AGEs, whereas one glazed doughnut can have a much as 425 to 740 units of AGEs.[275] Going on a low calorie diet for two months will markedly reduce dangerous Advanced Glycation End Products.[276]

LIFESTYLE IMPROVEMENTS

People who eat breakfast regularly have significantly lower cholesterol levels.[277]

Scheduled regularity improves cholesterol, lowers total and LDL cholesterol, and raises HDL.[278] Irregularity, such as shift work, raises cholesterol.[279] What's more, shift workers are 174% more likely to have elevated triglycerides and 81% more likely to have abdominal obesity than workers on a routine schedule.[280]

When you snack, food stays in your stomach much longer. The longer it takes to empty your stomach the more cholesterol will be adsorbed.[281] Eating between meals (snacking) also reduces HDL cholesterol.[282]

Cholesterol rise after a meal is more prolonged after an evening meal than meals taken during the day.[283,284]

Pure water is a key to controlling the body's oxidative stress and inflammation. Distilled water lowers the risks associated with high cholesterol levels while tap water raises the risks.[285,286] Dehydration causes relative elevation in the blood lipids such as total HDL and LDL cholesterol.[287]

Obesity is a risk factor for increased blood cholesterol levels. A body mass index (BMI) of 25, categorized as overweight, increases the risk of hypercholesterolemia by 250%, being obese (BMI of 30) increases that risk to 540%.[288] Waist circumference is also a negative indicator of health, triglycerides go up and HDL goes down with increasing waist circumference.[289]

Vitamin D is a potent inhibitor of damage caused by lipid peroxidation.[290] Vitamin D is synthesized from cholesterol during sun exposure. Twice weekly sunbathing can significantly improve LDL/HDL ratios lowering heart disease risks.[291] Because gardeners get more sun and fresh air, they have higher vitamin D levels, and enjoy lower cholesterol levels.[292]

Athletes have significantly lower total cholesterol and significantly higher HDL cholesterol.[293] In fact, the more vigorous you exercise the lower your risk of hypertension, hypercholesterolemia, and diabetes.[294] Endurance training significantly: lowers total cholesterol, triglycerides, and LDL cholesterol at the same time it increases HDL cholesterol.[295] Resistance training or weight lifting reduces triglycerides by about 18%.[296] Exercise therapy, at a heart rate of around 135 bpm for 30 minutes 3 times/week, can decrease triglycerides by 20 mg/dL and increase HDL by 10 mg/dL.[297] Choosing the stairs *over* an elevator 5 times a day can lower LDL cholesterol by 8%.[298] Walking for exercise, 30 minutes a day, significantly lowers triglycerides and total cholesterol and increases HDL cholesterol.[299] Walking 6,000 or more steps per day has been shown to lower triglycerides 10 mg/dL and raise HDL 3 mg/dL.

Eating less food, "caloric restriction" by 25% lowers triglycerides 31 mg/dL. Together with

exercise, caloric restriction has been shown to lower LDL 16 mg/dL.[300,301,302]

Too little sleep raises total cholesterol and LDL cholesterol.[303,304,305] Longer sleep duration is related to higher total cholesterol level and a higher total/HDL cholesterol ratio.[306] Both under sleep and over sleep increase triglycerides and lower HDL cholesterol.[307]

People showing other clinical signs of stress have a 180% higher risk of elevated cholesterol.[308],[309],[310] On the other hand, laughter may boost HDL by as much as 23%.[311]

Religious observance has a lowering effect on total cholesterol, triglycerides and LDL while elevating HDL.[312,313] This may be a testimony to its impact on stress. Jesus said, "Come to me, all you who are weary and burdened, and I will give you rest."[314] "You cannot eat your way into heaven, but you can eat your way out of heaven."—Ed Reid. A mind bogged down with excess fat or cholesterol is in no position to interact with our loving Creator.

SUMMARY

- Avoid foods that require lots of "soap" to digest (i.e. fats).
- Avoid animal protein because it stimulates your liver to produce cholesterol.
- Eliminate all oxidized cholesterol from your diet.
- Maximize your whole plant food, fiber, and pure water intake in your diet and lifestyle.
- Exercise regularly.
- Turn your stress over to God

For further ideas on how to incorporate what you have just learned into your daily life, see the article entitled, "How Can I Apply Healthy Principles in My Daily Life". Or lifestyle choices.

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