



## Your Monthly Update

*Dear Colleague*

Following on from last month's issue, we are continuing the topic of *Cardiovascular Dysfunction*; this month covering Cholesterol. Please continue to submit requests for your chosen topics.

Our new catalogue will be launched to coincide with the Trade Show – if you are registered with us, you will automatically be sent a new catalogue as soon as they are available. We have a number of new items listed in the catalogue, so do take the time to look through when it arrives.

We always welcome feedback and suggestions.

### Elevated Cholesterol

#### Protocol Summary

Ranking	Nutritional Supplements	Botanical Medicine
<b>Primary</b>	Beta-glucan Chromium/brewer's yeast Fibre Policosanol Soy Vitamin B3 (niacin only) Vitamin B5 (pantethine only) Vitamin C (protection of LDL cholesterol)	Psyllium Red yeast rice
<b>Secondary</b>	Calcium Copper Flaxseed (raw) Royal jelly Tocotrienols	Artichoke Berberine Garlic Green tea Guggul
<b>Other</b>	Chitosan Chondroitin sulfate Creatine monohydrate L-carnitine Lecithin Magnesium Vitamin E	Alfalfa Maitake Wild yam

**Primary** – Reliable and relatively consistent scientific data showing a substantial health benefit.

**Secondary** – Contradictory, insufficient, or preliminary studies suggesting a health benefit or

minimal health benefit.

**Other** – An herb is primarily supported by traditional use, or the herb or supplement has little scientific support and/or minimal health benefit.

## **Dietary Modification**

Eating animal foods containing saturated fat is linked to high cholesterol levels and cardiovascular disease. Significant amounts of animal-based saturated fat are found in beef, pork, veal, poultry (particularly in poultry skins and dark meat), cheese, butter, ice cream, and all other forms of dairy products not labelled “fat free.” Avoiding consumption of these foods reduces cholesterol and has been reported to reverse even existing cardiovascular disease.

Unlike other dairy foods, skimmed milk, nonfat yogurt, and nonfat cheese are essentially fat-free. Dairy products labelled “low fat” are not particularly low in fat. A full 25% of calories in 2% milk come from fat. (The “2%” refers to the fraction of volume filled by fat, not the more important percentage of calories coming from fat.)

Palm oil has been reported to elevate cholesterol. Research regarding coconut oil is mixed, with some trials finding no link to cardiovascular disease, while other research reports that coconut oil elevates cholesterol levels.

Despite the links between saturated fat intake and serum cholesterol levels, not every person responds to appropriate dietary changes with a drop in cholesterol. A subgroup of people with elevated cholesterol who have what researchers call “large LDL particles” has been reported to have no response even to dramatic reductions in dietary fat. (LDL is the cholesterol most associated with an increased risk of cardiovascular disease.) This phenomenon is not understood (although it may be that the elevated cholesterol has more to do with stress levels than anything else).

Yogurt and acidophilus milk are fermented milk products that have been reported to lower cholesterol in most, but not all, double-blind and other controlled research. Until more is known, it makes sense for people with elevated cholesterol who consume these foods, to select non-fat varieties.

Eating fish has been reported to increase HDL cholesterol and is linked to a reduced risk of cardiovascular disease in most, but not all, studies. Fish contains very little saturated fat, and fish oil contains EPA and DHA, both of which protect against cardiovascular disease.

Vegetarians have lower cholesterol and less cardiovascular disease than meat eaters, in part because they avoid animal fat. Vegans (people who eat no meat, dairy, or eggs) have the lowest cholesterol levels and switching from a standard diet to a vegan diet, along with other lifestyle changes, has been reported to reverse cardiovascular disease in controlled research.

### **Dietary cholesterol**

Eating eggs has shown an increased serum cholesterol in most studies. However, eating eggs does not increase serum cholesterol as much as eating foods high in saturated fat.

The origin of the egg is an important factor in its association with cholesterol levels. Eggs laid by chickens that are truly free to roam and therefore peck at the grit and soil will contain high natural levels of lecithin which assists in the conversion of cholesterol to bile. Chickens deprived of this natural environmental will lay eggs containing little or no lecithin, so that the implications on the diet are much more significant.

An additional factor to consider is that, when cholesterol in eggs is cooked or exposed to air, it oxidizes. Oxidized cholesterol is linked to increased risk of cardiovascular disease. Boiled eggs are therefore a much healthier option; poached are a second alternative. The worst choice is scrambled egg or omelette, where there is maximum mixture of air in the beating process.

While coconut oil is high in saturated fat, some evidence suggests it does not cause unhealthy changes in blood cholesterol levels compared with other saturated fats. In a controlled study of people with high cholesterol, coconut oil resulted in higher total and LDL cholesterol levels compared with safflower oil (a polyunsaturated oil), but lower levels compared with butter, while HDL levels were similar for all three diets.

## **Fibre**

Soluble fibre from beans, oats, psyllium seed and fruit pectin has lowered cholesterol levels in most trials. Doctors often recommend that people with elevated cholesterol eat more of these high-soluble fibre foods. However, even grain fibre (which contains *insoluble* fibre and does not lower cholesterol) has been linked to protection against cardiovascular disease, though the reason for the protection remains unclear. It makes sense for people wishing to lower their cholesterol levels and reduce the risk of cardiovascular disease to consume more fibre of all types.

Oat bran is rich in a soluble fibre called beta-glucan. Several double-blind and other controlled trials have shown that oat bran and oat milk supplementation may significantly lower cholesterol levels in people with elevated cholesterol, but only weakly lowers them in people with healthy cholesterol levels.

Flax seed, another good source of soluble fibre, has been reported to lower total and LDL cholesterol in preliminary studies. A double-blind trial found that while both flaxseed and sunflower seed lowered total cholesterol, only flaxseed significantly lowered LDL.

## **Alpha-linolenic acid**

Researchers are interested in alpha-linolenic acid (ALA)—the omega-3 fatty acid found in large amounts in flaxseeds and flaxseed oil. ALA is a precursor to EPA, believed to protect against cardiovascular disease. To a limited extent, ALA converts to EPA within the body. However, unlike EPA, ALA does not lower triglyceride levels (a risk factor for cardiovascular disease).

## **Soy**

Tofu, tempeh, miso, and some protein powders in health food stores, are derived from soybeans. In 1995, an analysis of many trials proved that soy reduces both total and LDL cholesterol. Since then, other double-blind and controlled trials have confirmed these findings. Trials showing statistically significant reductions in cholesterol have generally used more than 30 grams per day of soy protein. However, if soy replaces animal protein in the diet, as little as 20 grams per day has been shown to significantly reduce both total and LDL cholesterol. Isoflavones found in soy beans appear to be key cholesterol-lowering ingredients of the bean.

## **Sugar**

Eating sugar has been reported to reduce protective HDL cholesterol and increases other risk factors linked to cardiovascular disease. However, higher sugar intake has been associated with only slightly higher risks of cardiovascular disease in most reports.

## **Coffee**

Drinking percolated or cafetiere coffee increases cholesterol levels. Modern paper coffee filters trap the offending chemicals and keep them from entering the cup. Therefore, drinking paper-filtered coffee does not increase cholesterol levels. Espresso

coffee has amounts of the offending chemicals midway between those of other unfiltered coffees and paper-filtered coffee. The effects of decaffeinated coffee on cholesterol levels remain in debate.

### **Alcohol**

Moderate drinking (one to two drinks per day) increases protective HDL cholesterol. This effect happens equally with different kinds of alcohol. Alcohol also acts as a blood thinner, an effect that should lower cardiovascular disease. However, a high intake of alcohol can *increase* the risk of cardiovascular disease.

### **Olive oil**

Olive oil lowers LDL cholesterol, especially when the olive oil replaces saturated fat in the diet. People from countries that use significant amounts of olive oil appear to be at low risk for cardiovascular disease. Diets high in monounsaturated fatty acids from olive oil do not adversely affect HDL levels.

### **Trans fatty acids and margarine**

Trans fatty acids (TFAs) are found in many processed foods containing partially hydrogenated oils. The highest levels occur in margarine. Margarine consumption is linked to increased risk of unfavourable changes in cholesterol levels and cardiovascular disease. Margarine and other processed foods containing partially hydrogenated oils should be avoided.

### **Garlic**

Eating garlic has helped to lower cholesterol in some research, though several double-blind trials have not found garlic supplements to be effective. Although some of the negative reports have been criticized, the relationship between garlic and cholesterol lowering remains unproven. However, garlic is known to act as a blood thinner and may reduce other risk factors for cardiovascular disease.

### **Nuts**

Preliminary research consistently shows that people who eat nuts frequently have a dramatically reduced risk of cardiovascular disease. Almonds and walnuts would appear to be most effective at lowering cholesterol. Hazelnuts and pistachio nuts have also been reported to help lower cholesterol.

Nuts contain many factors that could be responsible for protection against cardiovascular disease, including fibre, vitamin E, alpha-linolenic acid (found primarily in walnuts), oleic acid, magnesium, potassium, and arginine. Although nuts are loaded with calories, a preliminary trial surprisingly reported that adding hundreds of calories per day from nuts for six months did not increase body weight in humans —an outcome supported by other reports.

### **Number and size of meals**

When people eat a number of small meals, serum cholesterol levels fall compared with the effect of eating the same food in three big meals. Patients with hypercholesterolemia should probably avoid very large meals and eat more frequent, smaller meals.

## **Lifestyle Modification**

Exercise increases protective HDL cholesterol, an effect that occurs even from walking. Total and LDL cholesterol are typically lowered by exercise, especially when weight-loss also occurs. Exercisers have a relatively low risk of cardiovascular disease.

Obesity increases the risk of cardiovascular disease, in part because weight gain lowers HDL cholesterol. Weight loss reduces the body's ability to make cholesterol, increases HDL levels, and reduces triglycerides (another risk factor for cardiovascular disease). Weight loss also leads to a decrease in blood pressure.

Smoking is linked to a lowered level of HDL cholesterol and is also known to cause cardiovascular disease.

“Type A Behaviour” - the combination of feelings of hostility, stress, and time urgency – increases the risk of cardiovascular disease and elevates cholesterol levels.

## Nutritional Supplement Treatment Options

**Glucomannan** is a water-soluble dietary fibre that is derived from konjac root. Controlled and double-blind trials have shown that supplementation with glucomannan significantly reduced total blood cholesterol, LDL cholesterol, and triglycerides, and in some cases raised HDL cholesterol. Effective amounts of glucomannan for lowering blood cholesterol have been 4 to 13 grams per day.

**Policosanol** - *In vitro* and animal studies indicate that policosanol is capable of inhibiting cholesterol production by the liver.

Extensive preliminary and double-blind research in Cuba and other countries in Latin America has demonstrated that taking 10 to 20 mg per day of policosanol extracted from sugar cane results in significant changes in blood cholesterol levels, including total cholesterol (17 to 21% lower on average), LDL cholesterol (21 to 29% lower), and HDL cholesterol (7 to 29% higher).

**Vitamin C** appears to protect LDL cholesterol from damage. In some clinical trials, cholesterol levels have fallen when people with elevated cholesterol supplement with vitamin C. Some studies report that decreases in total cholesterol occur specifically in LDL cholesterol. Research leads to a recommended dosage varying from 100mg to 1 gram per day of vitamin C.

**Pantethine** may help reduce cholesterol biosynthesis. Several preliminary and two controlled trials have found that pantethine (300 mg BID–QID) significantly lowers serum cholesterol levels and may also increase HDL. Common pantothenic acid has not been reported to have any effect on high blood cholesterol.

**Chromium** supplementation has reduced total cholesterol, LDL cholesterol and increased HDL cholesterol in double-blind and other controlled trials, especially when in combination with daily exercise.

**Brewer's yeast**, which contains readily absorbable and biologically active chromium, has also lowered serum cholesterol. People with higher blood levels of chromium appear to be at lower risk for cardiovascular disease. A reasonable and safe intake of supplemental chromium is 200 mcg per day. People wishing to use brewer's yeast as a source of chromium should look for products specifically labelled “from the brewing process”, since most yeast found in health food stores is not brewer's yeast, and does not contain chromium. Optimally, true brewer's yeast contains up to 60 mcg of chromium per tablespoon, and a reasonable intake is 2 tablespoons per day.

**Niacin** - High amounts (several grams per day) of niacin lower cholesterol, unlike the other common form of vitamin B3—niacinamide—which has no effect on cholesterol levels. Some niacin preparations have raised HDL cholesterol better than certain

prescription drugs. *Symptoms caused by niacin supplements, such as flushing, can be reduced by ingesting banana along with the supplement.*

**Soy** supplementation has been shown to lower cholesterol in humans. Soy is available in foods such as tofu, miso, and tempeh and as a supplemental protein powder. Soy contains isoflavones, naturally occurring plant components that are believed to be soy's main cholesterol-lowering ingredients.

Soy also contains phytosterols. One such molecule, beta-sitosterol, is available as a supplement. Beta-sitosterol alone, and in combination with similar plant sterols, has been shown to reduce blood levels of cholesterol in preliminary and controlled trials. This effect may occur because beta-sitosterol blocks absorption of cholesterol.

**Tocotrienols**, a group of food-derived compounds that resemble vitamin E, may lower blood levels of cholesterol, but evidence is conflicting.

**Copper** - Deficiency of the trace mineral, copper, has been linked to high blood cholesterol. In a controlled trial, daily supplementation with 3 to 4 mg of copper for eight weeks decreased blood levels of total cholesterol and LDL cholesterol, in a group of people over 50 years of age.

**Beta-glucan** is a type of soluble fibre molecule derived from the cell wall of baker's yeast, oats and barley, and many medicinal mushrooms, such as **maitake**. Beta-glucan is the key factor for the cholesterol-lowering effect of oat bran. As with other soluble-fibre components, the binding of cholesterol (and bile acids) by beta-glucan and the resulting elimination of these substances in the faeces is very helpful for reducing blood cholesterol. For lowering cholesterol levels, the amount of beta-glucan used has ranged from 2,900 to 15,000 mg per day.

**Calcium** - Some preliminary and double-blind trials have shown that supplemental calcium reduces cholesterol levels. The possible method of action is the calcium binding with and thus preventing the absorption of dietary fat. Reasonable supplemental levels are 800 to 1,000 mg per day.

**Vitamin E** is known to protect LDL cholesterol from damage. Most cardiologists believe that only damaged LDL increases the risk of cardiovascular disease. Studies of the ability of vitamin E supplements to prevent cardiovascular disease have produced conflicting results, but many doctors continue to recommend that patients supplement 400 IU of vitamin E per day to lessen the risk of having a myocardial infarction.

**L-carnitine** is needed by heart muscle to utilize fat for energy. Preliminary trials report that carnitine reduces serum cholesterol. HDL cholesterol has also increased in response to carnitine supplementation. Most trials have used 1 to 4 grams of carnitine per day.

**Magnesium** is required for normal cardiac function. Although the mechanism is unclear, magnesium supplements (430 mg per day) lowered cholesterol in a preliminary trial. Another preliminary study reported that magnesium deficiency is associated with a low HDL cholesterol level.

**Chondroitin sulphate** has lowered serum cholesterol levels in preliminary trials. Years ago, this supplement dramatically reduced the risk of myocardial infarctions in a controlled, six-year follow-up of people with cardiovascular disease. Recommended dosage for people with a history of cardiovascular disease or elevated cholesterol levels is 500 mg TID.

**Lecithin** has been reported to increase HDL cholesterol and lower LDL cholesterol.

**Chitosan** - The fibre-like supplement chitosan appears to reduce the absorption of bile acids or cholesterol; either of these effects may cause a lowering of blood cholesterol.

This effect has been repeatedly demonstrated in animals, and a preliminary human study showed that 3 to 6 grams per day of chitosan taken for two weeks resulted in a 6% drop in cholesterol and a 10% increase in HDL ("good") cholesterol.

**Royal jelly** has prevented the cholesterol-elevating effect of nicotine and has lowered serum cholesterol in animal studies. An analysis of cholesterol-lowering trials shows that 50 to 100 mg per day is the typical amount used in such research.

**Creatine** - A double-blind trial found that 20 grams per day of creatine taken for five days, followed by ten grams per day for 51 days, significantly lowered serum total cholesterol and triglycerides, but did not change either LDL or HDL cholesterol, in both men and women.

**Octacosanol**, a substance found in wheat germ oil, is sometimes available as a supplement. Small amounts (5 to 20 mg per day) of policosanol, an experimental supplement from Cuba consisting primarily of octacosanol, has led to large reductions in LDL cholesterol and/or increases in HDL. Octacosanol may lower cholesterol by inhibiting hepatic production of cholesterol.

Homocysteine may increase the rate at which LDL cholesterol is damaged. While vitamin B6, vitamin B12, and folic acid lower homocysteine, a recent trial found no effect of supplements of these vitamins on protecting LDL cholesterol, even though homocysteine was lowered.

## Botanical Treatment Options

**Red Yeast Rice** - Researchers have determined that one of the ingredients in red yeast rice, called monacolin K, inhibits the production of cholesterol by stopping the action of the key enzyme in the liver (i.e., HMG-CoA reductase) that is responsible for manufacturing cholesterol.

**Psyllium** - Use of psyllium has been extensively studied as a way to reduce cholesterol levels. An analysis of all double-blind trials in 1997 concluded that a daily amount of 10 grams psyllium lowered cholesterol levels by 5% and LDL cholesterol by 9%. Since then, a large controlled trial found that use of 5.1 grams of psyllium BID significantly reduced serum cholesterol as well as LDL-cholesterol. Generally, 5 to 10 grams of psyllium are added to the diet per day to lower cholesterol levels. The combination of psyllium and oat bran may also be effective at lowering LDL cholesterol.

**Guggul**, a mixture of substances taken from a plant, is an approved treatment for elevated cholesterol in India and has been a mainstay of the Ayurvedic approach to preventing atherosclerosis. One double-blind trial studying the effects of guggul reported that serum cholesterol dropped by 17.5%. Daily intakes of guggul are based on the amount of guggulsterones in the extract. The recommended amount of guggulsterones is 25 mg TID. Most extracts contain 5 to 10% guggulsterones. It is generally recommended to take guggul for at least 12 weeks before evaluating its effect.

**Garlic** - Reports on many double-blind garlic trials performed since 1998 suggested that cholesterol was lowered by an average of 9 to 12% and triglycerides by 8 to 27% over a one-to-four month period. Most of these trials used 600 to 900 mg per day of garlic supplements. *The supplement must contain allicin to have any beneficial effect.*

**Green tea** has been shown to lower total cholesterol levels and improve people's cholesterol profile, decreasing LDL cholesterol and increasing HDL cholesterol according to preliminary studies. Much of the research documenting the health benefits of green tea is based on the amount of green tea typically drunk in Asian countries—about three cups per day, providing 240 to 320 mg of polyphenols.

**Artichoke** has moderately lowered cholesterol and triglycerides in some, but not all, human trials. One double-blind trial found that 900 mg of artichoke extract per day significantly lowered serum cholesterol and LDL cholesterol but did not decrease triglycerides or raise HDL cholesterol. Cholesterol-lowering effects occurred when using 320 mg of standardized leaf extract BID–TID for at least six weeks.

**Berberine**, a compound found in certain herbs such as goldenseal, barberry, and Oregon grape, has been found to lower serum cholesterol levels. In a study of people with high cholesterol levels, 500 mg of berberine BID for three months lowered the average cholesterol level by 29%. No significant side effects were reported, except for mild constipation.

**Wild yam** has been reported to raise HDL cholesterol in preliminary research. Doctors sometimes recommend 2 to 3 ml of tincture TID–QID, or 1 to 2 capsules or tablets of dried root TID.

**Maitake** - Animal studies suggest that the mushroom maitake may lower fat levels in the blood. This research is still preliminary and requires confirmation with controlled human trials.

**Alfalfa** - Animal studies indicate that saponins in alfalfa seeds may block absorption of cholesterol and prevent the formation of atherosclerotic plaques. However, consuming the large amounts of alfalfa seeds (80 to 120 grams per day) needed to supply high doses of these saponins may potentially cause damage to red blood cells in the body.

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