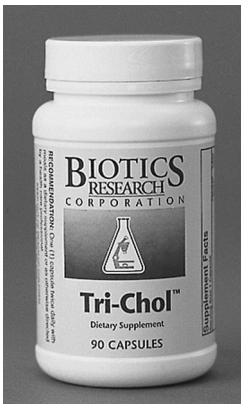
Biotics Research Corporation

Technical Support

TS006 Tri-Chol™ Product #2700

Tri-Chol™



Risk factors in cardiovascular disease

Coronary artery disease (CAD) is the leading cause of death in most industrialized nations, including the U.S. Most data regarding risks associated with cardiovascular disease in general, and CAD in particular, pertain to middle-aged men. However, after the age of 60, CAD is the primary cause of death among women (1). Atherosclerosis accounts for about 50% of all female deaths, although most of these occur after the age of 70 (1). Primary risk factors for both genders include hyperlipidemia, hypertension, smoking, diabetes, work-related stress, age, hyperhomocysteinemia and obesity (2,3,4). Recent studies indicate that physical inactivity represents an additional lifestyle risk factor that ranks as high as any other (5), and high alcohol consumption increases the risk of death from cardiovascular disease (6).

Hyperlipidemia and cardiovascular disease

Elevated serum cholesterol and serum LDL and depressed HDL are interrelated risk factors for CAD (7). High postprandial serum triglycerides are also a risk factor, though the correlation is not as strong. Recent studies indicate these risk factors become more prominent in post-menopausal women as well (8). After the age of 80, elevated serum cholesterol does not seem to increase the risk of CAD for men, though it may still be a factor for elderly women (9). The interrelationships among the various risk factors are complex, and in subjects with more than one factor, there is a synergistic effect among various factors. For example, hyperlipidemia increases blood pressure (10).

The liver clears dietary cholesterol, and feedback mechanisms help regulate circulating cholesterol levels. When the cholesterol input increases, cholesterol tends to accumulate in hepatocytes. This in turn leads to down-regulation of hepatic receptors that clear LDL cholesterol from the bloodstream (11). In contrast to LDL, HDL functions mainly to move excess tissue cholesterol to the liver for excretion. Elevated serum HDL, or lowered serum cholesterol/HDL ratios correlate with decreased risk of cardiovascular disease.

Cholesterol oxidation and cardiovascular disease

Elevated serum cholesterol increases the probability of oxidation of LDL-cholesterol (LDL-C). Oxidized LDL-C is cytotoxic to arterial endothelial cells. According to the oxidation hypothesis of cardiovascular disease (12), partially oxidized LDL-C is selectively taken up by monocytes and macrophages that evolve into lipid-filled foam cells. Scavenger receptors on these cells absorb oxidized LDL. Unlike the LDL receptor, the scavenger receptor is not down-regulated by high levels of cytoplasmic cholesterol, and the cells continue to accumulate oxidized LDL indefinitely. In addition, it also promotes the proliferation of smooth muscle cells, which aggregate at atherosclerotic lesions. Furthermore, oxidized LDL-C stimulates the production of chemotactic factors that attract macrophages into the subendothelial space. Oxidized LDL can activate inflammatory responses that generate free radicals, inducing further oxidative damage. These events are thought to cause “fatty streaks” and leading eventually to the build up of plaque deposits in arteries.

Primary prevention of cardiovascular disease

Most strategies for reducing the risk factors for coronary artery disease in women and men are the same. Increased physical activity, decreased hypertension, cessation of cigarette smoking, decreased serum homocysteine, and lowered serum LDL-C are generally recommended. For American men, there is a 2 to 3 percent decline in the risk of CAD for every 1 percent reduction in total serum cholesterol level (13). Extrapolation of these figures to premenopausal women has been questioned because estrogen modifies serum lipids. An increase in serum HDL cholesterol levels is a strong predictor of decreased CAD risk. Extensive research indicates nutritional status affects the levels of serum lipids. The consumption of certain saturated fatty acids, such as palmitic acid, can increase serum cholesterol due to decreased cholesterol turnover and are therefore considered atherogenic, while consumption of un-saturated fatty acids tends to lower serum LDL (14).

Specific nutrients modulate cholesterol levels

Niacin (Inositol hexaniacinate). Oral niacin lowers LDL-cholesterol, Lp(a), triglycerides and fibrinogen levels (15). Furthermore, oral niacin was shown to reduce mortality by 11% compared to the group receiving a placebo, while cholestryramine was associated with an increased mortality (16). A comparison of niacin and lovastatin found that while lovastatin produced greater reductions in LDL-cholesterol, niacin provided better overall results (17). Thus niacin increased levels of HDL, while lovastatin had a minimal effect on HDL. Furthermore, niacin resulted in a 35% reduction of lipoprotein (a), while lovastatin had no effect on this parameter. Another study focused on middle aged men with normal total serum cholesterol levels, but also with low HDL levels (18). In this group, niacin was found to raise HDL levels by 30%.

One of the safest forms of niacin is inositol hexaniacinate, which has long been used in Europe (19).

Chromium. Chromium is an essential nutrient for carbohydrate and lipid metabolism. Significant numbers of Americans consume less than the RDA for chromium. The dietary requirement for chromium is believed to increase with glucose intolerance. When type 2 diabetics were supplemented with 1000 mcg of chromium per day, for four months, the subjects had lower glycosylated hemoglobin, plasma cholesterol, blood glucose, and insulin levels than controls consuming a placebo (20). In another study, patients with type 2 diabetes supplemented daily with 200 mcg of chromium complexed with niacin for 8 weeks experienced slightly lowered plasma triglycerides, LDL cholesterol and fasting blood sugar (21).

Choline. Choline is both a methyl donor and a building block of phosphatidylcholine. As the major phospholipid of lipoproteins, phosphatidylcholine is needed to move cholesterol and triglycerides out of the liver. Choline administered to lab animals decreased the amount of fat associated with the liver, but not carcass fat (22). Diabetic rats often display fat accumulation in the myocardium. Treatment with choline and methionine dramatically reduced fat buildup and improved cardiac performance in these animals (23). Earlier studies had demonstrated that dietary choline increased biliary lecithin and cholesterol excretion (24).

Botanical support of lipid metabolism.

Commiphora mukul. The gum resin of C. mukul contains gum, essential oil and sterol derivatives, including guggulsterone, guggulsterol and diterpenoids (25). In Ayurvedic practice, mukul has a hypocholesterolemic effect. Chronic feeding of guggulsterone to rats was associated with

increased uptake of LDL by the liver due to increased hepatic LDL receptor activity (27). In a double blind, placebo controlled experiment, hypocholesterolemic patients supplemented with mukul in addition to a fruit/vegetable enriched, prudent diet exhibited a 12.5% decline in LDL-C as compared to controls (26). In the mukul-treated group serum lipid peroxide levels declined by 33% after 12 weeks. Side effects were observed in a few patients, which included headache, mild nausea, and eructation. Mukul resin also decreased experimentally-induced inflammation in lab animals (28).

Alisma orientale. The dried roots and stems of this plant contain sterol derivatives called alisol A and B, alisol monoacetate and the essential oil epialsol A, as well as B vitamins and niacin (29). As used in traditional Chinese practice, this herb enters the kidney and bladder channels and is said to leach out dampness and associated stagnation (30). It drains dampness without injuring yin energy. In animal models, orally administered terpenoid extracts from A. orientale were shown to inhibit type II and type III allergic reactions mediated by cellular and humoral mechanisms (31).

Polygonum cuspidatum. The dried roots and stems of P. cuspidatum contain resveratrol, and its glucoside, polydatin, as well as emodin, polygonin, glucofragulin and physcion together with flavonoids (32). Hypercholesterolemic patients administered this herb were reported to exhibit decreased cholesterol levels (33). Resveratrol exhibits protein tyrosine kinase activity implicated in signal transduction, regulating the cell cycle and other essential functions (34).

Polygonum multiforum. This plant contains approximately 1% as active principles, including emodin, emodin methyl ester, rhein, chrysophenol and chyrsophanic acid (35). It also contains glycosides and lecithin. This herb enters liver and kidney channels according to Chinese traditional practice. It reportedly increases coronary circulation, reduces heart rate, and reduces intestinal uptake of cholesterol (36). Preparations reduced blood cholesterol levels in experimentally-induced hypercholesterolemia in rabbits. When individuals with elevated blood cholesterol were given decoctions of P. mulitiforum, most subjects (78/88) had lowered cholesterol levels, while a few (8/88) had elevated cholesterol and 2/88 had no change (35). Facial flushing or increase bowel movements were reported possible side effects.

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PRODUCT INFORMATION

Tri-Chol™ is available in bottles of 90 capsules

Product Adjuncts: Bio-Glycozyme Forte™, Livotrit Plus™, and Beta-TCP™.

For more information, contact the Client Services Department or one of our Technical Consultants at Biotics Research Corporation.

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