

Fish Oils and Cholesterol/Triglycerides

Summaries of the latest research concerning fish oils and cholesterol/triglycerides

Eating fish may lower inflammation in the blood vessels

ATHENS, GREECE. Consuming fish has long been thought to help protect against heart disease, possibly through reducing inflammation in blood vessels. However, study results on the effects of fish on inflammatory markers are mixed, so a team of researchers from Harokopio University set out to examine the relationship in a population-based group of men and women free of heart disease. They gathered data on 1,514 men and 1,528 women aged 18 to 89, taking part in the ongoing ATTICA study into the benefits of a Mediterranean diet on heart health. Compared to those who did not eat fish, those who ate the most (10.5 ounces per week or more) had an average 33 per cent lower level of C-reactive protein, a widely-used marker for inflammation. They also had a 33 per cent lower level of interleukin-6, another inflammatory marker found in the plasma. This group had 21 per cent lower tumor necrosis factor-alpha, which affects lipid metabolism, coagulation, and insulin resistance, and 28 per cent lower serum amyloid A, a blood protein increased by inflammation. Significantly lower levels of these markers were also found in people who ate about 5 to 10 ounces of fish per week. This clear and strong inverse association between fish consumption and inflammatory markers may help explain why people who eat fish tend to have lower rates of heart disease, say the authors. The benefits remained once many risk factors were taken into account and were observed even in people with high blood pressure or diabetes, but not high cholesterol. Nevertheless, it was a cross-sectional study which did not follow people over time, so cannot prove causation. These results support recommendations that people eat more fish, the authors write, particularly oily fish with their high levels of omega-3 fatty acids. One or two portions per week may be sufficient, but the fish should not be fried. In some cases, omega-3 fatty acid supplements may be appropriate to achieve an optimal intake of 0.6 grams of omega-3 fatty acids per day. *Zampelas, A. et al. Fish consumption among healthy adults is associated with decreased levels of inflammatory markers related to cardiovascular disease: The ATTICA Study. Journal of the American College of Cardiology, Vol. 46, July 2005, pp. 120-24/*

Fish oils recommended for heart disease prevention

DALLAS, TEXAS. The American Heart Association has reviewed the benefits of regular consumption of fish and fish oils. The review concludes that fish and fish oils help prevent cardiovascular disease including fatal and non-fatal heart attacks, strokes, sudden cardiac death, and coronary artery disease (angina). The reviewers believe that the mechanisms by which fish oils exert their protective effect include: * Reduction in susceptibility to ventricular arrhythmia * Decrease in platelet aggregation * Reduction in triglyceride levels * Retardation of atherosclerosis * Lowering of blood pressure * Promotion of nitric oxide induced endothelial relaxation * Anti-inflammatory effects. Fish and fish oils contain long-chain polyunsaturated omega-3 fatty acids, more specifically, eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). The average American diet contains only about 100-200 mg/day of EPA and DHA. The diet also contains about 1.4 grams/day of alpha-linolenic acid mainly from canola and soybean oils. Alpha-linolenic acid can be converted in the body to EPA and DHA, but not in amounts sufficient to make a significant impact. Some studies have shown that alpha-linolenic acid, on its own, may have heart-protective effects, but other studies have failed to confirm this. NOTE: Flax seed oil is a particularly rich source of alpha-linolenic acid. The American Heart Association recommends that people increase their intake of long-chain polyunsaturated omega-3 oils from fish or directly from fish oil supplements. Healthy people should consume oily fish at least twice a week. Patients with

heart disease should eat enough oily fish on a daily basis to obtain about 1 gram per day of EPA and DHA combined or take a fish oil supplement providing 1 gram per day of EPA + DHA. Patients with high triglyceride levels should receive 2-4 grams/day of EPA+DHA under the care of a physician. The reviewers point out that many fish species contain significant amounts of methylmercury, polychlorinated biphenyls (PCBs), dioxins, and other environmental contaminants and therefore must be consumed in moderation, if at all, especially by children and pregnant and lactating women. Poorer quality fish oils may also contain these contaminants, so it is important to only supplement with highly purified, pharmaceutical grade oils. *Kris-Etherton, PM, et al. Fish consumption, fish oil, omega-3 fatty acids, and cardiovascular disease. Circulation, Vol. 106, November 19, 2002, pp. 2747-57/*

Omega-3 fatty acids and cholesterol

GUELPH, CANADA. Supplementation with fish oils (eicosapentaenoic acid [EPA] and docosahexaenoic acid [DHA]) is highly effective in lowering the blood level of triglycerides. High triglyceride levels are a major risk factor for heart disease particularly in women. Some studies have shown that fish oil supplementation may increase the level of LDL-cholesterol (the "bad" kind), but that the ratio of HDL- cholesterol (the "good" kind) to LDL remains unchanged. Researchers at the University of Guelph have just completed a study aimed at determining if taking gamma-linolenic acid (GLA) along with the fish oil would maintain the benefits of lowering triglyceride levels without the possible commensurate disadvantage of increasing LDL levels. Their study involved 32 women between the ages of 36 and 68 years who were assigned to one of four supplementation protocols for 28 days. * Group A: 4 grams of EPA + DHA daily (control group) * Group B: 4 grams of EPA + DHA + 1 gram of GLA * Group C: 4 grams of EPA + DHA + 2 grams of GLA * Group D: 4 grams of EPA + DHA + 4 grams of GLA At the end of the trial period LDL concentrations were about 12% lower than at baseline in groups C and D and within plus or minus 2% of baseline values in groups A and B. Triglyceride concentrations were 40% lower at day 28 in group A, 39% lower in group B, and 35% lower in group C. There was no difference in triglyceride level in group D between day 0 and day 28 indicating that the GLA overpowered the effect of EPA and DHA on triglyceride reduction. The important LDL/HDL ratio was reduced by 6% in group B, 15% in group C, and 20% in group D. The researchers conclude that a supplementation protocol involving 4 grams of EPA + DHA plus 2 grams of GLA per day is optimum for achieving desirable cholesterol and triglyceride levels in women. They estimate that this protocol reduces the risk of having a heart attack within the next 10 years by 43%. *Laidlaw, Maggie and Holub, Bruce J. Effect of supplementation with fish oil-derived n-3 fatty acids and gamma-linolenic acid on circulating plasma lipids and fatty acid profiles in women. American Journal of Clinical Nutrition, Vol. 77, January 2003, pp. 37-42/*

Triglycerides: A potent heart disease risk factor

MUNSTER, GERMANY. A high level of low-density lipoprotein (LDL) cholesterol combined with a low level of high-density lipoprotein (HDL) cholesterol is a potent risk factor for heart disease. There is also some evidence that high triglyceride levels are detrimental (especially in women), but just how much of a risk they pose has not been clear. Now researchers at the University of Munster report that high triglyceride levels alone or in combination with high LDL levels and low HDL levels are indeed a potent risk factor. Their study involved 19,698 men and women, aged 16 to 65 years, who were enrolled between 1979 and 1985. After 8 years of follow-up the researchers concluded that elevated triglyceride levels are a significant and independent risk factor for a major coronary event (fatal or nonfatal heart attack or sudden cardiac death). This association held true even after adjusting for LDL and HDL cholesterol levels, age, blood pressure, smoking, angina, diabetes, and family history of heart disease. A combination of high triglyceride levels with a high LDL level and a LDL:HDL ratio greater than 5 was found to increase risk by a factor of 6. Other studies have found that a 1.0 mmol/L (88 mg/dL) increase in triglyceride levels increased the risk of cardiovascular disease in men by 30% and by 75% in

women. Of particular interest is the finding that a high ratio of triglycerides to HDL cholesterol is a powerful risk factor for a major cardiac event even when LDL cholesterol levels are normal.

Editor's note: Independent research has shown that fish oil supplementation is highly effective in reducing triglyceride levels and lowering the triglyceride/HDL ratio. One study found that taking 8 fish oil capsules daily (providing 2.4 grams of eicosapentaenoic acid and 1.6 grams of docosahexaenoic acid) reduced triglyceride levels by about 26% and triglyceride/HDL ratio by 28% in women. Another study found an average reduction of 38% in triglyceride levels and an increase of HDL levels of 24% in both men and women consuming fish on a daily basis. *Cullen, Paul. Evidence that triglycerides are an independent coronary heart disease risk factor. American Journal of Cardiology, Vol. 86, November 1, 2000, pp. 943-49/*

Fish oils reduce cardiovascular risk factors in women

GUELPH, CANADA. Recent research has shown that a high blood level of triglycerides (triacylglycerol) is a potent risk factor for cardiovascular disease (CVD) in women. It is now also known that a high ratio of triacylglycerol to HDL cholesterol (high density lipoprotein cholesterol) is a more important risk factor for CVD in women than is a high LDL:HDL ratio. Estrogen replacement therapy (ERT) was originally believed to be protective against CVD in women, but 2 recent large studies found no such benefit. As a matter of fact, both clinical trials concluded that ERT raises triglyceride levels significantly. Researchers at the University of Guelph have just completed a clinical trial to determine if fish oil supplementation can reduce CVD risk factors in postmenopausal women. The double-blind, randomized, placebo-controlled trial involved 35 women aged 43 to 60 years who had either experienced natural menopause (18 women) or surgical menopause (17 women). Nineteen of the women were receiving either estrogen or combined-hormone therapy and 16 were not receiving any form of HRT. The women were randomly assigned to receive either 8 capsules of fish oil concentrate (providing 2.4 grams of eicosapentaenoic acid and 1.6 grams of docosahexaenoic acid) or 8 capsules of evening primrose oil (placebo) daily. Fasting blood samples were taken and analyzed at the start of the trial and at the end of the 28-day supplementation period. The researchers found that the women taking fish oils lowered their triacylglycerol concentrations by an average 26% (35% in women not on HRT and 19% in women on HRT). They also observed a 28% overall decrease in the important triacylglycerol:HDL ratio (39% in women not on HRT and 20% in women on HRT). The women on HRT generally had higher initial triacylglycerol concentrations and triacylglycerol:HDL ratios than the women not on HRT. The researchers conclude that postmenopausal women can reduce their risk of CVD by about 27% (whether or not they are on HRT) by supplementing with fish oils. / Stark, Ken D., et al. Effect of fish-oil concentrate on serum lipids in postmenopausal women receiving and not receiving hormone replacement therapy in a placebo-controlled, double-blind trial. *American Journal of Clinical Nutrition, Vol. 72, August 2000, pp. 389-94/*

Fish consumption combats hypertension and obesity

PERTH, AUSTRALIA. Obesity in patients with high blood pressure is associated with high cholesterol levels, poorer glucose control, and an increased risk of atherosclerosis and heart attacks. Researchers at the University of Western Australia have just released the results of a study that clearly demonstrates that a weight-loss diet combined with daily fish consumption is highly effective in reducing blood pressure, lowering triglyceride levels while increasing "good" (HDL2) cholesterol levels and in improving glucose tolerance. The study involved 63 men and postmenopausal women who were overweight and being treated for hypertension. The participants were randomly assigned to one of four groups. Group 1 included a daily fish meal (turbot, sardines, tuna or salmon) in their diet; group 2 consumed a calorie-restricted diet; group 3 consumed a calorie-restricted diet including a daily fish meal; and group 4 served as a control. Blood pressure, glucose tolerance, fatty acid profile, and cholesterol levels were measured at baseline and after 16 weeks on the diets. The two calorie-restricted diets resulted in an average weight loss of 5.6 kg (12 lbs) during the first 12 weeks of the experiment. No significant weight

loss was observed in the control group and the daily fish meal group. Waking blood pressures decreased by 5.5 mm Hg (systolic) and 2.2 mm Hg (diastolic) in the calorie-restricted group and by 13.0 mm Hg and 9.3 mm Hg in the group combining a daily fish meal with a calorie-restricted diet. The combination of fish consumption and weight loss improved glucose and insulin metabolism significantly and also resulted in a 38% reduction in triglyceride levels and a 24% increase in the level of "good" cholesterol (HDL2). The researchers conclude that a combination of weight loss and daily fish consumption significantly reduces the risk of cardiovascular disease among obese, hypertensive patients. / Mori, Trevor A., et al. Dietary fish as a major component of a weight-loss diet: effect on serum lipids, glucose, and insulin metabolism in overweight hypertensive subjects. *American Journal of Clinical Nutrition*, Vol. 70, November 1999, pp. 817-25 [57 references]/

Fish oil supplementation is safe for diabetics

PARIS, FRANCE. People suffering from type II diabetes often have high blood levels of triglycerides and are therefore prone to coronary heart disease. Fish oils are known to be effective in lowering triglyceride levels, but concern has been expressed that they may also increase low-density lipoprotein (LDL) levels and be deleterious to glucose control. Medical researchers at the Hotel-Dieu hospital now report the results of a study designed to investigate these concerns. The study involved 10 men with type II diabetes (average age of 54 years). The men were randomized into two groups in the double-blind crossover study. Group 1 supplemented with 6 grams/day of fish oils (containing 320 mg of eicosapentaenoic acid [EPA] and 215 mg of docosahexaenoic acid [DHA]) for two months while group 2 supplemented with 6 grams/day of sunflower oil (containing 65% linoleic acid). At the end of the two months all participants went through a 2-month wash-out period and group 1 was then assigned to supplement with sunflower oil while group 2 was given fish oil supplements. All participants maintained their regular diet (55% carbohydrates, 15% protein, and 30% fat) and continued with their medications throughout the study except for cholesterol-lowering drugs which were discontinued 2 months before the start of the trial. The researchers noted a considerable increase in both EPA and DHA content in blood plasma phospholipids and in red blood cell membranes after two months on the fish oil supplements. Triglyceride levels and the level of plasma lipoprotein(a) were both significantly lowered following fish oil supplementation. No adverse effects on glucose control were observed; there was a small increase in the LDL level, but this was compensated for by a similar increase in the HDL (high-density lipoprotein) level so that the important LDL/HDL ratio remained unchanged. The researchers conclude that fish oil supplementation is effective in lowering triglyceride levels in type II diabetics and has not adverse effects on glycemic control or overall cholesterol levels. *Luo, Jing, et al. Moderate intake of n-3 fatty acids for 2 months has no detrimental effect on glucose metabolism and could ameliorate the lipid profile in type 2 diabetic men. Diabetes Care, Vol. 21, May 1998, pp. 717-24/*

Fish oils and fiber benefit diabetics

CLEVELAND, OHIO. Patients with non-insulin-dependent diabetes mellitus (NIDDM) often suffer from abnormal lipid (fat) and lipoprotein metabolism resulting in unfavourable cholesterol levels and an accompanying increase in the risk of heart disease. Numerous studies have shown that fish oil supplementation lowers the levels of very-low-density-lipoprotein (VLDL) and triglycerides (triacylglycerol), but has little effect on the levels of low-density-lipoprotein (LDL) and total cholesterol. There has also been some reports that fish oil supplementation may worsen glycemic (glucose) control. Now medical researchers at the Case Western Reserve University report that adding soluble fiber to the fish oil supplementation regimen is highly beneficial. Their experiment involved 15 non-obese NIDDM patients (12 men and 3 women) aged 32 to 74 years. For the first four weeks the patients received 20 grams of fish oil per day (equivalent to six grams of n-3 fatty acids). During the next four weeks all patients received the fish oil plus 15 grams/day of soluble apple pectin. During the final four weeks both supplements were withdrawn. The patients

continued their usual diabetic diet and medication during the entire study period. Analysis of blood samples showed that fish oil supplementation alone lowered the levels of triacylglycerol and VLDL cholesterol by 41 per cent and 36 per cent respectively. No changes were observed in total cholesterol, LDL cholesterol or HDL cholesterol. When apple pectin was added to the treatment triacylglycerol and VLDL cholesterol levels were both lowered by 38 per cent, but in addition total cholesterol levels decreased by 13 per cent and LDL cholesterol by 7 per cent. There was no significant change in HDL cholesterol level. Fasting and two-hour postprandial plasma glucose concentrations were not affected by the fish oil or fish oil/pectin supplementation and no changes in serum levels of zinc, magnesium, and copper were observed. Plasma levels of triglycerides and cholesterols returned to pre-treatment levels four weeks after discontinuation of supplementation. The researchers conclude that a combination of fish oil supplementation and increased fiber intake (up to 40 grams/day total) may be a beneficial addition to the conventional treatment of high cholesterol levels in NIDDM patients. *Sheehan, John P., et al. Effect of high fiber intake in fish oil-treated patients with non-insulin-dependent diabetes mellitus. American Journal of Clinical Nutrition, Vol. 66, November 1997, pp. 1183- 87/*

Garlic and fish oils lower cholesterol

GUELPH, CANADA. Elevated levels of total cholesterol and low-density-lipoprotein (LDL) cholesterol are well established risk factors for coronary heart disease. It is also clear that people with accompanying high levels of triglycerides (triacylglycerol) face an even higher risk of heart disease. Very recent work has shown that high triglyceride levels alone are powerful risk factors for atherosclerosis and heart disease especially among women. Supplementation with garlic has been shown to lower overall cholesterol levels and LDL levels significantly while fish oil supplementation is known to lower triglyceride levels. Now researchers at the University of Guelph report that a combination of garlic and fish oil is highly effective in lowering the levels of total cholesterol, LDL cholesterol, and triglycerides. Their study involved 50 men with a total cholesterol level in excess of 5.2 mmol/L (200 mg/dL). The men were randomly allocated into four groups for the 12-week long experiment. Group 1 was given a daily supplement of 900 mg garlic placebo and 12 g oil placebo, Group 2 took 900 mg garlic (Kwai) and 12 g oil placebo, Group 3 took 900 mg garlic placebo and 12 g fish oil [12 1-gram capsules each containing 180 mg EPA (eicosapentaenoic acid) and 120 mg DHA (docosahexaenoic acid)] while Group 4 took 900 mg garlic and 12 g fish oil per day. All supplements were taken in three divided doses with meals. At the end of the 12- week study period significant reductions were observed for total cholesterol (12.2 per cent), LDL cholesterol (9.5 per cent), and triacylglycerol (34.3 per cent) in the group taking both garlic and fish oil supplements. A significant, reduction (beneficial) in the ratios of total cholesterol to high-density- lipoprotein (HDL) cholesterol and LDL to HDL was also observed for both the garlic groups (with and without fish oil). Garlic by itself did not lower triglyceride concentrations while fish oils by themselves actually increased LDL concentrations significantly (by 8.5 per cent). The researchers conclude that supplementing with garlic pills and fish oils in combination is effective in lowering blood levels of total cholesterol, LDL cholesterol, and triglycerides while at the same time providing a beneficial decrease in the ratios of total cholesterol to HDL cholesterol and in LDL to HDL cholesterol. *Adler, Adam J. and Holub, Bruce J. Effect of garlic and fish-oil supplementation on serum lipid and lipoprotein concentrations in hypercholesterolemic men. American Journal of Clinical Nutrition, Vol. 65, February 1997, pp. 445-50* *Kris-Etherton, Penny M., et al. Efficacy of multiple dietary therapies in reducing cardiovascular disease risk factors. American Journal of Clinical Nutrition, Vol. 65, February 1997, pp. 560-1 (editorial)/*

Fish oils and cholesterol

KANSAS CITY, MISSOURI. Dr. William S. Harris of the Mid America Heart Institute has released a comprehensive study of the results of 68 major clinical trials aimed at determining the effects of fish oil supplementation on cholesterol and triglyceride levels. The studies included over 2800

participants, lasted from 2 to 52 weeks, and involved supplementation with around 10 grams/day of fish oils. The participants received either fish oil or placebo (mostly olive oil) and included people with normal as well as people with elevated cholesterol and triglyceride levels. Based on the results of the studies Dr. Harris concludes that fish oil supplementation lowers blood levels of triglycerides by about 25-30%; he points out that this is equivalent to the effect obtained by taking the drug gemfibrozil. Fish oils tend to increase the levels of low-density cholesterol (LDL) by about 5-10%, but has little effect on high-density cholesterol (HDL) levels. Overall cholesterol levels are not affected by fish oil supplementation. Dr. Harris emphasizes that the triglyceride-reducing effect is unique to long-chain omega-3 acids found in fish oils. The shorter chain omega-3 oil, alpha-linolenic acid (found in flax seed oil) has no effect on triglyceride or cholesterol levels. / Harris, William S. n-3 fatty acids and serum lipoproteins: human studies. *American Journal of Clinical Nutrition*, Vol. 65 (suppl), 1997, pp. 1645S-54S [83 references] / *Diabetics may benefit from fish oil supplementation* NAPLES, ITALY. Animal studies have shown that fish oil supplementation has a beneficial effect on insulin resistance and can prevent its development in animals fed a high-fat diet. It is also known that a high fish intake can delay the development of diabetes in glucose-intolerant individuals. Researchers at the Federico II University recently set out to investigate if long-term supplementation with fish oils would improve insulin sensitivity in patients with non-insulin-dependent diabetes (NIDDM). The clinical trial involved 16 NIDDM patients (average age of 56 years) who, after a 3 week run-in period during which they received 3 olive oil capsules per day, were assigned to receive either fish oil capsules or olive oil capsules for a further 6-month period. For the first two months the participants received either 3 fish oil capsules daily (320 mg eicosapentaenoic acid [EPA] and 530 mg docosahexaenoic acid [DHA] per capsule) or 3 placebo capsules (each containing 1 gram of olive oil). During the last four months these dosages were reduced to 2 fish oil or 2 placebo capsules daily. The patients were evaluated at the beginning and end of the trial and maintained their usual diet and medications (except for cholesterol-lowering drugs) during the entire trial period. The researchers concluded that fish oil supplementation induced a significant decrease in triglyceride concentrations particularly in the level of very-low-density lipoprotein (VLDL) triglycerides (a reduction of 45%). There was also a significant decrease in VLDL cholesterol levels (47% drop) and a 14% increase in LDL cholesterol. There was no significant change in blood glucose control and, contrary to expectations, no significant improvement in insulin resistance despite the fact that red blood cell levels of EPA and DHA increased significantly. The researchers conclude that long-term fish oil supplementation lowers triglyceride levels in NIDDM patients without adversely affecting blood glucose control. NOTE: This study was partially funded by Pharmacia, Farmitalia Carlo Erba, Milan, Italy. *Rivellese, Angela A., et al. Long-term effects of fish oil on insulin resistance and plasma lipoproteins in NIDDM patients with hypertriglyceridemia. Diabetes Care, Vol. 19, November 1996, pp. 1207-13/*

Diabetes and fish oil supplementation

EDMONTON, CANADA. Diabetics are at significantly increased risk for cardiovascular disease and any dietary intervention that could decrease this risk would be of great importance. Studies have shown that fish oil supplementation lowers triglycerides, very low density lipoprotein (VLDL) levels, and blood pressure in non-diabetic individuals and thereby diminishes their risk of heart disease. Unfortunately, some early experiments with fish oil supplementation in type II diabetics reported adverse effects on glycemic control and cholesterol levels. Researchers at the University of Alberta have just released the results of a new study aimed at evaluating the overall effects of fish oil supplementation in type II diabetics. Eleven subjects with non-insulin-requiring type II diabetes took part in the randomized, double-blind, crossover study. All participants underwent a 3-month run-in period during which they supplemented with olive oil capsules (placebo). They were then randomized into two groups with one group supplementing with fish oil capsules (about 2.0 grams/day) and the other group supplementing with flax seed oil capsules. After 3 months the participants underwent a crossover to the alternative oil for a final 3 months of supplementation. All study participants had acceptable blood levels of total cholesterol, triglycerides, high density lipoproteins, low density lipoproteins, and low density triglycerides prior to initiating

supplementation with fish oil or flax seed oil. Supplementation did not change these levels except in the case of triglycerides which were markedly reduced after fish oil supplementation. Glycemic control was not adversely affected by supplementation with either oil and there was a trend towards decreased insulin sensitivity in the group taking fish oils. The researchers conclude that fish oil supplementation is safe in type II diabetes and can help ameliorate cardiovascular disease risk factors such as high triglyceride levels. They also conclude that flax seed oil supplementation, while having no adverse effects, is not of significant benefit in type II diabetes. NOTE: This study was partially funded by the Canadian Dairy Bureau. / McManus, Ruth M., et al. A comparison of the effects of n-3 fatty acids from linseed oil and fish oil in well-controlled type II diabetes. *Diabetes Care*, Vol. 19, May 1996, pp. 463-67/

Fish oils recommended for diabetes and hypertension

TROMSO, NORWAY. Fish and fish oils help protect against the development of atherosclerosis and heart disease. It is believed that fish oils exert their protective effect by lowering blood pressure and the levels of triglycerides and very-low-density lipoprotein (VLDL). Fish oils are also believed to reduce platelet aggregation and to suppress the growth of smooth-muscle cells in the arterial walls. Many people with hypertension also suffer from diabetes and there has been concern that fish oil supplementation may aggravate problems with glucose intolerance. Researchers at the University of Tromso now report that fish oil supplementation lowers blood pressure significantly in people with hypertension and has no effect on glucose control even in people with mild diabetes. The study involved 78 obese volunteers with essential hypertension. The participants were randomly assigned to one of two equal-sized groups. The fish oil group received four fish oil capsules a day (containing a total of 3.4 grams of a mixture of eicosapentaenoic acid and docosahexaenoic acid) for a period of 16 weeks. The control group received four corn oil capsules a day. At the end of the test period the average (mean) systolic blood pressure had dropped by 4.4 mm Hg and the diastolic pressure by 3.2 mm Hg in the fish oil group. The average blood pressure in the control group did not change. The researchers also found that plasma triglyceride and VLDL levels in the fish oil group decreased significantly (by about 9 per cent) while they increased significantly (by about 12 per cent) in the control group. There were no changes in total or low-density-lipoprotein levels in either group. Extensive tests (oral glucose tolerance, hyperglycemic and hyperinsulemic clamps) were done to evaluate the effect of fish oil supplementation on glucose control. No adverse effects were found. An editorial accompanying the research report concludes that fish or fish oil is useful in the prevention of vascular disease in diabetics. Patients with diabetes should eat fish two to three times a week or, as an alternative, supplement with two to three one gram capsules of fish oil per day. *Toft, Ingrid, et al. Effects of n-3 polyunsaturated fatty acids on glucose homeostasis and blood pressure in essential hypertension. Annals of Internal Medicine, Vol. 123, No. 12, December 15, 1995, pp. 911-18 Connor, William E. Diabetes, fish oil, and vascular disease. Annals of Internal Medicine, Vol. 123, No. 12, December 15, 1995, pp. 950-52/*

Fish oil supplementation recommended for type II diabetics

DALLAS, TEXAS. High cholesterol and triglyceride levels are common among diabetics and are major contributors to their increased risk of cardiovascular disease. Researchers at the Texas Woman's University and the University of Texas Medical Center now report that fish oil supplementation can markedly decrease cholesterol and triglyceride levels without adversely affecting glycemic control. Their study involved 40 patients with non-insulin-dependent diabetes mellitus (NIDDM) who had abnormally high blood plasma levels of one or more of the following lipids: total cholesterol (greater than 5.17 mmol/L), LDL cholesterol (greater than 3.36 mmol/L), or triglycerides (greater than 6.47 mmol/L). After a four-week baseline phase during which cholesterol levels, weight, blood pressure, and diabetes control were assessed every two weeks the participants were randomly assigned to one of four groups - daily dose of 9 grams of corn oil (57% linoleic acid), 18 grams of corn oil, 9 grams of fish oil (29% EPA and 27% DHA), and 18

grams of fish oil. All participants were assessed every two weeks during the 12-week supplementation period. A significant reduction in the levels of very-low-density lipoproteins, triglycerides and very-low-density triglycerides was observed among the participants supplementing with fish oils at both the 6-week and 12-week mark. There were no significant differences in the effect of 9 grams/day versus 18 grams/day supplementation. The level of LDL cholesterol increased temporarily at the 6-week mark, but this effect was no longer present at the 12-week examination. Neither fish oil nor corn oil supplementation produced any significant changes (over baseline values) in total cholesterol levels, HDL cholesterol levels, fasting plasma glucose, weight or blood pressure. A small increase in VLDL cholesterol was noted in the corn oil group at the end of the experiment. The researchers conclude that fish oil supplementation is useful in lowering triglycerides in diabetics with excessive levels and has no deleterious effect on glycemic control. *Morgan, Wanda A., et al. A comparison of fish oil or corn oil supplements in hyperlipidemic subjects with NIDDM. Diabetes Care, Vol. 18, January 1995, pp. 83-86/*

Fish oils reduce cardiovascular risk factors

OSLO, NORWAY. High blood levels of triglycerides and fibrinogen are known risk factors for cardiovascular disease. Fibrinogen is a large protein molecule which is a key factor in blood coagulation. High levels of fibrinogen aggravate the symptoms of intermittent claudication and speeds up the progression of atherosclerosis. Recent research has shown that fibrinogen level is a more reliable indicator of heart disease risk than is total cholesterol level. Researchers at the University of Oslo now report that fish oil supplementation is effective in lowering both triglyceride and fibrinogen levels. Their study involved 64 healthy men between the ages of 35 and 45 years. The participants were randomly assigned to receive either 14 1-gram capsules of fish oils or 14 1-gram capsules of olive oil every day for six weeks. The fish oil capsules contained 25.7% eicosapentaenoic acid (EPA) and 20.5% docosahexaenoic acid (DHA) and the olive oil capsules contained about 80% oleic acid. Blood samples were taken and analyzed at the start of the study, 3 and 6 weeks into the study, and 3 weeks after stopping supplementation. The red blood cell (phospholipid phase) content of EPA increased markedly after supplementation; DHA level increased slightly and the level of both linoleic acid and arachidonic acid decreased significantly. Blood level of fibrinogen dropped an average of 13% (from 2.73g/L to 2.37 g/L) after 3 weeks, but returned to baseline 3 weeks after stopping fish oil supplementation. There were no changes in fibrinogen levels in the olive oil group. Triglyceride levels decreased by an average of 22% (from 1.58 mmol/L to 1.23 mmol/L) after 6 weeks in the fish oil group, but increased by about 19% in the olive oil group. Values in both groups reverted to baseline 3 weeks after ceasing supplementation. Total cholesterol level and the level of LDL cholesterol (low-density lipoprotein) did not change with supplementation in either group, but a small transient decrease in the level of HDL (high-density lipoprotein) cholesterol was noted in the fish oil group. Blood pressure fell slightly in both groups after 3 and 6 weeks of supplementation, but reverted to baseline once supplementation was discontinued. The researchers conclude that the antithrombotic (blood clot preventing) effect of fish oils may be due to their ability to lower fibrinogen levels. *Flaten, Hugo, et al. Fish-oil concentrate: effects of variables related to cardiovascular disease. American Journal of Clinical Nutrition, Vol. 52, 1990, pp. 300-06/*

A regular diet containing fish oils improves fat tolerance

PORTLAND, OREGON. An experiment involving seven healthy human subjects was carried out to determine if the composition of a background diet fed for four weeks would influence the rise in triglyceride level experienced after consuming a fatty test meal. The three background diets contained 30-40% of calories as saturated fats, polyunsaturated vegetable oils, and salmon oils respectively. Fasting triglyceride levels in the three regimes were 72+-19, 76+-37, and 46+-11 mg/dl respectively. It was found that the rise in plasma triglyceride level after a test meal containing 50 grams of fat was significantly lower for subjects who had been on the fish oil background diet. This relationship held true independent of the type of fat in the test meal

(saturated, vegetable oil, or fish oil). The results suggest that long term (but not acute) fish oil consumption may improve fat tolerance. / Harris, William S., et al. Reduction of postprandial triglyceridemia in humans by dietary n-3 fatty acids. *Journal of Lipid Research*, Volume 29, No. 11, November 1988, pp. 1451-1460/ *Consuming freshwater fish may lower risk of heart disease* KUOPIO, FINLAND. A 15-week experiment involving 62 students was carried out to determine if a regular diet of freshwater fish affects coronary heart disease risk factors. The students were divided into three groups: a fish eating group who made no other changes to their diet, a fish eating group who also decreased their overall fat intake and a control group (19 students) who ate a typical western diet. The special diet consisted of one fish meal a day (in addition to the regular diet) and provided about 0.25 g/day of eicosapentaenoic acid and 0.55 g/day of docosahexaenoic acid. Serum cholesterol was found to decrease in fish eaters who also decreased their lipid intake but not in the other groups. Blood triglyceride levels decreased significantly in the fish eating groups, but not in the control group. Levels of apolipoproteins A1 and B were lowered in both fish eating groups as was the formation of thromboxane B2 during incubation of whole blood. In the fish eating groups, the proportion of omega-3 fatty acids increased significantly in erythrocyte ghosts and platelets at the expense of omega-6 fatty acids. The results of the study support the contention that moderate fish consumption has a protective effect against coronary heart disease. / Agren, J.J., et al. Boreal freshwater fish diet modifies the plasma lipids and prostanoids and membrane fatty acids in man. *LIPIDS*, Vol. 23, No.10, October 1988, pp. 924-929/ Coromega *Additional References* 1. Goodfellow, J., et al. 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