LIPOGUARD CLINICAL STUDY

N.C. Morcos, MD, PhD
Irvine, California

Fish consumption has been shown to influence epidemiology of heart disease, and garlic has been shown to influence triglyceride levels. This study was undertaken to evaluate the effect of fish oil and garlic combinations as a dietary supplement on the lipid subfractions. Forty consecutive subjects with lipid profile abnormalities were enrolled in a single-blind, placebo-controlled crossover study. Each subject received placebo for 1 month and fish oil (1800mg of eicosapentanoic acid [EPA] + 1200 mg of docosahexanoic acid) with garlic powder (1200 mg) capsules daily for 1 month. Lipid fractionation was performed prior to study initiation, after the placebo period, and after the intervention period. Subjects all had cholesterol levels >200. Subjects were instructed to maintain their usual diets.

Supplementation for 1 month resulted in an 11% decrease in cholesterol, a 34% decrease in triglyceride, and a 10% decrease in low-density lipoprotein (LDL) levels, as well as a 19% decrease in cholesterol/high-density lipoprotein (HDL) risk. Although not significant, there was a trend toward increase in HDL. There was no significant placebo effect. These results suggest that in addition to the known anticoagulant and antioxidant properties of both fish oil and garlic, the combination causes favorable shifts in the lipid subfractions within 1 month. Triglycerides are affected to the largest extent. The cholesterol lowering and improvement in lipid/HDL risk ratios suggests that these combinations may have antiatherosclerotic properties and may protect against the development of coronary artery disease. (J Natl Med Assoc. 1997;89:673-678).

Key words:

• coronary artery disease • lipid profile • garlic • fish oil

---

From the Division of Cardiology, University of California, Irvine, California, and Division of Cardiology, Western Medical Center, Santa Ana, California. This research was supported by a grant from Westar Nutrition Inc and Viva America Corp. Requests for reprints should be addressed to Dr N.C. Morcos, Division of Cardiology, Med Sci 1, Room C388, University of California, Irvine, CA 92717.

Research related to the beneficial cardiovascular effects of fish oil (w 3-fatty acids) and garlic (allin) has increased tremendously in the past decade.1,2 Fish oil contains the w 3-fatty acids eicosapentanoic acid (EPA) and docosahexanoic acid (DHA). The average daily intake of human populations ranges from 0 to 10 g fish.1 However, studies of Inuit3,4 and Dutch Zutpkin5 populations drew attention to the beneficial relation between diets containing approximately 50g fish per day and the low incidence of coronary artery disease and mortality. Protective effects of fish oil on the recurrence of coronary stenosis following angioplasty was documented with 2 to 3 g of w 3-fatty acids as daily dietary supplement.6 Consumption of >20 g of fish/day by Dutch men was associated with a 50% reduction in stroke risk.7

A large spectrum of antithrombotic effects of fish oil include blood-thinning effects by incorporation into red cell membranes, causing an increase in membrane fluidity and reducing plasminogen, which decreases blood viscosity.2 The formation of eicosanoides, modulators involved in the regulation of blood vessels and inflammation, is altered by w 3-fatty acids.1 The resultant decrease in thromboxane A2 and increase in prostaglandin I3 and I2 inhibits platelet aggregation and favors vasodialation of blood vessels. This shift also favors a decrease in the production of proinflammatory leukotrienes. The lipoprotein effects of w 3-fatty acids are a result of its inhibition of the hepatic triglyceride-synthesizing enzyme, which reduces hepatic secretion of triglycerides and hence lowers serum triglycerides.8,9 No extensive studies are available on the modulation of lipid subfractions and associated lipid-related cardiovascular risk factors.

Garlic has as its principal ingredient a sulfur-containing antioxidant, allicin, in addition to other antioxidants including vitamin C, germanium, and selenium. Although at times controversial and with inconsistent effects, garlic has been the focus of medical and clinical attention because of reports on several cardiovasular risk factors.10,11 Garlic extracts have been reported to reduce some serum lipid levels,2,10-25 blood pressure,10,15-21,23-25 and plasma viscosity,26 as well as inhibit platelet aggregation,17,27 increase fibrinolytic activity,17,27 and produce vasodialation.27-29 In contrast, certain

studies were not able to substantiate the blood pressure-lowering effect12 and absence of effects on serum lipids and lipoproteins despite matching dosages. Since the overall property profiles of both w fish oil and garlic includes modulation, at least in part, of subfractions of the lipids and lipoproteins, this study was undertaken to evaluate the net effect and potential synergism when ingested together at optimal daily dosages in subjects with mild to moderate hyperlipidemia in a placebo-controlled, randomized, crossover study.

MATERIALS AND METHODS

Forty consecutive volunteer subjects from the cardiology/internal medicine clinic aged 40 to 75 years with cholesterol or triglyceride levels >200 were enrolled in a randomized, placebo-controlled, crossover study. Subjects were instructed to continue their usual daily diets and activity levels during the study. Fasting baseline laboratory values were obtained for all parameters on each subject prior to the start of the study. The test arm and the placebo arm of the study each lasted 4 weeks. There was 4-week interval for washout between termination of one arm of the study and prior to crossover to the second arm of the study.

Each subject was instructed to take daily placebo or fish oil/garlic capsules (1800 mg of EPA, 1200 mg of DHA, and 1200 mg of garlic powder). After each 4-week arm period, fasting blood samples were drawn from a peripheral vein, and lipid fractionation and chemistry analysis panels were performed.

Fish oil and garlic extract capsules were of the brand name LipoGuard™ (Viva America Marketing Corp., Costa Mesa, California). Fish oil was obtained from pink salmon and garlic powder was obtained from garlic cloves. Placebo tablets contained basic ingredients of inert cellulose base and filler.

Statistical analysis was performed using paired student's t-test with descriptive statistics in a StatMost program (DataMost Inc, Salt Lake City, Utah). P values <.05 were considered significant, and results were expressed as mean±standard deviations (SD). All subjects volunteered for the supplementation studies with informed consent. A summary of the subjects' demographics is shown in Table 1. Diets were consistent with a standard western diet.

Table 1. Patient Demographics

Characteristic	No. Patients
Total no. patients	40
Age range (years)	40 to 75
Mean age±SD (years)	53±13
Males	23
Mean age±SD (years)	47±10
Females	17
Mean age±SD (years)	63±11
Hypertension	14
Coronary artery disease	5
Diabetes	3
Cholesterol level >200	40
Triglyceride level >180	20
Smokers	0
Abbreviations: SD= standard deviation.	

RESULTS

Subjects with mild hyperlipidemia were enrolled in the study to evaluate the combined effect of fish oil and garlic supplementation on the lipid profile (Table 1). Fourteen of the 40 subjects had hypertension; most had at least one other clinical condition including diabetes and coronary artery disease. All subjects successfully completed the study. Only one subject complained of esophageal reflux during the first hour following ingestion of the capsules; otherwise, there were no reported side effects. All subjects maintained their usual standard western diet during the study.

All subjects demonstrated a significant reduction (11%; P<.01) in total cholesterol, while placebo effect was non-significant. A significant reduction (34%; P<.01) in total triglycerides also was observed in all

subjects, with a non-significant change in placebo. There was a trend toward increase in high-density lipoprotein (HDL) by 32% (P<.01), but this trend was noted in only 35% of the subjects. The average total HDL when all subjects were considered did not show a significant change, presumably because of the strong dependence of this variable on the diet fat content during fish oil supplementation. Low-density lipoprotein (LDL) cholesterol was significantly reduced by 10% (P<.01) over placebo in 80% of subjects (Table 2).

Table 2. Effect of Fish Oil/Garlic on Patients' Lipid Profiles*

	Mean±SD	%Change From Baseline	No. (%) Subjects Respond†	P value Paired
Total Cholesterol				
Baseline	238±33	_	_	_
Placebo	234±34	-1	0	NS
Fish oil/garlic (4 weeks)	213±35	-11	40/40 (100)	<.01
Triglycerides				
Baseline	214±25	_	_	_
Placebo	210±23	-2	0	NS
Fish oil/garlic (4 weeks)	142±19	-34	40/40 (100)	<.05
High-Density Lipoprotein				
Baseline	43±18	-	-	-
Placebo	42±16	-2	0	NS
Fish oil/garlic (4 weeks)	43±16	0	14/40 (35)††	NS
Low-Density Lipoprotein				
Baseline	150±29	-	-	-
Placebo	143±27	-4	0	NS
Fish oil/garlic (4 weeks)	135±36	-10	37/40 (92)	<.01

Abbreviations: SD = standard deviation and NS = not significant.
*40 subjects enrolled as described under methods.
†Number of subjects showing a decrease in levels.
††Number of subjects showing an increase in levels

The reduction in LDL probably contributes to the reduction in total cholesterol. This significant reduction in LDL is translated into a significant reduction of 18% (P<.05) in the LDL/HDL cardiovascular risk ratio in 90% of the subjects (Table 3). The reduction in total cholesterol also permits a significant reduction of 19% (P<.01) in the other cardiovascular risk ratio, the cholesterol/HDL risk ratio (Table 3). The combined effects of reduction in total cholesterol, total triglycerides, LDL, and cardiovascular risk ratios strongly suggest a potential favorable effect on modulation and progression of atherosclerosis and cardiovascular disease.

Table 3. Effect of Fish Oil/Garlic on Patients' Cardiovascular Risk Ratios*

	Mean±SD	%Change From Baseline	No. (%) Subjects Respond†	P value Paired
LDL/HDL Risk				
Baseline	4.0±0.3	_	_	_
Placebo	3.8±0.2	-5	6/40 (15)	NS
Fish oil/garlic (4 weeks)	3.3±0.2	-18	36/40 (90)	<.05
Cholesterol/HDL Risk				
Baseline	6.4±3.5	_	_	_
Placebo	6.1±2.1	-5	4/40/(10)	NS
Fish oil/garlic (4 weeks)	5.2±2.0	-19	36/40/(90)	<.05

Abbreviations: SD= standard deviation, LDL = low-density lipoprotein, HDL = high-density lipoprotein, and NS = not significant.
*40 subjects enrolled as described under methods.
†Number of subjects showing a decrease in risk ratio.

DISCUSSION

These results demonstrate favorable alteration in lipid profile in subjects with mild hyperlipidemia during supplementation with fish oil and garlic capsules. The lipid fraction alterations are a reflection of the summation and synergism of the individual effects of garlic and fish oil in subjects who had an abnormal lipid profile and who continued their usual dietary habits during placebo and fish oil/garlic supplementation periods over a 4-week period in each regimen. An 11% reduction was noted in total cholesterol levels during fish oil/garlic supplementation. Earlier reports demonstrated 5% to 6% reduction of total cholesterol after 4 weeks of garlic supplementation alone. 12,17

Independently, garlic extract caused significant reduction of total cholesterol and cholesterol ester accumulation by smooth muscle cells from atherosclerotic plaque.30 Supplementation with fish oil alone31 resulted in a change that ranged from +5% increase in high-fat diets (40%) to -5% decrease in low fat diets (30%).

Triglyceride levels were consistently lowered by 34% in this study. Previous reports indicated no change and slight increases for similar periods of garlic supplementation.12,17 Studies with fish oil supplementation report 41% and 30% reductions in total triglycerides with high- and low-fat diets, respectively.32 The triglyceride-lowering effect of dietary fish oils on serum lipids frequently has been demonstrated33-37 in healthy volunteers38 and in those with abnormal lipid levels39, as well as in insulin-dependent diabetics40-41 and subjects with vascular disease.42

The mechanism by which garlic lowers serum lipids suggests that inhibition of hydroxymethyl glutaryl coenzyme A reductase43 and cholesterol biosynthesis44 play an important role. In contrast, the effects of fish oil and w-3 fatty acids are modulated by the inhibition of hepatic very-low-density lipoprotein (VLDL)-triglyceride synthesis45-49 and an increase in the fractional catabolic rate of VLDLs.37,46-49

The fish oil/garlic combination resulted in a significant reduction (10%) in LDL-cholesterol (LDL-C). Previous studies showed that w-3 fatty acids and fish oils may result in a small increase (5% to 8%) of LDL-C,31,37 including patients with insulin-dependent diabetes40,41 and vascular disease.42 Mechanisms by which w-3 fatty acids raise LDL-C include increased synthesis or removal,37 with more evidence supporting the former50 through increased triglyceride-poor smaller and denser VLDL particles that are more readily converted to LDL.51,52

In addition, these VLDL particles may compete more effectively with LDL for receptor-mediated removal.53 The concentration of LDL therefore might be expected to increase despite an overall reduction in triglycerides. In contrast, reports on subjects receiving garlic supplementation demonstrate a reduction as high as 9%12 and as low as 1%.54 The effects of garlic on LDL reduction may be mediated by its rich content of the antioxidants vitamin C, selenium, and organic germanium.55 Selenium56 and vitamin C57,58 recently have been shown to decrease LDL-C by 14% and 5.6%, respectively. The net effects of the combined effect of fish oil and garlic in this study was a significant reduction in LDL-C.

In the present study, there was no significant change in the average total HDL levels when all subjects were considered, although there was a trend toward an increase in a subgroup representing 35% of the subjects. Several studies demonstrated no effect of garlic supplementation alone on HDL.12,54,59 However, many studies with fish oil supplementation demonstrate a substantial increase in the HDL2 subfraction that may be reflected as a total HDL increase (5% to 7%), particularly in low-fat diets.31 The lack of significant total HDL increase in the present study is probably secondary to the absence of inherent garlic effects and the small effects of fish oil supplementation on this lipid subfraction.

CONCLUSION

The proposed benefits of dietary fish oil and garlic supplementation on cardiovascular disease largely is supported by the observed significant reduction in both the LDL/HDL and cholesterol/HDL risk ratios reported in the present study. These reductions are a result of the significant reduction of the LDL and cholesterol levels. In a small group of hypercholesterolemic men, similar reductions in risk factors recently were reported.59

From a nutritional and public health standpoint, these results suggest additive and synergistic beneficial alterations in the lipid profile that translate into significant reduction in the lipid subfraction risk ratios for cardiovascular diseases by fish oil and garlic combination. The results should be viewed as an extension of the other beneficial properties of these agents, including antioxidant activity and reduced platelet aggregability that are likely to contribute to their role in preventing coronary heart disease.

Literature Cited

1. Drevon CA. Sources, chemistry and biochemistry of dietary lipids. In: Drevon CA, Baksas I, Krokan HE, eds. Omega 3 Fatty Acids Metabolism and Biological Effects. Basel, Switzerland: Birxhauser Verlag; 1993:110-210.
2. Mansell P, Reckless JPD. Garlic. Effects on serum lipids, blood pressure, coagulation, platelet aggregation and vasodialation. BMJ. 1991;303:379-380.
3. Bang HO, Dyerberg J, Nielsen AB. Plasma Lipid and lipoprotein pattern in Greenlandic West-Coast Eskimos. Lancet. 1971;1:1143-1145.
4. Dyerberg J, Bang HO, Hjorne N. Fatty acid composition of the plasma lipids in Greenland Eskimos. Am J Clin Nutr. 1975;28:958-966.
5. Kromhout D, Bosschieter EB, Delezenne Coulander C. The inverse relation between fish consumption and 20 year mortality from coronary heart disease. N Engl J Med. 1985;312:1205-1209.
6. Bairati I, Roy L, Meyer F. Double-blind randomized, controlled trial of fish oil supplements in prevention of recurrence of stenosis after coronary angioplasty. Circulation. 1992;85:950-956.
7. Keli SO, Freskens EJM, Kromhout D. Is fish consumption inversely associated with stroke incidence? The Zuptkin study. Stroke. 1994;25:328-332.
8. Rustan AC, Nossen JO, Osmundsen H, Drevon CA. Eicosapentanoic acid inhibits cholesterol estrification in cultured rat hepatocytes. J Biol Chem. 1988;263:8126-8132.
9. Rustan AC, Nossen JO, Christiansen EC, Drevon CA. Eicosapentanoic acid reduces hepatic synthesis and secretion of triacylglycerol by decreasing the activity of acyl-coenzyme A:1,2 diacylglycerol acyltransferase. J Lipid Res. 1988;29:1417-1426.
10. Second International Garlic Symposium. Pharmacy, pharmacology and clinical application of allium sativum. Cardiology in Practice. 1991;(suppl):2-19.
11. Greenwood TW. Garlic therapy. Br J Clin Pract. 1990;44(suppl 69):1-2.
12. Jain AK, Vargas R, Gotzkowsky S, McMahon G. Can garlic reduce levels of serum lipids? A controlled clinical study. Am J Med. 1993;94:632-635.
13. Lau BHS, Adetumbim A, Sanchez A. Allium sativum and atherosclerosis: a review. Nutr Res. 1983;3:119-128.
14. Ernst E, Welhmayr TH, Matral A. Garlic and blood lipids. BMJ. 1985;291:139. Letter.
15. Kandziora I. Antihypertensive effectiveness and tolerance of garlic medication. Arztiche Forchung. 1988; 1`:1-8.
16. Kandziora I. The blood pressure lowering and lipid lowering effect of a garlic preparation in combination with a diuretic. Arziche Forchung. 1988;3:1-8.
17. Harenberg J, Giese C, Zimmermann R. Effect of dried garlic on blood coagulation, fibrinolysis, platelet aggregation and serum cholesterol levels in patients with hyperlipoproteinemia. Atherosclerosis. 1988;74:247-249.
18. Mader FH. Treatment of hyperlipidemia with garlic-powder tablets. Evidence from the German Association of General Practitioners' multicenteric placebo-controlled double blind study. Arneimittelforschung. 1990;40:1111-1116.
19. Grunwald I. Garlic and cardiovascular risk factors. Br J Clin Pharmacol. 1990;29:582-583. Letter.
20. Auer W, Eiber A, Hertkorn E, Hoehfeld E, Koehrle U, Lorenz A. Hypertension and hyperlipidemia: garlic helps in mild cases. Br J Clin ract. 1990;44(suppl 69):3-6.
21. Vorberg G, Schneider B. Therapy with garlic: results of a placebo-controlled double-boind study. Br J Clin Pract. 1990;44(suppl 69):7-11.
22. Brosche T, Platt D, Dorner H. The effect of a garlic preparation on the composition of plasma lipoproteins and erythrocyte membranes in geriatric subjects. Br J Clin Pract. 1990;44(suppl 69):12-19.
23. Zimmermann W, Zimmermann B. Reduction in elevated blood lipids in hospitalized patients by a standard garlic preparation. Br J Clin Pract. 1990;44(suppl 69):20-23.
24. Barrie SA, Wright JV, Pizzamo JE. Effects of garlic oil on platelet aggregation, serum lipids, and blood pressure in humans J. Orthomolecular Medicine. 1987;2:15-21.
25. Bordia A. Effect of garlic on blood lipids in patients with coronary heart disease. American Journal Clinical Nutrition. 1981;34:2100-2103.
26. Kiesewetter H, Jung F, Jung EM, Blume J, Mrowietz C, Birk E, Koscielny J, Wenzel E. Effects of garlic coated tablets in peripheral arterial occlusive disease. Clinical Investigator. 1993;71:383-386.
27. Kiesewetter H, Jung F, Pindur G, Jung EM, Mrowietz C, Wenzel E. Effect of garlic on thrombocyte aggregation, microcirculation, and other risk factors. Int J Clin Pharmacol Ther Toxicol. 1991;29:151-155.
28. Jung F, Jung EM, Mrowietz C, Kiesewetter H. Wenzell E. Influence of garlic powder on cutaneous microcirculation: a randomized, placebo-controlled, double-blind, cross over study in apparently healthy subjects. Br J Clin Pract. 1990;44(suppl 69):30-35.
29. Wolf S, Reim M. Effect of garlic on conjunctival vessels: a randomized, placebo-controlled, double-blind trial. Br J Clin Pract.

1990;44(suppl 69):36-39.
30. Orekhov AN, Tertov W, Igor A, Pivovarova S, Pivovarova EM. Direct anti-atherosclerosis-related effects of garlic. Ann Med. 1995;27:63-65.
31. Mori TA, Vandongen R, Beilin LJ, Burke V, Morris J, Ritchie J. Effects of varying dietary fat, fish, and fish oils on blood lipids in a randomized controlled trial in men at risk of heart disease. Am J Nutr. 1994;59:1060-1068.
32. Nordoy A, Hatcher LF, Ullmann D, Connor WE. Individual effects of dietary unsaturated fatty acids and fish oil on plasma lipids and lipoproteins in normal men. Am J Clin Nutr. 1993;57:634-639.
33. Kinsella JE. Seafoods and fish oils in human health and disease. In: Food Science and Technology. New York,NY: Marcel Dekker; 1987:23:1-37.
34. Budowski P. Omega 3 fatty acids in health and disease. In: Bourne GH, ed. Aspects of Human Nutrition-World Review of Nutrition and Dietetics. Basel, Switzerland: S Karger AG; 1988;57:214-274.
35. Goodnight SH. Mechanisms of the antithromobotic effects of fish oil. Baillieres Clin Haematol. 1990;3:601-623.
36. Herold PM, Kinsella JE. Fish oil consumption and decreased risk of cardiovascular disease: a comparison of animal and human feeding trials. Am J Clin Nutr. 1986;43:566-598.
37. Harris WS. Fish oils and plasma lipid and lipoprotein metabolism in humans: a critical review. J Lipid Res. 1989;30:785-807.
38. Mori TA, Vandongen R, Massarei JRL, Stanton KG, Dunbar D. Dietary fish oils increase serum lipids in insulindependent diabetics compared to healthy controls. Metabolism. 1989;38:404-409.
39. Phillipson BE, Rothrock DW, Connor WE, Harris WS, Illingworth DR Reduction of plasma lipids, lipoproteins and apoproteins by fish oils in patients with hypertriglyceridemia. N Eng J Med. 1985;312:1210-1216.
40. Mori TA, Vandongen R, Masarei JRL. Fish oil-induced changes in apolipoproteins in IDDM subjects. Diabetes Care. 1990;13:725-732.
41. Mori TA, Vandongen R, Masarei JRL, Rousse IL, Dunbar D. Comparison of diets supplemented with fish oil or olive oil on plasma lipoproteins in insulin dependent diabetics. Metabolism. 1991;40:241-246.
42. Mori TA, Vandongen R, Mahanian F, Douglas A. Plasma lipids, platelet and neutrophil function in patients with vascular disease following fish oil and olive oil supplementation. Metabolism. 1992;41:1059-1067.
43. Broshe T, Siegers CP, Platt O. The effects of garlic therapy on cholesterol biosynthesis and on plasma and membrane lipids. Medizinische Welt. 1991;42(suppl 7A):10-11.
44. Gebhardt R. Inhibition of cholesterol biosynthesis by a water soluble garlic extract in primary cultures of rat hepatocytes. Arzneimittel-Forschung/Prub Research. 1991;41:800-804.
45. Harris WS, Conner WE, Inkeles SB, Illingworth Dr. Omega-3 fatty acids prevent carbohydrate-induced hypertriglyceridemia. Metabolism. 1984;33:1016-1019.
46. Nestel PJ, Connor WE, Reardon MR, Connor S, Wong, Boston R. Suppression by diets rich in fish oil of very low density lipoprotein production in man. J Clin Invest. 1984;74:72-89.
47. Sanders TAB, Sullivan DR, Reeve J. Thompson GR. Triglyceride lowering effect of marine polyunsaturates in patients with hypertryglyceridemia. Arteriosclerosis. 1985;5:459-465.
48. Conner WE. Hypolipidemic effects of dietary omega-3 fatty acids in normal and hyperlipedemic humans: effectiveness and mechanisms. In: Simopoulos AR, Kifer RR, Martin RE, eds. Health Effects of Polyunsaturated Fatty Acids in Seafoods. Orlando, Fla: Academic Press; 1986:173-210.
49. Harris WS, Connor WE, Illingworth DR, Rothrock DW, Foster DM. Effects of fish oil on triglyceride kinetics in humans. J Lipid Res. 1990;31:1549-1558.
50. Huff MW, Telford DE. Dietary fish oil increase the conversion of VLDL apoB to LDL apoB. Arteriosclerosis. 1989;9:58-66.
51. Sullivan DR, Sanders TAB, Trayner IM, Thompson GR. Paradoxical elevation of LDL apoprotein B levels in hyper triglyceridemic patients and normal subjects ingesting fish oil. Atherosclerosis. 1986;61:129-134.
52. Packard CJ, Monro A, Lorimer AR, Gotto AM, Shepherd J. Metabolism of apopolipoprotein B in large, triglyceride rich very low density lipoproteins of normal and hypertriglyceridemic subjects. J Clin Invest. 1984;74:2178-2192.
53. Gianturco SH, Brown FB, Gotto AM, Bradley WA. Receptor medicated uptake of hypertriglyceridemic VLDL by normal human fibroblasts J Lipid Res. 1982;23:984-993.
54. Simmons LA, Blasubramaniam S, von Konigsmark M, Parfitt A, Simons J, Peters W. On the effects of garlic on plasma lipids and lipoproteins in mild hypercholesterolemia. Atherosclerosis. 1995;113:219-225.
55. Abdullah TH, Elkadi KA, Carter J. Garlic revisited: therapeutic for the major diseases of our times? J Natl Med Assoc. 1988;80:439-445.
56. Kauf E, Dawczynski H, Jahreis G, Janitzky E, Winnefeld K. Sodium selenite therapy and thyroid-hormone status in cystic fibrosis and congenital hypothyroidism. Biol Trace Elem Res. 1994;40:247-253.
57. Jacques PF, Sulsky SI, Perrone GA, Schaefer EJ. Ascorbic acid and plasms lipids. Epidemiology. 1994;5:19-26.
58. Bendich A, Langseth L. The health effects of vitamin C supplementation: a review. J Am Coll Nutr. 1995;14:124-136.
59. Adler Aj. Holub Bj. Effect of garlic and fish oil supplementation on serum lipid and lipoprotein concentrations in hypercholesterolemic men. J Clin Nutr. 1997;65:445-450.

---

mailto:webmaster@vivalife.com
Last Revised: 12/23/99 .