Summary of Research
Inflammation

Disease: Endpoints of Interest	First Author	Study Title and Complete Citation	Date	Abstract	Study Type
CVD: oxidation inflammation endothelial function markers	Upritchard JE	Effect of supplementation with tomato juice, vitamin E, and vitamin C on LDL oxidation and products of inf lammatory activity in type 2 diabetes. Upritchard JE, Sutherland WH, Mann JI. Diabetes Care. 2000 Jun;23(6):733-8.	2000	OBJECTIVE: To compare the effects of short-term dietary supplementation with tomato juice, vitamin E, and vitamin C on susceptibility of LDL to oxidation and circulating levels of C-reactive protein (C-RP) and cell adhesion molecules in patients with type 2 diabetes. RESEARCH DESIGN AND METHODS: There were 57 patients with well-controlled type 2 diabetes aged <75 years treated with placebo for 4 weeks and then randomized to receive tomato juice (500 ml/day), vitamin E (800 U/day), vitamin (500 mg/day), or continued placebo treatment for 4 weeks. Susceptibility of LDL to oxidation (lag time) and plasma concentrations of lycopene, vitamin E, vitamin C, C-RP, vascular cell adhesion molecule 1, and intercellular adhesion molecule 1 were measured at the beginning of the study, after the placebo phase, and at the end of the study. RESULTS: Plasma lycopene levels increased nearly 3-fold (P = 0.001), and the lag time in isolated LDL oxidation by copper ions increased by 42% (P = 0.001) in patients during supplementation with tomato juice. The magnitude of this increase in lag time was comparable with the corresponding increase during supplementation with vitamin E (54%). Plasma C-RP levels decreased significantly (-49% , P = 0.004) in patients who received vitamin E. Circulating levels of cell adhesion molecules and plasma glucose did not change significantly during the study. CONCLUSIONS: This study indicates that consumption of commercial tomato juice increases plasma lycopene levels and the intrinsic resistance of LDL to oxidation almost as effectively as supplementation with a high dose of vitamin E, which also decreases plasma levels of C-RP, a risk factor for myocardial infarction, in patients with diabetes. These findings may be relevant to strategies aimed at reducing risk of myocardial infarction in patients with diabetes.	RCT
CVD: inflammation	Watzl B	Supplementation of a low-carotenoid diet with tomato or carrot juice modulates	2003	BACKGROUND: Beta-carotene has been shown to enhance immune functions in humans. Whether vegetables rich in carotenoids, such as beta-carotene or lycopene, modulate immune functions in healthy humans is presently not known. The objective of this study was to investigate the effects of a low-carotenoid diet supplemented with either tomato (providing	RCT

		immune functions in healthy men. Watzl B, Bub A, Briviba K, Rechkemmer G. Ann Nutr Metab. 2003;47(6):255-61.		high amounts of lycopene) or carrot juice (providing high amounts of alpha- and beta-carotene) on immune functions in healthy men. METHOD: In a blinded, randomized, cross-over study, male subjects on a low-carotenoid diet consumed 330 ml/day of either tomato juice (37.0 mg/day lycopene) or carrot juice (27.1 mg/day beta-carotene and 13.1 mg/day alpha-carotene) for 2 weeks with a 2-week depletion period after juice intervention. Immune status was assessed by measuring lytic activity of natural killer (NK) cells, secretion of cytokines (IL-2, IL-4, TNFalpha), and proliferation by activated peripheral blood mononuclear cells. RESULTS: Juice consumption resulted in relatively fast responses in plasma carotenoid concentrations ($p < 0.0002$) which were not accompanied by concomitant changes in immune functions. For IL-2, NK cell cytotoxicity, and lymphocyte proliferation, maximum responses were observed during depletion periods. The highest production rate was measured only for TNFalpha at the end of the first intervention period. Juice intervention did not modulate the secretion of IL-4. CONCLUSIONS: Increased plasma carotenoid concentrations after vegetable juice consumption are accompanied by a time-delayed modulation of immune functions in healthy men consuming a low-carotenoid diet.	
CVD: oxidation inflammation	Riso P	Effect of a tomato-based drink on markers of inflammation, immunomodulation, and oxidative stress. Riso P, Visioli F, Grande S, Guarnieri S, Gardana C, Simonetti P, Porrini M. J Agric Food Chem. 2006 Apr 5;54(7):2563-6.	2006	Regular consumption of tomato and its products is being consistently associated with lower risk of several types of cancer and, to a lesser extent, coronary heart disease. Among the many tomato components credited with healthful properties, carotenoids and particularly lycopene are being actively investigated. Given the recognized role of immune/inflammatory processes in atherogenesis, the effects of a tomato-based drink (Lyc-o-Mato), which was previously shown to afford DNA protection from oxidative stress, on the modulation of immune and inflammatory markers (by enzyme immunoessay), on basal lymphocyte DNA damage (by comet assay), and on F2-isoprostane excretion (by LC-MS/MS), were investigated in 26 healthy young volunteers. In a placebo-controlled, double-blind, crossover study, Lyc-o-Mato (5.7 mg of lycopene, 3.7 mg of phytoene, 2.7 mg of phytofluene, 1 mg of beta-carotene, and 1.8 mg of alpha-tocopherol) or a placebo drink (same taste and flavor, but devoid of active compounds) were given for 26 days, separated by a wash-out period. During the study subjects maintained their habitual, hence unrestricted, diet. TNF-alpha production by whole blood was 34.4% lower after 26 days of drink consumption, whereas the other parameters were not significantly modified by the treatment. In turn, modest effects of the regular intake of a tomato drink, providing small amounts of carotenoids, were found on the production of inflammatory mediators, such as TNF-alpha, in young healthy volunteers. Future intervention trials in subjects with low carotenoid	RCT

				status and/or compromised immune system will resolve the issue of whether carotenoids modulate immune parameters in humans.	
CVD: oxidation inflammation	Sanchez-Moreno C	Mediterranean vegetable soup consumption increases plasma vitamin C and decreases F2-isoprostanes, prostaglandin E2 and monocyte chemot actic protein-1 in healthy humans. Sanchez-Moreno C, Cano MP, de Ancos B, Plaza L, Olmedilla B, Granado F, Martin A. J Nutr Biochem. 2006 Mar;17(3):183-9. Epub 2005 Aug 15.	2006	Consumption of fruits and vegetables is associated with a reduced risk of death from all causes including heart disease and stroke. In this work, the bioavailability of vitamin C from a Mediterranean vegetable soup (gazpacho) constituted mainly of tomato, pepper and cucumber, and its influence on plasma vitamin C, 8-epi-prostaglandin F(2alpha) (8-epi-PGF2alpha), prostaglandin E2 (PGE2), monocyte chemotactic protein-1 (MCP-1), and the cytokines/tumor necrosis factor-alpha (TNF-alpha), interleukin-1beta (IL-1beta), and IL-6 concentrations in a healthy human population were assessed. Six men and six women consumed 500 ml of commercial gazpacho per day for 14 days, corresponding to an intake of 78 mg of ascorbic acid per day. There were no differences (P = .22) in baseline plasma vitamin C concentrations between the men and women. The maximum increase (P < .05) in plasma vitamin C occurred 4 h postdose in both men and women. Vitamin C concentrations were significantly higher (P < .03) on Days 7 and 14 of the intervention. Baseline concentrations of uric acid and 8-epi-PGF2alpha were significantly higher (P < or = .032) in men than in women. Baseline concentrations of 8-epi-PGF2alpha decreased significantly (P < or = .05) by Day 14 of the intervention. A significant inverse correlation was observed between vitamin C and 8-epi-PGF2alpha (r = -.415, P = .049). Baseline concentrations of PGF2 and MCP-1 were significantly higher (P< or = .025) in men than in women but decreased significantly (P< or = .05) by Day 14 of the intervention. No effect on TNF-alpha, IL-1beta and IL-6 was observed at Day 14 of the intervention. Drinking gazpacho (500 ml/day) significantly increases plasma concentrations of vitamin C and significantly decreases 8-epi-PGF2alpha, PGE2 and MCP-1 concentrations in healthy humans.	Interv
CVD: inflammation endothelial function markers	Blum A	Tomato-rich (Mediterranean) diet does not modify inflammatory markers. Blum A, Monir M, Khazim K, Peleg A, Blum N. Clin Invest Med. 2007;30(2):E70-4.	2007	BACKGROUND: The Mediterranean diet is rich in lycopene and has been reported to reduce cardiovascular events. The mechanism of prevention of cardiovascular events has not been clearly established. Our aim was to study the effects of a tomatoes-rich diet on markers of vascular inflammation. METHODS: Plasma concentrations of E-selectin, intercellular adhesion molecule 1 (ICAM-1), and high sensitivity C-reactive protein (hs-CRP) were determined by ELISA in 103 apparently healthy volunteers. Volunteers were randomly assigned to two groups: 50 participants ate 300 g tomatoes daily for 1 month, and 53 participants ate their usual diet with tomatoes prohibited during that period. Markers of inflammation were measured before enrollment and 1 month after their assigned diet. RESULTS: The two diet groups had similar baseline clinical characteristics and similar baseline levels of inflammatory markers. After 30 days of assigned diet concentrations of hs-CRP, E-selectin and ICAM-1 were unchanged compared with baseline in the tomato-rich diet.	RCT

				However, ICAM-1 concentration was increased in the regular diet group from 247.55+/-55 ng/ml to 264.71+/-60.42 ng/ml (P=0.01). CONCLUSIONS: The mechanisms of benefit of the tomato-rich diet are not directly related to inhibition of markers of vascular inflammation	
CVD: oxidation inflammation endothelial function markers	Denniss SG	Effect of short-term lycopene supplementation and postprandial dyslipidemia on plasma antioxidants and biomarkers of endothelial health in young, healthy individuals. Denniss SG, Haffner TD, Kroetsch JT, Davidson SR, Rush JW, Hughson RL. Vasc Health Risk Manag. 2008;4(1):213-22.	2008	The objective of this study was to test the hypothesis that the effect of a high-fat meal (HFm) on plasma lipid-soluble antioxidants and biomarkers of vascular oxidative stress and inflammation would be attenuated by short-term lycopene supplementation in young healthy subjects. Following restriction of lycopene-containing foods for 1-wk (LYr), blood was collected in a fasting state and 3 h after a HFm and a low-fat meal (LFm) in N = 18 men aged 23 +/- 2 years, and after a HFm only in N = 9 women aged 23 +/- 1 years. Blood was also sampled pre- and post-meals following 1-wk of 80 mg/day lycopene supplementation (LYs) under continued dietary LYr. In the fasting state, LYs compared with LYr not only evoked a >2-fold increase in plasma lycopene but also increased plasma beta-carotene and alpha-tocopherol ($p < 0.01$), though LYs did not affect plasma nitrate/nitrite (biomarker of nitric oxide), malondialdehyde (biomarker of lipid oxidative stress), vascular- and intercellular-adhesion molecules or C-reactive protein (biomarkers of inflammation). Contrary to the hypothesis, the HFm-induced dyslipidemic state did not affect plasma malondialdehyde, C-reactive protein, or adhesion molecules in either LYr or LYs. Both the HFm and LFm were associated with decreases in the nitric oxide metabolites nitrate/nitrite and lipid-soluble antioxidants ($p < 0.05$). The data revealed that 1-wk of LYs increased plasma lycopene, beta-carotene, and alpha-tocopherol yet despite these marked changes to the plasma lipid-soluble antioxidant pool, biomarkers of vascular oxidative stress and inflammation were unaffected in the fasted state as well as during dyslipidemia induced by a HFm in young healthy subjects.	Interv
CVD: oxidation lipids inflammation	Jacob K	Influence of lycopene and vitamin C from tomato juice on biomarkers of oxidative stress and inflammation. Jacob K, Periago MJ, Bahm V, Berruezo GR. Br J Nutr. 2008 Jan;99(1):137-46. Epub 2007 Jul 19.	2008	A human study was carried out to investigate whether tomato juice, rich in natural lycopene and fortified with vitamin C, is able to reduce several biomarkers of oxidative stress and inflammation and whether the effect can be attributed to lycopene, vitamin C or any other micronutrient. Following a 2-week depletion phase, volunteers were assigned randomly to ingest either tomato juice with (LC) or without (L) vitamin C fortification for 2 weeks (daily dose 20.6 mg lycopene and 45.5/435 mg vitamin C). Plasma and urine were analysed for carotenoids and vitamin C, lipid status, antioxidant capacity, thiobarbituric acid reactive substances (TBARS) and 8-epi-PGF2alpha, protein carbonyls, cytokines IL-1beta and TNFalpha and C-reactive protein (CRP). The consumption of tomato juice led to a reduction in total cholesterol levels (L: 157.6 v. 153.2 mg/dl, P = 0.008; LC: 153.4 v. 147.4 mg/dl, P = 0.002) and that of CRP (L: 315.6 v. 262.3 microg/l, P = 0.017; LC: 319.2 v. 247.1 microg/l, P = 0.001) in both groups. The vitamin C-fortified juice slightly raised the antioxidant capacity in urine and decreased TBARS in plasma and urine. All other markers were affected to a lesser extent or remained unchanged. Cholesterol reduction was correlated with lycopene uptake (P = 0.003), whereas	RCT

				the other effects could not be related with particular micronutrients. Any beneficial effects of tomato consumption for human health cannot be attributed only to lycopene and, as the additional supplementation with ascorbic acid indicates, a variety of antioxidants might be needed to optimize protection against chronic diseases.	
CVD: oxidation inflammation	Markovits N	The effect of tomato-derived lycopene on low carotenoids and enhanced systemic inflammation and oxidation in severe obesity. Markovits N, Ben Amotz A, Levy Y. Isr Med Assoc J. 2009 Oct;11(10):598-601.	2009	BACKGROUND: Fat tissue mediates the production of inflammatory cytokines and oxidative products, which are key steps in the development of type 2 diabetes and atherosclerosis. Antioxidant-rich diets protect against chronic diseases. Antioxidants may interfere with pro-inflammatory signals. OBJECTIVES: To investigate the effect of the potent tomato-derived antioxidant carotenoid, lycopene, on plasma antioxidants (carotenoids and vitamin E), inflammatory markers (C-reactive protein, interleukin-6, tumor necrosis factor-alpha) and oxidation products (conjugated dienes). METHODS: Eight obese patients (body mass index 37.5 +/- 2.5 kg/m2) were compared with a control group of eight lean, age and gender-matched subjects (BMI 21.6 +/- 0.6 kg/m2), before and after 4 weeks of lycopene supplementation (tomato-derived Lyc-O-Mato) (30 mg daily). RESULTS: Plasma carotenoids were significantly reduced in the obese compared to control subjects (0.54 +/- 0.06 vs. 0.87 +/- 0.08 microg/ml, P < 0.01). CRP levels were significantly higher (6.5 vs. 1.1 mg/L, P = 0.04) in obese vs. controls, as were IL-6 and conjugated dienes (3.6 and 7.9-fold, respectively). CRP, IL-6 and conjugated dienes correlated with BMI, while IL-6 and conjugated dienes correlated inversely with carotenoids (P < 0.05). Following lycopene treatment, a significant elevation of plasma carotenoids (1.79 vs. 0.54 microg/ml) and specifically lycopene (1.15 vs 0.23 microg/ml) (P < 0.001) occurred in the treatment vs. the placebo group, respectively. Markers of inflammation and oxidation products were not altered by lycopene. CONCLUSIONS: Obese patients showed abnormally higher markers of inflammation and oxidation products and lower plasma carotenoids. The lack of reduction of pro-inflammatory markers could be attributed to the short period of the study and the small number of participants. More studies are needed on the protective qualities of natural antioxidant-rich diets against obesity-related co-morbidities.	Interv
CVD: oxidation lipids inflammation	Burton-Freeman B	Protective activity of processed tomato products on postprandial oxidation and inflammation: a clinical	2012	SCOPE: This study was designed to evaluate the ability of tomato rich in lycopene to modify postprandial oxidative stress, inflammation, and endothelial function in healthy weight individuals.	RCT

endothelial function		trial in healthy weight men and women. Burton-Freeman B, Talbot J, Park E, Krishnankutty S, Edirisinghe I. Mol Nutr Food Res. 2012 Apr;56(4):622-31. doi: 10.1002/mnfr.201100649. Epub 2012 Feb 14.		METHODS AND RESULTS: Twelve women and 13 men (mean age = 27 ± 8 years; mean body mass index= 22 ± 2) consumed high-fat meals known to induce postprandial oxidative stress on two separate occasions containing either processed tomato product or non-tomato alternative. Blood samples were collected at 0, 30, 60, 90, 120 min, then hourly until 360 min. Flow-mediated dilation (FMD) was performed at 0 and 210 min. Endpoints included changes in glucose, insulin, lipids, oxidized low-density lipoprotein (OxLDL), inflammatory cytokines, and FMD. Both meals induced increases in plasma glucose, insulin, and lipid concentrations ($p < 0.05$). A trend for higher triglycerides at >240 min was observed after the tomato meal ($p = 0.006$). Tomato significantly attenuated high-fat meal-induced LDL oxidation ($p < 0.05$) and rise in interleukin-6 ($p < 0.0001$), a proinflammatory cytokine and inflammation marker. CONCLUSION: The data indicate that consuming tomato products with a meal attenuates postprandial lipemia-induced oxidative stress and associated inflammatory response. The relevance of OxLDL and inflammation to vascular injury suggests apotentially important protective role of tomato in reducing cardiovascular disease risk. ClinicalTrials.gov Registration number - NCT00966550.	
CVD: lipids inflammation BP insulin resistance endothelial function	Thies F	Effect of a tomato-rich diet on markers of cardiovascular disease risk in moderately overweight, disease-free, middle-aged adults: a randomized controlled trial. Thies F, Masson LF, Rudd A, Vaughan N, Tsang C, Brittenden J, Simpson WG, Duthie S, Horgan GW, Duthie G. Am J Clin Nutr. 2012 May;95(5):1013-22. doi: 10.3945/ajcn.111.026286. Epub 2012 Apr 4.	2012	BACKGROUND: Cardiovascular disease (CVD) is a major cause of mortality in the United Kingdom. Epidemiologic studies suggest that consumption of tomato-based foods may lower CVD risk. Such potential benefits have been ascribed in part to high concentrations of lycopene in the tomatoes. However, these findings have not yet been validated by comprehensive intervention trials. OBJECTIVE: The aim of this study was to conduct a single-blind, randomized controlled intervention trial with healthy middle-aged volunteers to assess whether the consumption of tomato-based foods affects recognized biomarkers of CVD risk. DESIGN: After a 4-wk run-in period with a low-tomato diet, 225 volunteers (94 men and 131 women) aged 40-65 y were randomly assigned into 1 of 3 dietary intervention groups and asked to consume a control diet (low in tomato-based foods), a high-tomato-based diet, or a control diet supplemented with lycopene capsules (10 mg/d) for 12 wk. Blood samples were collected at baseline, at 6 wk, and after the intervention and were analyzed for carotenoid and lipid profiles and inflammatory markers. blood pressure, weight, and arterial stiffness were also measured. Dietary intake was also determined during the intervention. RESULTS: None of the systemic markers (inflammatory markers, markers of insulin resistance and sensitivity) changed significantly after the dietary intervention. Moreover, lipid concentrations and arterial stiffness were also unaffected by the interventions. CONCLUSION: These data indicate that a relatively high daily consumption of tomato-based products (equivalent to 32-50 mg lycopene/d) or lycopene supplements (10 mg/d) is	RCT

				ineffective at reducing conventional CVD risk markers in moderately overweight, healthy, middle-aged individuals. This trial was registered at isrctn.org as ISRCTN34203810	
CVD: oxidation lipids inflammation	Abete I	A regular lycopene enriched tomato sauce consumption influences antioxidant status of healthy young-subjects: A crossover study Abete I, Perez-Cornago A, Navas-Carretero S, Bondia-Pons I, Zulet MA, Martinez, JA Journal of Functional Foods Volume 5, Issue 1, January 2013, Pages 28–35	2013	Tomato and tomato products are known as potential factors to decrease oxidative stress biomarkers. Therefore, the objective was to evaluate the effects of consumption of two tomato sauces with different concentrations of lycopene on oxidative stress markers. Thirty healthy subjects (Men/women: 9/21; Aged 39 ± 6 years old; BMI: 24.5 ± 3.3 kg/m2) were recruited to participate in a double-blind crossover study. Participants had to consume 160 g/day of tomato sauce, while maintaining their usual dietary and physical activity habits. The regular consumption of the high-lycopene tomato sauce induced a significant reduction in the oxidized-LDL cholesterol levels (−9.27 ± 16.8% ; $p < 0.05$). Moreover, total plasma antioxidant capacity tended to increase with the high-lycopene tomato sauce, while it decreased slightly with commercial tomato sauce consumption (2.69 ± 13.4 vs −0.05 ± 0.4; $p = 0.058$). Lipid, glucose profile and C-reactive protein concentrations were stable during both intervention periods, as well as anthropometric and body composition variables. Thus, the daily consumption of 160 g of a high-lycopene tomato sauce improved oxidized-LDL cholesterol levels, evidencing the putative role of lycopene in combination with other bioactive compounds in the prevention of oxidative stress related diseases	RCT
CVD: oxidation inflammation	DiSilvestro RA	Lycopene Concentrate Supplementation Decreases Plasma Values for C-Reactive Protein and oxidized LDL DiSilvestro RA, Joseph E, DiSilvestro D. The FASEB Journal. 2013;27:638.13	2013	Various lines of indirect evidence suggest that lycopene can exert anti-inflammatory effects relevant to problems such as cardiovascular disease (CVD). However, a beneficial influence for lycopene supplementation on measures relevant to inflammation remain largely lacking. In the present study, a lycopene rich extract from tomato (20 mg lycopene/day in Lyc-O- Mato® tomato lycopene complex), or placebo, was given to healthy middle aged men for 6 weeks (N = 10 per group). Subjects did not have to follow a low lycopene diet, but a preliminary screening eliminated people with a history of frequent tomato product intake. In the lycopene group, plasma c-reactive protein concentrations, which rise with CVD-relevant inflammation, showed a mean decrease of almost 30% ($p < 0.05$, 2-tailed paired t-test). Placebo gave no statistically significant effect. Lycopene also produced a mean decrease of 5.1% in plasma oxidized LDL values, an atherosclerosis-related measure that can be increased by inflammation ($p < 0.05$, 2-tailed paired t-test). Although this percent decrease was not tremendously large, longer intervention periods and/or combination with other natural products may heighten the effect. Again, placebo was ineffective. Neither of the lycopene effects was boosted by adding supplementation with zinc arginate (15 mg zinc/day) + selenium (200 µg selenium/day) in another group of subjects. These mineral supplements did improve zinc and selenium functional status based on two measures for each mineral. In summary, in a small study, supplementation with a tomato extract-lycopene by itself produced changes in two cardiovascular disease-relevant measures related to inflammation	RCT

CVD: inflammation	Ghavipour M	Tomato juice consumption reduces systemic inflammation in overweight and obese females. Ghavipour M, Saedisomeolia A, Djalali M, Sotoudeh G, Eshraghyan MR, Moghadam AM, Wood LG. Br J Nutr. 2013 Jun;109(11):2031-5. doi: 10.1017/S0007114512004278. Epub 2012 Oct 15.	2013	Tomatoes are the richest source of lycopene, a potent antioxidant. Tomato products improve antioxidant defences and reduce the risk of inflammatory diseases, at least partly, due to the presence of lycopene. Lycopene, as an anti-inflammatory agent, prevents the production of inflammatory cytokines. Obesity is a chronic inflammatory condition in which the increased level of body fat leads to an increase in circulating inflammatory mediators. We hypothesised that the consumption of a lycopene-rich food would reduce inflammation in people who are overweight or obese. A total of 106 overweight or obese female students of the Tehran University of Medical Sciences were enrolled and randomly allocated to an intervention group (n 53) or a control group (n 53) consuming 330 ml/d of tomato juice or water, respectively, for 20 d. At baseline and day 20, serum concentrations of IL-6, IL-8, high-sensitivity C-reactive protein and TNF-a were analysed by ELISA and compared between the groups. Serum concentrations of IL-8 and TNF-a decreased significantly in the intervention group compared with the control group and with baseline. Subgroup analysis indicated that this effect was confined to subjects who were overweight. Among obese subjects, serum IL-6 concentration was decreased in the intervention group compared with the control group, with no differences in IL-8 and TNF-a observed. Tomato juice reduces inflammation in overweight and obese females. Thus, increasing tomato intake may provide a useful approach for reducing the risk of inflammatory diseases such as CVD and diabetes, which are associated with obesity.	RCT
CVD: oxidation lipids inflammation	McEneny J	Lycopene intervention reduces inflammation and improves HDL functionality in moderately overweight middle-aged individuals. McEneny J, Wade L, Young IS, Masson L, Duthie G, McGinty A, McMaster C, Thies F. J Nutr Biochem. 2013 Jan;24(1):163-8. doi: 10.1016/j.jnutbio.2012.03.015. Epub 2012 Jul 21.	2013	The management of overweight subjects by interventions aimed at reducing inflammation is highly desirable. To date, observational studies have identified a link between increased dietary antioxidant intake and reduced cardiovascular morbidity. However, direct trial evidence regarding the ability of antioxidants to influence inflammation is lacking. Therefore, this study examined lycopene's ability to lower systemic and high-density lipoprotein (HDL)-associated inflammation in moderately overweight middle-aged subjects. Serum was collected before and after a 12-week intervention from 54 moderately overweight, middle-aged individuals. Subjects were randomised to one of three groups: control diet (<10 mg lycopene/week), lycopene-rich diet (224-350 mg lycopene/week) and lycopene supplement (70 mg lycopene/week). HDL was subfractionated into HDL(2&3) by rapid ultracentrifugation. Compliance was monitored by assessing lycopene concentration in serum and HDL(2&3). Systemic and HDL-associated inflammation was assessed by measuring serum amyloid A (SAA) levels. HDL functionality was determined by monitoring the activities of paraoxonase-1 (PON-1), cholesteryl ester transfer protein (CETP) and lecithin cholesterol acyltransferase (LCAT). Lycopene increased in serum and HDL(2&3) following both lycopene interventions (P<.001, for all), while SAA decreased in serum following the lycopene supplement and in HDL(3) following both lycopene interventions (P<.05 for all). PON-1 activity increased in serum and HDL(2&3) in both lycopene groups (P<.05, for all). Furthermore, the activity of CETP decreased in serum following the lycopene supplement, while the activity of LCAT increased in serum and HDL(3) following both lycopene interventions (P<.05 for all). These results demonstrate that in moderately overweight, middle-aged subjects, increasing lycopene intake leads to changes to	RCT

				HDL(2&3), which we suggest enhanced their antiatherogenic properties. Overall, these results show the heart-protective properties of increased lycopene intake.	