

## Summary of Research Blood Pressure 2014

Disease: Endpoints of Interest	First Author	Study Title and Complete Citation	Date	Abstract	Study Type
CVD: BP oxidation	John JH	<p>Effects of fruit and vegetable consumption on plasma antioxidant concentrations and blood pressure: a randomised controlled trial.</p> <p>John JH, Ziebland S, Yudkin P, Roe LS, Neil HA; OxfordFruit and Vegetable Study Group.</p> <p>Lancet. 2002 Jun 8;359(9322):1969-74.</p>	2002	<p><b>BACKGROUND:</b> High dietary intakes of fruit and vegetables are associated with reduced risks of cancer and cardiovascular disease. Short-term intensive dietary interventions in selected populations increase fruit and vegetable intake, raise plasma antioxidant concentrations, and lower blood pressure, but long-term effects of interventions in the general population are not certain. We assessed the effect of an intervention to increase fruit and vegetable consumption on plasma concentrations of antioxidant vitamins, daily fruit and vegetable intake, and blood pressure.</p> <p><b>METHODS:</b> We undertook a 6-month, randomised, controlled trial of a brief negotiation method to encourage an increase in consumption of fruit and vegetables to at least five daily portions. We included 690 healthy participants aged 25-64 years recruited from a primary-care health centre.</p> <p><b>FINDINGS:</b> Plasma concentrations of alpha-carotene, beta-carotene, lutein, beta-cryptoxanthin, and ascorbic acid increased by more in the intervention group than in controls (significance of between-group differences ranged from p=0.032 to 0.0002). Groups did not differ for changes in lycopene, retinol, alpha-tocopherol, gamma-tocopherol, or total cholesterol concentrations. Self-reported fruit and vegetable intake increased by a mean 1.4 (SD 1.7) portions in the intervention group and by 0.1 (1.3) portion in the control group (between-group difference=1.4, 95% CI 1.2-1.6; p&lt;0.0001). Systolic blood pressure fell more in the intervention group than in controls (difference=4.0 mm Hg, 2.0-6.0; p&lt;0.0001), as did diastolic blood pressure (1.5 mm Hg, 0.2-2.7; p=0.02).</p> <p><b>INTERPRETATION:</b> The effects of the intervention on fruit and vegetable consumption, plasma antioxidants, and blood pressure would be expected to reduce cardiovascular disease in the general population. Comment in: Lancet. 2002 Nov 30;360(9347):1785-6; author reply 1786. Lancet. 2002 Nov 30;360(9347):1786.</p>	RCT

CVD: BP oxidation lipids	Engelhard YN	<p>Natural antioxidants from tomato extract reduce blood pressure in patients with grade-1 hypertension: a double-blind, placebo-controlled pilot study.</p> <p>Engelhard YN, Gazer B, Paran E.</p> <p>Am Heart J. 2006 Jan;151(1):100.</p>	2006	<p><b>BACKGROUND:</b> Treatment of hypertension (HT) can reduce the risk for cardiovascular diseases. Tomato extract contains carotenoids such as lycopene, beta carotene, and vitamin E, which are known as effective antioxidants, to inactivate free radicals, and to slow the progression of atherosclerosis. The purpose of our study was to evaluate the effect of tomato extract on systolic and diastolic blood pressure in grade-1 HT, on serum lipoproteins, plasma homocysteine, and oxidative stress markers.</p> <p><b>METHODS:</b> This study is a single-blind, placebo-controlled trial. Thirty-one subject with grade-1 HT, without concomitant diseases, who required no antihypertensive or lipid-lowering drug therapy, who were recruited from primary care clinic, completed the trial. Subjects entered a 4-week placebo period, then an 8-week treatment period with tomato extract, 250 mg Lyc-O-Mato, and a 4-week control period with placebo.</p> <p><b>RESULTS:</b> Systolic blood pressure decreased from 144 (SE +/- 1.1) to 134 mm Hg (SE +/- 2, P &lt; .001), and diastolic blood pressure decreased from 87.4 (SE +/- 1.2) to 83.4 mm Hg (SE +/- 1.2, P &lt; .05). No changes in blood pressure were demonstrated during placebo periods. Thiobarbituric acid-reactive substances, a lipid peroxidation products marker, decreased from 4.58 (SE +/- 0.27) to 3.81 nmol/mg (SE +/- 0.32, P &lt; .05). No significant changes were found in lipid parameters.</p> <p><b>CONCLUSIONS:</b> A short-term treatment with antioxidant-rich tomato extract can reduce blood pressure in patients with grade-1 HT, naive to drug therapy. The continuous effect of this treatment and the long-term beneficial effect on cardiovascular risk factors still need to be demonstrated.</p>	RCT
CVD: BP	Paran E	<p>The effects of natural antioxidants from tomato extract in treated but uncontrolled hypertensive patients.</p> <p>Paran E, Novack V, Engelhard YN, Hazan-Halevy I.</p> <p>Cardiovasc Drugs Ther. 2009 Apr;23(2):145-51. Epub 2008 Dec 4</p>	2009	<p><b>PURPOSE:</b> To evaluate the effect of adding tomato extract to the treatment regime of moderate hypertensives with uncontrolled blood pressure (BP) levels.</p> <p><b>METHODS:</b> Fifty four subjects with moderate HT treated with one or two antihypertensive drugs were recruited and 50 entered two double blind cross-over treatment periods of 6 weeks each, with standardized tomato extract or identical placebo. Plasma concentrations of lycopene, nitrite and nitrate were measured and correlated with BP changes.</p> <p><b>RESULTS:</b> There was a significant reduction of systolic BP after 6 weeks of tomato extract supplementation, from 145.8 +/- 8.7 to 132.2 +/- 8.6 mmHg (p &lt; 0.001) and 140.4 +/- 13.3 to 128.7 +/- 10.4 mmHg (p &lt; 0.001) in the two groups accordingly. Similarly, there was a decline in diastolic BP from 82.1 +/- 7.2 to 77.9 +/- 6.8 mmHg (p = 0.001) and from 80.1 +/- 7.9 to 74.2 +/- 8.5 mmHg (p = 0.001). There was no</p>	RCT

				<p>significant change in systolic and diastolic BP during the placebo period. Serum lycopene level increased from 0.11 +/- 0.09 at baseline, to 0.30 +/- 0.13 micromol/L after tomato extract therapy (<math>p &lt; 0.001</math>). There was a significant correlation between systolic BP and lycopene levels (<math>r = -0.49</math>, <math>p &lt; 0.001</math>).</p> <p>CONCLUSIONS: Tomato extract when added to patients treated with low doses of ACE inhibition, calcium channel blockers or their combination with low dose diuretics, had a clinically significant effect-reduction of BP by more than 10 mmHg systolic and more than 5 mmHg diastolic pressure. No side-effects to treatment were recorded and the compliance with treatment was high. The significant correlation between systolic blood pressure values and level of lycopene suggest the possibility of cause-effect relationships.</p>	
CVD: BP	Ried K	<p>Dark chocolate or tomato extract for prehypertension: a randomised controlled trial.</p> <p>Ried K, Frank OR, Stocks NP.</p> <p>BMC Complement Altern Med. 2009 Jul 8;9:22</p>	2009	<p>BACKGROUND: Flavanol-rich chocolate and lycopene-rich tomato extract have attracted interest as potential alternative treatment options for hypertension, a known risk factor for cardiovascular morbidity and mortality. Treatment of prehypertension (SBP 120-139/DBP 80-89 mmHg) may forestall progression to hypertension. However, there has been only limited research into non-pharmacological treatment options for prehypertension. We investigated the effect of dark chocolate or tomato extract on blood pressure, and their acceptability as an ongoing treatment option in a prehypertensive population.</p> <p>METHODS: Our trial consisted of two phases: a randomised controlled three-group-parallel trial over 12 weeks (phase 1) followed by a crossover of the two active treatment arms over an additional 12-week period (phase 2). Group 1 received a 50 g daily dose of dark chocolate with 70% cocoa containing 750 mg polyphenols, group 2 were allocated one tomato extract capsule containing 15 mg lycopene per day, and group 3 received one placebo capsule daily over 8 weeks followed by a 4-week washout period. In phase 2 the active treatment groups were crossed over to receive the alternative treatment. Median blood pressure, weight, and abdominal circumference were measured 4-weekly, and other characteristics including physical activity, general health, energy, mood, and acceptability of treatment were assessed by questionnaire at 0, 8 and 20 weeks. We analysed changes over time using a linear mixed model, and one time point differences using Kruskal-Wallis, Fisher's-Exact, or t-tests.</p> <p>RESULTS: Thirty-six prehypertensive healthy adult volunteers completed the 6-month trial. blood pressure changes over time within groups and between groups were not significant and independent of treatment. Weight and other characteristics did not change significantly during the trial. However, a marked difference in acceptability between the two treatment forms (chocolate or capsule) was revealed (<math>p &lt;</math></p>	RCT

				<p>0.0001). Half of the participants allocated to the chocolate treatment found it hard to eat 50 g of dark chocolate every day and 20% considered it an unacceptable long-term treatment option, whereas all participants found it easy and acceptable to take a capsule each day for blood pressure.</p> <p>CONCLUSION: Our study did not find a blood pressure lowering effect of dark chocolate or tomato extract in a prehypertensive population. Practicability of chocolate as a long-term treatment option may be limited.</p>	
CVD: BP oxidation lipids endothelial function	Kim JY	<p>Effects of lycopene supplementation on oxidative stress and markers of endothelial function in healthy men.</p> <p>Kim JY, Paik JK, Kim OY, Park HW, Lee JH, Jang Y, Lee JH.</p> <p>Atherosclerosis. 2011 Mar;215(1):189-95. Epub 2010Dec 9.</p>	2011	<p>OBJECTIVE: The objective was to determine the effects of lycopene supplementation on endothelial function assessed by reactive hyperemia peripheral arterial tonometry (RH-PAT) and oxidative stress.</p> <p>METHODS: Healthy men (n=126) were randomized to receive placebo (n=38), 6 mg (n=41), or 15 mg (n=37) lycopene daily for 8-week.</p> <p>RESULTS: Serum lycopene increased in a dose-dependent manner after 8-week supplementation (P&lt;0.001). The 15 mg/day group had greater increase in plasma SOD activity (P=0.014) and reduction in lymphocyte DNA comet tail length (P=0.042) than the placebo group. Intragroup comparison revealed a 23% increase in RH-PAT index from baseline (1.45±0.09 vs.1.79±0.12; P=0.032) in the 15 mg/day group after 8-week. hs-CRP, systolic blood pressure, sICAM-1 and sVCAM-1 significantly decreased, and β-carotene and LDL-particle size significantly increased only in the 15 mg/day group. Interestingly, the beneficial effect of lycopene supplementation on endothelial function (i.e., RH-PAT and sVCAM-1) were remarkable in subjects with relatively impaired endothelial cell function at initial level. Changes in RH-PAT index correlated with SOD activity (r=0.234, P=0.017) especially in the 15 mg lycopene/day group (r=0.485, P=0.003), lymphocyte DNA comet tail moment(r=-0.318, P=0.001), and hs-CRP (r=-0.238, P=0.011). In addition, changes in lycopene correlated with hs-CRP (r=-0.230, P=0.016) and SOD activity (r=0.205, P=0.037).</p> <p>CONCLUSION: An increase in serum lycopene after supplementation can reduce oxidative stress which may play a role in endothelial function</p>	RCT
CVD: BP lipids	Shidfar F	<p>The effects of tomato consumption on serum glucose, apolipoprotein B, apolipoprotein A-I, homocysteine and blood pressure in type 2 diabetic patients.</p>	2011	<p>Tomatoes are a rich source of lycopene, β-carotene, potassium, vitamin C, flavonoids, folate and vitamin E that may provide protection against the development of type 2 diabetic patients, so the present study was undertaken to evaluate the effects of tomato intake on serum glucose, homocysteine, apolipoprotein (apo) B, apoA-I and blood pressure in type2 diabetic patients. In a quasi-experimental study, 32 type 2 diabetes patients received 200 g raw tomato</p>	Interv

		<p>Shidfar F, Froghifar N, Vafa M, Rajab A, Hosseini S, Shidfar S, Gohari M.</p> <p>Int J Food Sci Nutr. 2011 May;62(3):289-94. Epub 2010Dec 8.</p>		<p>daily for 8 weeks. Serum glucose enzymatically, apoB and apoA-I immunoturbidometrically and homocysteine by high-performance liquid chromatography were measured at the beginning and end of 8 weeks. There were significant decreases in systolic and diastolic blood pressure and also a significant increase in apoA-I at the end of study compared with initial values (P = 0.0001, P = 0.0001 and P = 0.013, respectively). In conclusion, 200 g raw tomato per day had a favored effect on blood pressure and apoA-I so it might be beneficial for reducing cardiovascular risk associated with type 2 diabetes.</p>	
<p>CVD: BP lipids inflammation insulin resistance endothelial function</p>	<p>Thies F</p>	<p>Effect of a tomato-rich diet on markers of cardiovascular disease risk in moderately overweight, disease-free, middle-aged adults: a randomized controlled trial.</p> <p>Thies F, Masson LF, Rudd A, Vaughan N, Tsang C, Britenden J, Simpson WG, Duthie S, Horgan GW, Duthie G.</p> <p>Am J Clin Nutr. 2012 May;95(5):1013-22. doi:10.3945/ajcn.111.026286. Epub 2012 Apr 4.</p>	<p>2012</p>	<p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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 ineffective at reducing conventional CVD risk markers in moderately overweight, healthy, middle-aged individuals. This trial was registered at isrctn.org as ISRCTN34203810.</p>	<p>RCT</p>