

# Abstract

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## The role of cellular micronutrient analysis, nutraceuticals, vitamins, antioxidants and minerals in the prevention and treatment of hypertension and cardiovascular disease.

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**BACKGROUND:** Macronutrient and micronutrient deficiencies are very common in the general population and may be even more common in patients with hypertension and cardiovascular disease due to genetic, environmental causes and prescription drug use. The Hypertension Institute in Nashville, TN, has evaluated micronutrient deficiencies and oxidation status, in a group of hypertensive versus normotensive patients. There are significant differences in numerous intracellular micronutrients and oxidation status between these two groups. Replacement of the micronutrient deficiencies, as well as high-dose therapy of selected nutraceuticals in combination with optimal diet, exercise and weight management resulted in control of blood pressure to goal levels in 62% of the hypertensive population (as defined by JNC 7) over a period of 6 months with complete tapering and discontinuation of antihypertensive drugs.

**DISCUSSION:** These deficiencies will have an enormous impact on present and future cardiovascular health and outcomes such as hypertension, myocardial infarction, stroke and renal disease and overall health costs. It is estimated that the annual savings in drug costs alone for the treatment of hypertension could be as much as US\$10 billion. Diagnosis and treatment of these nutrient deficiencies and improvement in oxidation status using functional intracellular assessments will reduce blood pressure, improve vascular health, endothelial dysfunction, vascular biology and cardiovascular events. Vascular biology assumes a pivotal role in the initiation and perpetuation of hypertension and target organ damage sequelae. Endothelial activation, oxidative stress, inflammation and vascular smooth muscle dysfunction are initial events that start hypertension. Nutrient-gene interactions determine a broad array of phenotypic consequences such as vascular problems and hypertension. Optimal nutrition, nutraceuticals, vitamins, antioxidants, minerals, weight loss, exercise, smoking cessation and moderate restriction of alcohol and caffeine in addition to other lifestyle modifications can prevent and control hypertension in many patients. An integrative approach combining these lifestyle suggestions with the correct pharmacologic treatment will best achieve new goal blood pressure levels, reduce cardiovascular risk factors, improve vascular biology and vascular health, reduce cardiovascular target organ damage and reduce healthcare expenditure. The expanded scientific roles for nutraceutical supplements are discussed in relation to the prevention and treatment of essential hypertension and cardiovascular diseases with emphasis on mechanisms of action and clinical integration with drug therapy with hypertension guidelines.

**SUMMARY:** It is the purpose of this paper to review only the hypertension clinical trials that have evaluated the clinical use and efficacy of nutrition, weight loss, exercise and selected nutritional supplements, vitamins, minerals and antioxidants. Numerous clinical trials have evaluated the use of nutritional supplements such as beta carotene, selenium, vitamin C and vitamin E in the prevention of coronary heart disease and stroke yielding conflicting results (positive, neutral and negative). In many of these clinical trials there are enormous clinical design problems, methodologic flaws, varied patient population, variable dose and type of vitamin use, improper selection of vitamin used and many other issues that make the studies difficult to interpret. It is beyond the scope of this paper to review these trials. The reader is referred to the vast literature on this subject.

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