



Mixture Of Natural Nutrients Reduces Collagen Matrix Contraction Driven By Aortic Smooth Muscle Cells

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Abstract

Background:

Impaired arterial smooth muscle contractility plays a leading role in the development of systemic hypertension. Structural changes, such as occlusive atherosclerotic plaque formation, and functional changes, such as hormonal disturbances, play roles in pathophysiological mechanisms of altered arterial contractility.

Objective:

To study the effects of natural nutrients on arterial smooth muscle tissue contractility.

Methods:

In vitro model of collagen I gel contraction driven by embedded cultured human aortic smooth muscle cells (SMC). Tested compounds were evaluated by their effect on gel contraction, as measured by change in gel area during 24-hour incubation in serum free medium. Cellular expression of matrix metalloproteinases (MMPs) was followed by gel zymography.

Results:

Collagen gel contraction driven by SMC was significantly stimulated by angiotensins I and II. Addition of 17-beta estradiol enhanced this effect. Accelerated gel contraction was accompanied by elevated secretion of MMPs into cell culture media. Purified polyphenols, catechins, and their natural mixture, green tea leaf extract, counteracted SMC-dependent collagen gel contraction. Addition of ascorbic acid and amino acids lysine, arginine, cysteine and proline to green tea extract enhanced gel relaxation effects. A reduction in gel contraction correlated with decreased MMP expression. Specific MMP inhibitors added to the culture medium mimicked gel-relaxing effects.

Conclusion:

Nutrients can effectively counteract angiotensin-mediated excessive stimulation

of arterial tissue contraction. This anti-hypertensive action is mediated, at least in part, by inhibiting tissue proteases and extracellular matrix remodeling.

Comment:

Impaired arterial smooth muscle contractility plays a leading role in the development of systemic hypertension. Structural changes, such as occlusive atherosclerotic plaque formation, and functional changes, such as hormonal disturbances, play roles in pathophysiological mechanisms of altered arterial contractility. Accelerated gel contraction was accompanied by elevated secretion of MMPs into cell culture media. We found that purified polyphenols and catechins counteracted SMC-dependent collagen gel contraction; this gel relaxation effect was further enhanced by addition of ascorbic acid and amino acids lysine, arginine, cysteine and proline to green tea extract. A reduction in gel contraction correlated with decreased MMP expression. These results are significant as they indicated that nutrients can effectively counteract angiotensin-mediated excessive stimulation of arterial tissue contraction and have therapeutic potential in hypertension.

