



Natural Nutrient Mixture of Ascorbic Acid with Amino Acids Lysine, Arginine, Cysteine and Proline, and Green Tea Polyphenols Effectively Reduces Collagen Matrix Contraction Driven by Human Uterine Smooth Muscle Cells

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Abstract

Background:

Abnormal uterine myometrial contractility causes preterm delivery contributing to perinatal morbidity and mortality. Disturbances in the hormonal regulation and inflammation-related processes have been attributed a role in pathophysiological mechanisms of alternated uterine contractility.

Objective:

To study the effects of natural nutrients on uterine tissue contractility.

Methods:

We used an in vitro model of collagen I gel contraction driven by embedded cultured human uterine smooth muscle cells (UtSMC). Effects of tested compounds were evaluated by their capacity to affect gel contraction (measured by reduction 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 UtSMC was significantly stimulated by potassium chloride, pituitary hormone oxytocin and by inflammatory cytokine tumor necrosis factor alpha. Accelerated gel contraction was accompanied by elevated secretion of MMP-2 and MMP-9 into cell culture media. Among a variety of purified bioflavonoids and polyphenol-enriched plant extracts tested for their ability to counteract UtSMC-dependent collagen gel contraction, the strongest effects were demonstrated by epigallocatechin gallate and green tea leaf extract, respectively. Addition of ascorbic acid and amino acids lysine, arginine, cysteine and proline to green tea extract further increased its effectiveness. A reduction in

gel contraction correlated with decreased MMP expression.

Conclusion:

Pathophysiological mechanisms of abnormal uterine myometrial contractility can involve extracellular matrix remodeling and can be effectively counteracted by a combination of naturally occurring nutrients.

Comments

Disturbances in hormone regulation and inflammation-related processes have been shown to play roles in abnormal uterine contractility, which causes preterm delivery and can lead to perinatal morbidity and mortality. We used an in vitro model of collagen I gel contraction driven by embedded cultured human uterine smooth muscle cells to study the effect of various nutrients on uterine contraction. Among the bioflavonoids and plant extracts tested, we found that green tea leaf extract and epigallocatechin gallate showed the strongest ability to counteract uterine smooth muscle cell contraction. Furthermore, addition of ascorbic acid and amino acids lysine, arginine, cysteine and proline to green tea extract further increased its effectiveness. A reduction in gel contraction correlated with decreased MMP. The results of this study are significant since they demonstrate the great potential of nutrients in preventing preterm delivery and its sequelae.