Vitamin C


Old Things New View: Ascorbic Acid Protects the Brain in Neurodegenerative Disorders.

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Abstract
Ascorbic acid is a key antioxidant of the Central Nervous System (CNS). Under brain activity, ascorbic acid is released from glial reservoirs to the synaptic cleft, where it is taken up by neurons. In neurons, ascorbic acid scavenges reactive oxygen species (ROS) generated during synaptic activity and neuronal metabolism where it is then oxidized to dehydroascorbic acid and released into the extracellular space, where it can be recycled by astrocytes. Other intrinsic properties of ascorbic acid, beyond acting as an antioxidant, are important in its role as a key molecule of the CNS. Ascorbic acid can switch neuronal metabolism from glucose consumption to uptake and use of lactate as a metabolic substrate to sustain synaptic activity. Multiple evidence links oxidative stress with neurodegeneration, positioning redox imbalance and ROS as a cause of neurodegeneration. In this review, we focus on ascorbic acid homeostasis, its functions, how it is used by neurons and recycled to ensure antioxidant supply during synaptic activity and how this antioxidant is dysregulated in neurodegenerative disorders.


Effects of Oral Vitamin C Supplementation on Anxiety in Students: A Double-Blind, Randomized, Placebo-Controlled Trial.

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Abstract
Vitamin C (ascorbic acid) is a well-known antioxidant that is involved in anxiety, stress, depression, fatigue and mood state in humans. Studies have suggested that oxidative stress may trigger neuropsychological disorders. Antioxidants may play an important therapeutic role in combating the damage caused by oxidative stress in individuals that suffer from anxiety. In this context, it was hypothesized that oral vitamin C supplementation would reduce anxiety. However, few up to date studies have evaluated the consequences of oral vitamin C supplementation on anxiety in humans. The present study examined the effects of oral vitamin C supplements in 42 high school students, in a randomized, double-blind, placebo-controlled trial. The students were given either vitamin C (500 mg day(-1)) or placebo. Plasma concentrations of vitamin C and blood pressure were measured before the intervention and then one day after the intervention. Anxiety levels were evaluated for each student before and after 14 days following supplementation with the Beck Anxiety Inventory. Results showed that vitamin C reduced anxiety levels and led to higher plasma vitamin C concentrations compared to the placebo. The mean heart rates were also significantly different between vitamin C group and placebo control group. Present study results not only provide evidence that vitamin C plays an important therapeutic role for anxiety but also point a
possible use for antioxidants in the prevention or reduction of anxiety. This suggests that a diet rich in vitamin C may be an effective adjunct to medical and psychological treatment of anxiety and improve academic performance.


Efficacy of supplementary vitamins C and E on anxiety, depression and stress in type 2 diabetic patients: a randomized, single-blind, placebo-controlled trial.

Mazloom Z¹, Ekramzadeh M¹, Hejazi N¹.

Abstract
Diabetes mellitus as one of the most prevalent endocrine disease is associated with high oxidative stress. Anxiety, stress and depression are common neuropsychiatric features in diabetic patients. Hyperglycemia leads to increased oxidative stress which in turn diminishes antioxidant defense system. On the other hand oxidative stress is the leading cause of depression and anxiety disorders. Thus, it seems that diabetes could accelerate the trend of psychiatric diseases. In this randomized single-blind study, evaluation of the effects of two antioxidants (vitamin C and vitamin E) was done on Stress, depression and anxiety levels in 45 diabetic patients for six weeks. The patients were randomly divided in three groups of vitamin E (400 IU day(-1)), vitamin C (1000 mg day(-1)) and placebo. DASS-21 (Depression Anxiety Stress Scales 21-item) questionnaire items were read to each patient and completed by the main investigator of this study before and after six weeks of supplementation. The scores of depression, anxiety and stress were evaluated separately based on the DASS questionnaire. The results showed a significant decrease in anxiety level (p = 0.005) in vitamin C group compared to other groups but there were no significant differences between groups in terms of changes in stress and depression scores. In conclusion, this study suggests that short-term supplementation of vitamin C is safe and beneficial for reducing anxiety levels in diabetic patients through alleviating oxidative damage.


Role of antioxidants in generalised anxiety disorder and depression.

Gautam M¹, Agrawal M, Gautam M, Sharma P, Gautam AS, Gautam S.

Abstract
BACKGROUND:
Anxiety and depression form commonest stress-induced psychiatric disorders. To combat the biochemical changes which occur as a result of stress, there is antioxidant defence in the biological system. Secondary defence is by the nonenzymatic antioxidants like vitamins E (alphatocopherol), C (ascorbic acid), and β-carotene. Therefore, the authors interest was aroused to examine the status of these antioxidants in the biological system of patients suffering from stress-induced psychiatric disorders.

AIMS:
This study was carried out to find out whether patients with generalized anxiety disorder (GAD) and depression have any difference in blood serum levels of vitamins A (β-carotene), C, and E in comparison to the normal healthy control group and whether supplementation of adequate doses of vitamins A (β-carotene), C, and E leads to improvement in anxiety and depression and reduction in scores of the patients.

MATERIALS AND METHODS:
Eighty subjects in the age group of 20-60 years, who attended a psychiatric clinic of a private hospital and who met inclusion and exclusion criteria of the study and consented for psychological evaluation and blood screening to find out the serum levels of vitamins A, C, and E, were included in the study. Approval was sought from the institutional ethics committee for collecting the blood sample of these subjects before and after vitamins A, C, and E supplements given for a period of 6 weeks.

STATISTICS ANALYSIS:
It was observed that patients with GAD and depression had significantly lower levels of vitamins A, C, and E in comparison to healthy controls. After dietary supplementation of these vitamins for a period of 6 weeks, a significant reduction in anxiety and depression scores of patients was observed (P<0.001). A significant increase in the blood levels of antioxidants was observed in patients (P<0.05) except that of vitamin E in the group of depressed patients.

RESULTS AND CONCLUSION:
The findings suggest that antioxidant supplement therapy as an adjuvant therapy is useful in patients with stress-induced psychiatric disorders and the results have been discussed.


Vitamin E, vitamin C, beta carotene, and cognitive function among women with or at risk of cardiovascular disease: The Women's Antioxidant and Cardiovascular Study.

Kang JH1, Cook NR, Manson JE, Buring JE, Albert CM, Grodstein F.

Abstract

BACKGROUND:
Cardiovascular factors are associated with cognitive decline. Antioxidants may be beneficial.

METHODS AND RESULTS:
The Women's Antioxidant Cardiovascular Study was a trial of vitamin E (402 mg every other day), beta carotene (50 mg every other day), and vitamin C (500 mg daily) for the secondary prevention of cardiovascular disease. From 1995 to 1996, women > or =40 years of age with cardiovascular disease or > or =3 coronary risk factors were randomized. From 1998 to 1999, a cognitive function substudy was initiated among 2824 participants > or =65 years of age. With 5 cognitive tests, cognition was assessed by telephone 4 times over 5.4 years. The primary outcome was a global composite score averaging all scores; repeated-measures analyses were used to examine cognitive change over time. Vitamin E supplementation and beta carotene supplementation were not associated with slower rates of cognitive change (mean difference in change for vitamin E versus placebo, -0.01; 95% confidence interval, -0.05 to 0.04; P=0.78; for beta carotene, 0.03; 95% confidence interval, -0.02 to 0.07; P=0.28). Although vitamin
C supplementation was associated with better performance at the last assessment (mean difference, 0.13; 95% confidence interval, 0.06 to 0.20; \( P = 0.0005 \)), it was not associated with cognitive change over time (mean difference in change, 0.02; 95% confidence interval, -0.03 to 0.07; \( P = 0.39 \)). **Vitamin C was more protective against cognitive change among those with new cardiovascular events during the trial (\( P \) for interaction=0.009).**

**CONCLUSIONS:**
Antioxidant supplementation did not slow cognitive change among women with preexisting cardiovascular disease or cardiovascular disease risk factors. A possible late effect of vitamin C or beta carotene among those with low dietary intake on cognition warrants further study.


**Antioxidant intake and cognitive function of elderly men and women: the Cache County Study.**


**Abstract**

**OBJECTIVE:**
We prospectively examined associations between intakes of antioxidants (vitamins C, vitamin E, and carotene) and cognitive function and decline among elderly men and women of the Cache County Study on Memory and Aging in Utah.

**PARTICIPANTS AND DESIGN:**
In 1995, 3831 residents 65 years of age or older completed a baseline survey that included a food frequency questionnaire and cognitive assessment. Cognitive function was assessed using an adapted version of the Modified Mini-Mental State examination (3MS) at baseline and at three subsequent follow-up interviews spanning approximately 7 years. Multivariable-mixed models were used to estimate antioxidant nutrient effects on average 3MS score over time.

**RESULTS:**
Increasing quartiles of vitamin C intake alone and combined with vitamin E were associated with higher baseline average 3MS scores (\( p \)-trend = 0.013 and 0.02 respectively); this association appeared stronger for food sources compared to supplement or food and supplement sources combined. Study participants with lower levels of intake of vitamin C, vitamin E and carotene had a greater acceleration of the rate of 3MS decline over time compared to those with higher levels of intake.

**CONCLUSION:**
High antioxidant intake from food and supplement sources of vitamin C, vitamin E, and carotene may delay cognitive decline in the elderly.