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The Effects of Vitamin E on Gastric Ulcers and Gastric Mucosal Barrier in Stress Induced Rats

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Abstract: Effects of vitamin E on gastric ulcers gastric mucosal barrier were investigated in cold + restraint stress (CRS) induced rats. In this study 21 males two month old Swiss Albino Rats were used. Stress treated rats significantly decreased mucus and phospholipid content of gastric mucosa ($p < 0.01$, $P < 0.01$).

Vitamin E was administered orally in the dose of 100 mg/kg body weight thirty min. before

stress. Vitamin E reduced significantly gastric ulceration ($p < 0.01$). Moreover, it significantly protected mucus secretion and phospholipid content of gastric mucosa in rats ($p < 0.01$, $p < 0.01$, respectively). These results indicate that extrinsic application of vitamin E may strengthen gastric mucosal barrier in rats.

Key Words: Vitamin E, Stress, Gastric mucosal barrier.

Introduction

Cold restraint stress in rats causes gastric mucosal ulceration. The pathological basis for the development of this lesion has been postulated to be multifactorial such as increased gastric acid secretion, inhibition of gastric mucosal prostaglandin synthesis, disruption of gastric mucosal barrier, reduction of gastric mucosal blood flow, inhibition of gastric mucus and bicarbonate secretion (1,2). Prostaglandins are believed to maintain the integrity of the gastric mucosa by stimulating secretion of the mucus and bicarbonate and modulating mucosal blood flow (3,4).

Vitamin E is known to function as *in vivo* free radical scavenger that inhibits lipid peroxidation in biological system (5-8). In addition, vitamin E stimulates synthesis of prostaglandins (7).

As a result of literature investigations carried out, there are controversial among research results regarding the protection of a dose of vitamin E on gastric mucosal against stress (8-10). The aim of this study is to investigate the effect of vitamin E, applied in a dose, on gastric mucosal barrier and gastric lesions that stress causes.

Materials and Methods

Twenty one adult male wistar albino rats (160-200 g) were used in this study. They were individually placed in stainless steel cages and were kept under controlled temperature (22°C) and a photo period of 12 h light and 12 h dark. The animals were kept hungry for 24 h (but allowed to water). They were divided into three groups (controls (both stress applied and unapplied groups), experiment). Experimental group was administered with intragastric 100 mg/kg vitamin E (Merck DL tocoferol). Thirty minutes following administration of serum physiologic to control group, cold + restraint stress was applied according to Basso et al. method (11).

All animals were put into individual close fitting tubular restraint cages of wire mesh and exposed to a temperature of 4°C for 3 h. After cold restraint, the animals were sacrificed by decapitation. Stomach were removed, opened along the greater curvature, and examined macroscopically for gastric mucosal damage. Each lesion was measured along its greatest diameter (mm). When assessing the size of petechiae, five such lesions were considered equivalent to 1 mm ulcer. The sum of the lesions lengths each group was divided by number of rats in that group and expressed as the mean ulcer index (11).

The mucus secretion was determined according to the Corne method (12). In one half of the stomach, while Baur method (13) was used in determination of phospholipid in mucosal extracts on other hand.

The data were analysed for significance by using the Mann whitney U test.

Results

Cold + restraint stress reduced mucus and phospholipid contents of gastric mucosa ($p < 0.01$, $p < 0.01$, respectively). The effects of vitamin E cold + restraint stress induced gastric lesions and mucus content in rats are shown in Table 1. Vitamin E significantly reduced the acute gastric erosions and ulcers caused by cold + restraint stress ($p < 0.01$). Vitamin E increased mucus and fosfolipid content of the gastric mucosa ($p < 0.01$ and $p < 0.05$, respectively).

Discussion

Our results Show that vitamin E significantly decreased the levels of mucus phospholipids which are the important components of gastric mucosal barrier and the formation of acute Hemorrhagic gastric ulcer caused by cold + restraint stress. The physiopathology of experimental gastric ulcer caused by cold + re-

straint stress. The physiopathology of experimental gastric ulcer formation is not well studied. However, an increase in gastric acid secretion, gastric mucosal blood flow, prostaglandin synthesis, bicarbonate secretion reduction in mucus production and disruption of gastric mucosal barrier pathological mechanisms responsible for the lesions caused by stress (14). Many workers demonstrated that vitamin E deficiency was observed under stress conditions (15, 16). Young et al showed that vitamin E reduced ischemia which is caused by stress conditions (15, 16). Young et al showed that vitamin E reduced ischemia which is caused by stress (17). Furthermore, vitamin E stimulates prostaglandin synthesis by activating the calcium - dependent phospholipase enzyme A2 and inhibiting the lipooxygenase enzyme (7). Okuma et al found that the deficiency of diet vitamin E reduces the synthesis of arterial PGI_2 significantly (18). Thus, pre-vitamin treatment of animals may prevent, gastric mucosal damage caused by stress, by increasing PGE_2 level. However, whether vitamin E has protective effect in gastric ulcer formation against various ulserogenic agents and cold + restraint stress is controversial subject among scientists (8-10).

Vitamin E has been Reported to inhibit the lipid peroxidation as free radical scavenger and to help integrity of cell membrane against oxidant agents (19, 20). The stimuli causing stress were shown to initiate lipid peroxidation by decreasing the antioxidants, particularly in tissues (6). In this study, vitamin E reduced gastric lesions caused by cold + restraint stress Either in a way explained above or stimulating prostaglandin synthesis. Behrens et al reported that vitamin E does not protect against gastric ulcerations caused by indometacin, and inhibitor of prostaglandin synthesis. However, according to Armario et al vitamin E can not protect gastric mucosal lesions in rats exposed to restraint stress for 18 h (109). This indicates that the ability of vitamin E to prevent the formation of experimental ulcer. May also depend on the period of stress exposure.

Table 1. Values and statistical comparison of the analysed parameters in AMI

	Ulcer index (mm)	Mucus (μg weight tissue)	Phospholipid (mg/g weight tissue)
Control Group (n=7) (CRS unapplied)	----	162.42 \pm 23.77	6.46 \pm 2.50
Control Group (n=87) (CRS applied)	15.75 \pm 0.92	70.91 \pm 9.91 ^b	2.15 \pm 0.63 ^d
Experimental Group (n=7)	5.62 \pm 1.67 ^a	91.20 \pm 10.14 ^c	3.04 \pm 0.51 ^e

^a $p < 0.01$, ^b $p < 0.01$, ^c $p < 0.01$, ^d $p < 0.01$, ^e $p < 0.05$ all compared with the respective control values

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