

Ameliorative Role of Vitamin C against Toxicity by Food Additive in the Male Rats

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Abstract

Food additives are widely used in the food for example MSG present in variety types of food so the current study is proposed to evaluate the protective role of vitamin C in the male white rats for 30 days. The results showed the significant increase ($p < 0.05$) in the levels of liver functions tests and lipid profile as well as significant decrease ($p < 0.05$) in the biochemical parameters include total protein and albumin. Also, the histological examination for liver tissues demonstrate the histopathological change include degeneration, bleeding and necrosis. So that, the results appear MSG is highly toxic and treatment with vitamin C can to decrease the toxic effect for MSG in the biochemical parameters and histological changes in the liver tissues.

Keywords: *MSG, Liver functions, Vitamin C and rats.*

Introduction

Some ecological synthetic substances, for example, modern contaminations and nourishment added substances have been ensnared as causing unsafe impacts. Most sustenance added substances act either as additives, or enhancer of tastefulness. One such sustenance added substance is MSG and it is powder substance in the local market [1].

Some obsessive conditions like malignancies result from the body typical reactions to anomalous natural impacts as pathogenic microorganisms, injury, dietary lacks and genetic components acting alone or in a mind boggling collaboration with ecological elements, cause infections [2]. The security of MSG's utilization has created much debate locally and all around. In the world, most networks and people regularly utilize MSG as a fading operator for the expulsion of colors from materials (individual correspondence) [3].

There is developing dread that its blanching properties could be hurtful or harmful to the body, or more awful as yet inciting fatal sicknesses in buyers if taken as a flavor enhancer in food [4]. Notwithstanding the medical issues apparently connected with the utilization of MSG, legitimate worldwide

associations and nutritionists have kept on underwriting MSG, repeating that it has no unfavorable responses in people [5]. MSG enhances the agreeability of suppers and subsequently impacts the hunger focus decidedly with its resultant increment in the final of body weight [6, 7]. In spite of the fact that MSG enhances taste incitement and upgrades craving, reports show that it is poisonous to human and trial animals [8]. There are several disease results from retinal regenerations, endocrine issue and other conditions as epilepsy, neuropathic torment and tension [9, 10].

Liver is the largest organ in the body has weight about 1.4-1.6 kg. It is stay under the stomach, it has many important jobs in the body as glycogen synthesis, formation all plasma proteins, synthesis of bile secretion, detoxification of any foreign bodies and assimilation process. It might be powerless to damage coming about because of dangerous substances [11].

Cell reinforcements have been accounted for to assume a huge job in the assurance against lipid peroxidation [12]. A few examiners announced that cancer prevention agents hinder concoction carcinogenesis when the cell reinforcements are regulated

either earlier or amid cancer-causing changes [13].

Nutrient C (ascorbic corrosive) has an impressive cancer prevention agent movement: it searches receptive oxygen species and may, along these lines, anticipate oxidative harm to the imperative natural macromolecules [14].

Vitamin C applies a defensive job against intense bright B-beams (Sunburn cell development) [15] and organophosphorous pesticides [16] and could lessen aflatoxin incited liver disease [17]. In addition nutrient C cancels chromosome harm coming about because of the impact of dangerous particles [18], and help to ensure the body against toxins [19].

Since nutrient C is a natural lessening operator, it is likewise connected to the avoidance of degenerative sicknesses, for example, waterfalls, certain malignancies and cardiovascular illnesses [20, 21]. Expanded nutrient C admission could decrease and the anticipate nephrotoxic impact [22]. It aids the avoidance of blood coagulating and wounding. It additionally reinforces the dividers of the vessels [23] and moreover, is required for solid gums [24].

It is very much recorded that nutrient C decreases cholesterol levels, hypertension and anticipate atherosclerosis [25, 26]. The point of this investigation is to assess the conceivable defensive job of nutrient C in monosodium glutamate initiated changes in test rodent liver through biochemical and histopathological parameters.

Materials and Methods

Monosodium glutamate (MSG) commercially available pack as a white colored substance used as flavor enhancer and purchase from the local market .Vitamin C (ascorbic acid) (100 mg/tablet, India) was dissolved in distal water daily for administration.

Animals

In the present study used 20 rats (*Rattus norvigicus*) have weight 220-250 g which taken from animal house in the faculty of science / Kufa university. The animals were saved in the animal house about one week before started the experiment for acclimatization.

The rats were divided randomly into five groups each group have four rats and treated as following:

Group one received standard diet and normal saline and kept as control group, group two fed with diet has MSG at dose 8 mg/g/kg/day for 30 days, group three fed with diet has MSG at dose 8 mg/g/kg/day and vitamin C at dose 500 mg/kg for 30 days, group four fed with diet has MSG at dose 16mg/g/kg/day for 30 days and group five fed with diet has MSG at dose 16 mg/g/kg/day and vitamin C at dose 500 mg/kg for 30 days.

Blood Collection

At the end of experiments .Each animal was anaesthetized by the mixture of xylazine 0.1 ml and ketamine 0.5 ml and they were scarified [27]. Heart cut was finished with a 5 ml expendable syringe and 2-5 ml blood was drawn delicately and gradually. Every blood test was separated into 2 sections. The initial segment (around 0.5 ml) was set in a tube containing EDTA (22mg/ml) as anticoagulant and blended altogether, then utilized for the assurance of hematological investigation by a programmed analyzer.

The rest of the blood was put in test tube containing gel and left for 30 minutes in room temperature and used to get serum through centrifugation at 3000 rpm for 15 minutes to separate serum and put in epindroff tubes which kept at (- 20) in a cooler for assurance biochemical examination and the belly was opened to get the kidney for histological study [28].

Determination of Biochemical Parameters

Liver enzymes levels (AST and ALT) measured depend on [29], GGT was measured according to (30), lipid profile include (TC, HDL, TG) determined depend on [31, 32], VLDL measured depend on Friedwald 's equation [33] $VLDL = TG/5$

Total protein, and serum albumin were measured according to [34, 35] respectively.

Statistical Analysis

Using computerized SPSS program [36] all data were analyzed by (ANOVA) test followed by L.S.D. at probability 0.05 %

Results

Table 1: Effect of monosodium glutamate (MSG) and vitamin C in the levels of the liver enzymes in the rats after 30 days of treatment

Groups	AST (U/L)	ALT (U/L)	GGT (U/L)	TP (g/dL)	AL (g/dL)
8mg/g (MSG)	207.00 a \pm 75.23	85.00 a \pm 7.00	9.75 a \pm 0.47	4.93 \pm 0.37	2.28 a \pm 0.31
8mg/g (MSG) +Vit. C 500 mg/kg	164.33 b \pm 5.13	77.33 b \pm 2.08	7.87 b \pm 0.55	6.43 a \pm 0.14	3.08 \pm 0.54
16mg/g (MSG)	220.33 c \pm 25.54	147.00 c \pm 14.73	11.92 c \pm 1.16	4.30 \pm 0.25	1.43 b \pm 0.23
16mg/g (MSG) +Vit. C 500 mg/kg	195.00 d \pm 5.00	110.67 d \pm 10.07	10.95 d \pm 0.64	6.42 b \pm 0.19	2.12 c \pm 0.16
Control	120.33 \pm 26.08	55.67 \pm 4.04	3.12 \pm 1.13	5.62 \pm 1.14	3.64 \pm 0.28

Values are the Mean \pm SD, n=4

Different letters mean significant decrease $P < 0.05$ between control and treated groups.

Table 2: Effect of monosodium glutamate (MSG) and vitamin C in the levels of lipid profiles in the rats after 30 days of treatment

Groups	TC (mg/dL)	HDL (mg/dL)	TG (mg/dL)	VLDL (mg/dL)
8mg/g (MSG)	57.67 a \pm 2.52	46.45 a \pm 4.47	45.62 a \pm 1.45	49.53 a \pm 0.70
8mg/g (MSG) +Vit. C 500 mg/kg	45.67 b \pm 2.52	54.59 b \pm 4.06	41.31 b \pm 0.96	44.33 b \pm 2.21
16mg/g (MSG)	78.33 c \pm 1.53	41.73 c \pm 2.58	83.95 c \pm 8.84	64.57 c \pm 3.75
16mg/g (MSG) +Vit. C 500 mg/kg	65.67 d \pm 4.51	56.97 d \pm 6.10	74.20 d \pm 2.64	54.38 d \pm 3.68
Control	36.00 \pm 3.61	53.61 \pm 7.60	34.00 \pm 4.16	33.38 \pm 2.97

Values are the Mean \pm SD, n=4

Different letters mean significant decrease $P < 0.05$ between control and treated groups.

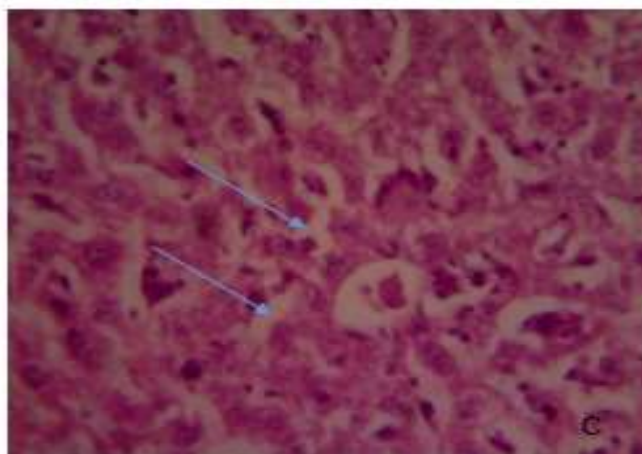
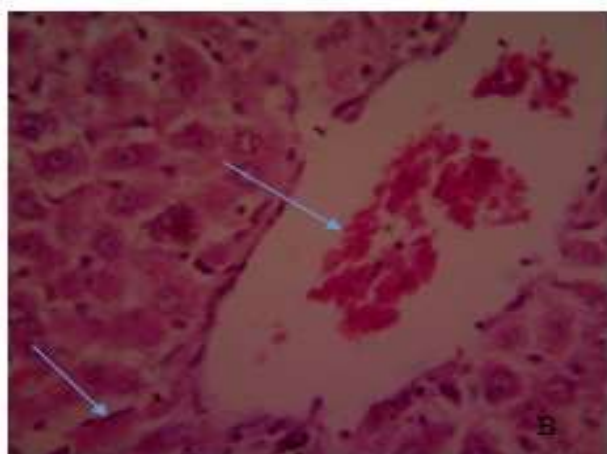
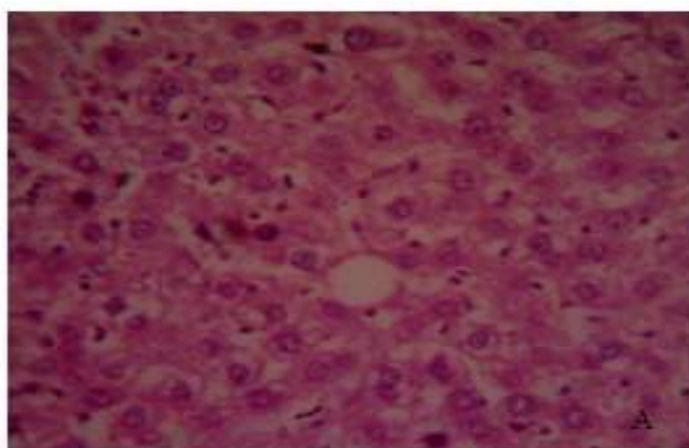


Figure 1: Liver section of rats in the control group (A) show normal architecture, (B) the liver section of rats treated with 16 mg/g of MSG appear bleeding and dilation in disse 's space, (C) the liver section of rats treated with 16 mg/g of MSG with vitamin C show somewhat normal but associated with dilation of the blood vessels (H&E) (400X)

Discussion

These days, sustenance added substances are viewed as one of the troublesome issues in the nourishment business. All sustenance added substances, regardless of whether quite utilize or being proposed for utilize, ought to be exposed to suitable toxicological testing and assessment. The common added substances are more secure and valued the option of nourishment conservation and shading [37]. Liver enzymes are inexhaustible in the liver and are discharged into the circulation system following hepatocellular harm, making them delicate marker of liver harm [38].

The checked increment in the plasma ALT and AST exercises saw in MSG sustained rodents may be characteristic of liver harm. Liver enzymes levels were utilized as a marker of harm to the liver basic respectability on the grounds that these catalysts are cytoplasmic in area and are discharged into the coursing blood simply after auxiliary harm [39]. The digestion of proteins and their subordinates strike a noteworthy degree in the liver [40] and basically includes removed ammonia group to create ammonia particle that could be harmful except if made less lethal through the responses of the urea cycle.

The sodium moiety in MSG could without much of a stretch separate to yield free glutamate. In this way, the conceivable ammonia particle over-burden that may happen with Mg or MSG admission could harm the liver, subsequently discharging the transaminases; thus it watched rise in the plasma. The outcome is like Onyema et al. [41] and Egbonu et al [42].

Who announced that MSG expanded the liver enzymes levels in male pale skinned person rodents because of conceivable ammonium particle over-burden coming about because of an expansion level of glutamate. Additionally, Mariyamma et al [43]. Announced increment in liver enzymes levels because of oxidative pressure which prompts modification in the layer trustworthiness accordingly is changing the film penetrability bringing about spillage of intracellular chemicals.

The examination additionally demonstrated a huge increment in the level of GGT in gathering co-controlled MSG. GGT is a liver-particular compound engaged to transport of

peptides and amino acids inside the cells and it equally participates in glutathione digestion [44]. GGT is a decent marker of hepatobiliary ailment and it has been named cholestatic liver compound in light of their expanded movement in kindled or harmed bile channel [45]. The higher GGT action recorded in the gathering co-managed with MSG is a sign in this gathering came about essentially from injuries in the liver and bile channel [46]. The instigated worry by MSG on the exercises of the liver capacity compounds were brought accordingly down to the treatment with the cancer prevention agents as nutrient C when contrasted with MSG treated rodents alone.

This cell reinforcement seems to act inside the cytoplasm where it kills free radicals, along these lines keeping a chain-responsive autoxidation of the narrow layer lipids and safeguard film trustworthiness [47]. Nonetheless, the cell damage may at present hold on as shown by the considerably height of ALT versus the control gathering. These discoveries concurred with that seen by Ashour and Abdelaziz [48].

These outcomes concurrence with magdy *et al* [49] were affirmed by discoveries that nutrient C and E improved the impacts of abamectin on the liver tissue which the greater part of them seemed typical aside from few of despite everything they demonstrated expansion of veins and irritation. Here, we can reason that nutrient C and nutrient E go about as cell reinforcements to some degree.

Nonetheless, the discoveries that nutrient C joined with nutrient E did not evacuate the poisonous impact of abamectin on the histological structure of liver, and did not cause a diminishing in the plasma level of ALT and AST drove us to infer that abamectin still has a dangerous impact even within the sight of nutrients C and E which are known as cancer prevention agents [50].

Liver is the essential organ for the amalgamation of plasma proteins. An unsettling influence of protein union along these lines happens as a result of disabled hepatic capacity which will prompt a reduction in their plasma focus. The decrease of the protein focus in the MSG treated rodents could demonstrate a decrease in the

engineered capacity of the liver or increment rate of protein debasement [51].

The current investigation exhibited that rodents treated with MSG demonstrated that there is decreased in serum add up to protein, egg whites fixations in MSG's rodents when contrasted with the control ones, These outcomes are as per [52]. These information recommend an incitement of thyroid and adrenal organs by MSG which prompt a blocked protein union, quick separate, expanded rate of free amino acids and diminished protein turnover [53].

El-Sheik and Khalil [54] demonstrated an inhibitory impact of some nourishment added substances on the biosynthesis of protein and egg whites which thusly mirrors that the liver can't play out its capacities. Additionally, the outcomes recorded critical increment in all out bilirubin in the gatherings of rodents treated MSG.

The present discoveries are in concurrence with [55]. Pretreatment with nutrient C has been appeared by the present examination to relieve hypoproteinemia and hypoalbuminemia with MSG gatherings and noteworthy lessening of aggregate bilirubin in similar gatherings treated with MSG and nutrient C [56]. The alleviation of the hypoalbuminemia by nutrient C might be because of security of the liver from oxidative harm incited by co-presentation to MSG clearly because of its cancer prevention agent impact.

The enhanced globulin focus by pretreatment with nutrient C may likewise be because of decrease in apoptotic harm to the WBC because of its cancer prevention agent properties [57]. Nutrient C has been appeared to relieve leukopenia prompted by MSG harming. Moreover, the outcomes recorded significant add up to bilirubin level in the gatherings of rodents treated with MSG and nutrient C because of stop hemolysis of blood and cell reinforcement properties of nutrient C [58].

Lipid profile variations from the norm assume a noteworthy job in diseases development and movement of atherosclerosis and cardiovascular maladies. Dyslipidaemia as a hazard factor for cardiovascular ailment in both urbanized and immature provincial nations have been accounted for [59]. We watched huge

increment in all out total cholesterol went with increment LDL but HDL and TG was not altogether adjusted. It is conceivable that MSG could build the exercises of 3-hydroxyl-3-methylglutaryl coenzyme A (HMG CoA) reductase, the rate constraining chemical in cholesterol biosynthesis bringing about increment amalgamation of cholesterol in the MSG treated rodents [60].

The outcomes appear in MSG treated gathering actuated noteworthy increment in cholesterol levels more than different gatherings treated with a mix of MSG and Vit. C which proposes an immediate connection between's MSG organization and the augmentation of cholesterol level and influencing on fat digestion. Inuwa et al [61].

Found that the potential clarification for MSG-heftiness connect lies in the change of administrative instruments that influence fat digestion. Additionally, another clarification in this investigation identified with expanded levels of TC, TG and VLDL recommends that MSG could be a hazard factor or coronary illness [62]. As indicated by our past outcomes recorded by Hamza et al [63].

As they detailed the job of propolis in diminishing blood glucose levels in diabetic rodents and accordingly upgrading lipid digestion as it is realized that liver is organ associated with glycogenesis, glycogenolysis, gluconeogenesis, and glycolysis and along these lines influencing by direct route on lipid digestion and this affirmed our acquired outcomes by diminished the levels of TC, TG, VLDL and HDL increment in gatherings treated by mix MSG and nutrient C [64].

The consequences of the histological examinations uncovered that with expanding portion of monosodium glutamate utilization, there were fluctuating degrees of dilatations of the focal vein of the liver which contained lysed red platelets in the treatment gather contrasted with the control areas of the liver. The putrefaction watched is in consonance with the discoveries recorded in past work on MSG [65].

Conclusions

Our outcomes show that monosodium glutamate actuated damage in liver rodent and offered knowledge the conceivable job of nutrient C in enhancing the unsafe impacts of monosodium glutamate.

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