

Effect of Aqueous Garlic Extract on Monosodium Glutamate Induced Weight Loss in Wistar Rats

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ABSTRACT

Background and Objective: Monosodium glutamate (MSG) is used as a taste enhancer and is a common ingredient of some foods as canned vegetables, soups, processed meat and traditional seasoning. Garlic, on the other hand, is known to have antibacterial and antiviral effects and has also been used for cancer prevention. The objective of current study is to observe the effect of aqueous garlic extract (AGE) in MSG induced toxic effects on the body weight of adult Wistar rats.

Methods: The present study was carried out in the Department of Anatomy at University of Health Sciences, Lahore in 2016. A total of 24 adult male Wistar rats, 6-8 weeks old of 150-175 grams weight were taken and divided into four groups (6 rats in each). Group A served as a control and received 6 ml/kg of distilled water orally via gavage tube and intraperitoneally for 14 days; Group B was treated with MSG 4 gm/kg dissolved in 6 ml of distilled water administered intraperitoneally for 14 days; Group C was treated with AGE 200 mg/kg dissolved in 0.4 ml of distilled water orally by gavage tube for 14 days and Group D was given 4 gm/kg MSG dissolved in 6ml of distilled water, intraperitoneally first, followed by AGE 200 mg/kg dissolved in 0.4 ml of distilled water, orally, by gavage tube for a period of 14 days. All doses were given once a day.

Results: At the end of study, the body weight of rats in MSG treated group was found to be decreased and was statistically significant ($P < 0.003$) and garlic did counter the effects of MSG though not significantly.

Conclusion: Aqueous garlic extract improves the deleterious effects of MSG on the body weight of Wistar rats.

KEYWORDS: Monosodium glutamate (MSG), Body weight, Aqueous garlic extract (AGE).

INTRODUCTION

Monosodium glutamate (MSG), a salt of glutamate (an amino acid), is a known flavor enhancer as well as a typical element of food stuffs as canned vegetables, soups, handled meat and is utilized for conventional flavoring as well. Likewise, it is present in huge sums in the Chinese cuisines. In the food industry it is generally being used in flavor enhanced chips and bites, sauces, marinated meats, stuffed chicken, packaged soya, seasoned fish and burgers.¹

Glutamate is a non-essential amino acid, synthesized in human body as well as found in almost all natural edible substances, particularly high protein diets, dairy items and processed meat.² It is known to have neurotoxic and metabolic upsetting impacts.^{3,4} MSG is also known to effect negatively on the typical histology of testis.⁵

Allium sativum, which usually is known by the name garlic, is an invigorating and extraordinary flavoring agent that adjoins fragrance, taste and

sustenance to our everyday dinners. It contributes medical advantages inferable from the presence of an assortment of intense sulfur-containing mixes including thiosulfinates (allicin), sulfoxides (alliin), and dithiins (ajoene). Allicin (diallylthiosulfinate) and S-modifying cysteine are the fundamental thiosulfinates out of which around 60-80% is allicin. Alliin is changed to its metabolites; allicin, pyruvate and alkali, by the activity of enzyme allinase of garlic knob.⁶

Non-pharmacological treatment with garlic is proposed to decrease the circulatory strain in hypertensive people. AGE has proved to remove hindrance in the movement of coronary supply route and causes an improvement in affected myocardial tissue.⁷ Some other uses of garlic include reduction in blood cholesterol levels and improvement in lipid profile.⁸ Garlic potentially improves the secretion of male reproductive hormones hence improves the male fertility.⁹ The present study is designed to observe the

effect of aqueous garlic extract in MSG induced toxic effects on the body weight of adult Wistar rats.

METHODS

The current study was conducted in the Department of Anatomy at University of Health Sciences Lahore, in 2016 after getting the ethical approval by the Institute. A total of twenty four (24) Wistar rats, weighing 150-175 gm and of age 6 – 8 weeks, were acquired from the animal house, University of Health Sciences, Lahore. These 24 rats were divided into four groups; A, B, C and D, each containing six rats. Experimental animals were kept under controlled temperature of $23 \pm 2^{\circ}\text{C}$, humidity $55 \pm 5\%$ and light and dark cycles of 12 hours each. The rats were given standard rat chow and water ad libitum and were acclimatized for two week before the beginning of the experiment. All methods were performed in a clean aseptic condition and keeping ethical considerations. Rats were weighed on 1st day of experiment and then weighed on the last (15th) day.

Group A served as control and was given distilled water at a dose of 6 ml/kg, orally by gavage tube and intraperitoneally daily for 14 days.¹⁰ Group B was given MSG 4 gm/kg dissolved in 6 ml of distilled water, intraperitoneally, daily for 14 days.¹⁰ Group C was given AGE 200 mg/kg dissolved in 0.4 ml of distilled water, daily by gavage tube, for 14 days.¹¹ Group D was given MSG 4 gm/kg dissolved in 6 ml distilled water, intraperitoneally, followed by AGE 200 mg/kg dissolved in 0.4 ml distilled water orally by gavage tube daily for 14 days.

MSG with concentration of ninety nine percent was purchased from local market. The 4 gm/kg of MSG was dissolved in 06ml of distilled water.¹⁰ To prepare the AGE, local garlic from new crop was obtained. Their cloves were separated, peeled and washed with distilled water and allowed to dry for an hour at room temperature. Fifty grams of these cloves were taken and cut into small pieces and were finally grounded in a pestle and mortar containing 100 ml of distilled water and then filtered with the help of a cotton cloth. The final concentration of garlic in this filtrate was 500 mg/ml. Two hundred mg/kg body

weight of AGE was prepared daily for treatment of rats and given orally by a nasogastric tube.¹¹

STATISTICAL ANALYSIS

All data were entered and analyzed in Statistical Package of Social Sciences (SPSS) version 20.0. Normality of distribution for the given data was measured by using Shapiro Wilk test. One way ANOVA was used to observe the difference in means of all the four groups. Pairwise comparison was applied to find out differences among individual groups by Post-Hoc Tukey HSD test.

RESULTS

Mean body weight (gm) of rats among the groups was compared at the start of experiment and it did not show any significant variation among groups (Table-1).

The mean body weight (gm) of rats among the groups were compared at the end of experiment showing significant variation among groups (Table -2).

The Post-Hoc Test was applied to find out the association among groups and it revealed significant differences between the body weights of groups A, B and C (Table-3).

DISCUSSION

Various experiments have been used to find out the eventual physiologic/metabolic effects of MSG on laboratory animals administered orally, by intubation or by injection.⁴ The focus of the current study was to observe the outcomes of monosodium glutamate administration on body weight by injecting MSG intraperitoneally and counter effects of garlic, given orally, on MSG induced body weight reduction.

These findings are in discordance with the study by Tawfik and Al-Badr (2012) who reported toxic weight gain in experimental animals along with visceromegaly by administration of MSG.¹² Similarly a study by Voigt and colleagues reports significant weight reduction in offspring of pregnant rats after MSG administration.¹³ However, the experiment on C57BL6/J mice in a study reports results similar to the

Table- 1: Comparison of mean body weight (gm) of rats at the start of experiment among groups (n = 6).

Groups	Group A: (n = 6)	Group B: (n = 6)	Group C: (n = 6)	Group D: (n = 6)	*P – value
Mean \pm SD	167.67 \pm 8.116	167.33 \pm 6.408	170.00 \pm 4.517	162.67 \pm 3.933	0.224

*P \leq 0.05 considered as statistically significant. One way ANOVA

Table- 2: Comparison of mean body weight (gm) of rats at 15th day of experiment among groups (n = 6).

Parameter	Group A: (n = 6)	Group B: (n = 6)	Group C: (n = 6)	Group D: (n = 6)	P – value
Mean body weight (gm) of rats on 15 th day	227.67 \pm 14.250	204.00 \pm 7.797	227.83 \pm 12.7	214.1 \pm 7.1	0.003*

*P \leq 0.05 considered as statistically significant. One way ANOVA

Table -3: Multiple comparison of mean body weight (gm) of rats at 15th day of experiment among groups.

Group I	Group J	Mean Difference (I-J)	Standard Error of Mean	P – value
A	B	23.667*	6.305	0.006
	C	-0.167	6.305	1.000
	D	13.500	6.305	0.174
B	A	-23.667*	6.305	0.006
	C	-23.833*	6.305	0.006
	D	-10.167	6.305	0.394
C	A	0.167	6.305	1.0
	B	23.833*	6.305	0.006
	D	13.667	6.305	0.167
D	A	-13.500	6.305	0.174
	B	10.167	6.305	0.394
	C	-13.667	6.305	0.944

present study.¹⁴ As no such experimental study is carried out to-date on aqueous garlic extract's effect on body weight disturbances produced by MSG, hence the authors here refer to the study carried out by Miyaki et al.¹⁵ who investigated the satiety effects caused by MSG intake and body weight in obese women who were given high fat savory food. The group that took the MSG containing soup exhibited a sufficiently reduced energy intake.¹⁶ Also, the current study showed that aqueous garlic extract was, on the other hand, able to counter the deleterious effects of MSG on the body weights of rats in Group D (both garlic and MSG administered group) though not significantly. This finding can be supplemented by the fact that garlic possesses the properties of being an anti-oxidant, anticancer and antimicrobial agent.¹⁷

CONCLUSION

AGE has ameliorative effect on MSG induced weight loss in adult Wistar rats. Though results are not statistically significant among different groups but weight stabilization was seen when AGE was administered with MSG.

LIMITATIONS OF STUDY

Mechanism of weight reduction by MSG was not validated with weight of different body organs and/or with determination of body mass index. Levels of certain biomarkers may help in augmenting the results of such studies in future.

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AUTHOR'S CONTRIBUTION

AHS: Conception of study and drafting the article.

IF: Revising the article critically for important intellectual content.

TRS, HR, NA&QF: Analysis of data and revising it critically for important intellectual content.

CONFLICT OF INTEREST

None to declare.

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