

# The Histological Alteration of Proximal Part of Aorta Exposed to (MSG) and Protective Effect of an a Lipoic Acid (ALA) in Male Rabbits

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## Abstract

Background. Monosodium Glutamate is one of the most world's most widely used food additives. Its toxic effect have been shown in numerous animal studies, in which study MSG effects on cardiovascular system, therefore, This study was aimed to investigate the effect of alpha lipoic acid(ALA) on the damage in the large blood vessels induce by Mono sodium glutamate. Thirty two male rabbits was divided equally and randomly into four groups as following. Control group in which rabbits where fed with normal diet without supplementation, second group was gived MSG orally (8mg/kg.BW), While animals of third group were given ALA orally (60mg/kg.BW) while animal in fourth group were given orally (MSG 8mg/kg.bw and ALA 60mg/kg.bw), all treatment are extended to 8 weeks. The outcomes of research revealed a significant increased ( $p<0.05$ ) in aortic medial layer thickness in animals administration of MSG in a comparsion with control and groups treated and distortion structure of laminar fibers, endothelial cells lost normal squamous. In addition, there is a significant decreased ( $p<0.05$ ) in medial tunica thicken in animals used ALA combination with MSG, so we noted return the disarranged of architecture tissue near.

**Keywords:** aorta, MSG, protective effect, a lipoic acid

## Introduction

Cardiovascular diseases (CVD) considered one of the main causes of death all the world and more developing countries, CVD, is the most common form of heart disease, CAD is a disease infecting the arterial blood vessel and is generally referred to as "hardening or furring" of the arteries. It is caused by configuration of multiple plaques within the arteries<sup>1, 2, 3</sup>. Atherosclerosis derives from a Greek word, Atheros meaning gruel<sup>4</sup>, Fatty streaks evolve to formation atherosclerotic plaques which is consisted of three components called of inflammatory cell, smooth muscle cell, a fibrous component of-connective tissue , a Fat component of lipids<sup>5</sup>. Monosodium glutamate (MSG) is the sodium salt of the non-essential amino acid glutamic acid. Glutamic acid is one of the most abundant amino acids presented in nature and found both as free glutamate and bound with more amino acids into protein.

Animal proteins may involve about 11 to 22% by weight of glutamic acid, with plant proteins including as much as 40% glutamate<sup>6</sup>. Glutamate is thus presented in a wide variety of foods, and in its free form, where it has been demonstrated to have a flavour enhancing effect, is also exist in relatively high concentrations in some foods such as tomatoes, mushrooms, peas and cheeses. ALA represent as a defensive agent versus hazard factors of cardiovascular disease. ALA may impact the CVD risk via the beneficial action on LDL oxidation, blood lipid profiles(LDL,VLDL,HDL) , plaque formation , hypertension<sup>7</sup>. ALA is a natural antioxidant created in the mitochondria of the liver and more tissues, so it has anti-inflammatory characteristics , ability to scavenge ROS, metal chelating, regenerate glutathione, vitamins (E, C) and diminished the atherosclerotic plaque by it can mending vascular function<sup>8, 9</sup>. The dearth information about role protective to alpha lipoic acid on the distortions in large red artery induce by Mono Sodium Glutamate for this reason, the experimented was deterrent.

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## Materials and Method

### Experimental design

In June –July month's adult eight male rabbit's per group, weight 1300-1500 g/kg which captured from the Karbala conserve were used in this study. First group gives diet without supplementation. Second group was administrated of MSG dissolved by water by orally at dose 8mg/kg B.W, for eight weeks<sup>10</sup>. While rabbits included in third group were gives Alpha lipoic acid dissolved by DMSO orally at dose 60 mg/kg B.W for eight weeks<sup>11</sup>. The experimental rabbits of euthanized by intra muscular administration of diazepam (1mg/1kg) combined with ketamine HCL (30Mg, 1Kg). After thoracic incision, the large artery (aorta) is obtaining and fixed in the 10% neutral buffer formalin. Cross sections was prepared histologically. Routine hematoxylin and eosin stains were used to general structure study, in addition to other special stain (Masson's trichrom stain) to give more histological details<sup>12</sup>. The parameter that thickness medial tunic was measured.

### Statistical Analysis

The collected data were represented by mean  $\pm$  standard deviation. Comparisons were done between rabbits group. The mean of differences between data were estimated.

### Results and Discussions

All histological stains were used in control group of our study appear the structure of elastic artery was consist of three layers, tunic intima which contain endothelium, basal lamina, and sub endothelial connective tissue, smooth muscle cells, internal elastic lamina that represent first layer but, the tunic media composed from greater fenestrated elastic laminae with lesser amount of smooth muscle with collagen fibers second layer thicker evaluated (588.4 $\pm$ 52.8), fig.(1) table(1) while, the third layer connective tissue concentrate collagen with scatter of elastic fibers and vaso vasorum this structure named tunic adventitia fig.(2,A,B). These results superposes many authors' who reported during your researches in differ model animals<sup>13,14</sup> The many studies were to evaluate the effect induced by monosodium glutamate(MSG)

on systems body include cardiovascular system in a rodent, fowls and rats animals these have shown irregular structure of the laminae fibers, thinning and fragmentation of elastic laminae, proliferation of medial smooth muscle, thickened of the aortic artery greatly in tunica intimal<sup>15-17</sup> these similar under line of the histomorphological study in our research of the aortic artery in supplementation rabbits group with MSG revealed the nuclei of endothelial cells in intimal surface were irregular and lost squamous cells specialty with foam cell existences and increased aortic medial thickness measured (1054.3 $\pm$ 39.9),fig.(1)table(1) and deterioration architectural of elastic fibers in tunica media when compared with control rabbit groups figs.(2,C,D; 3, E,F) in addison greater of adipocytes penetrated connective tissue of adventitial layer fig.(4, A,B)

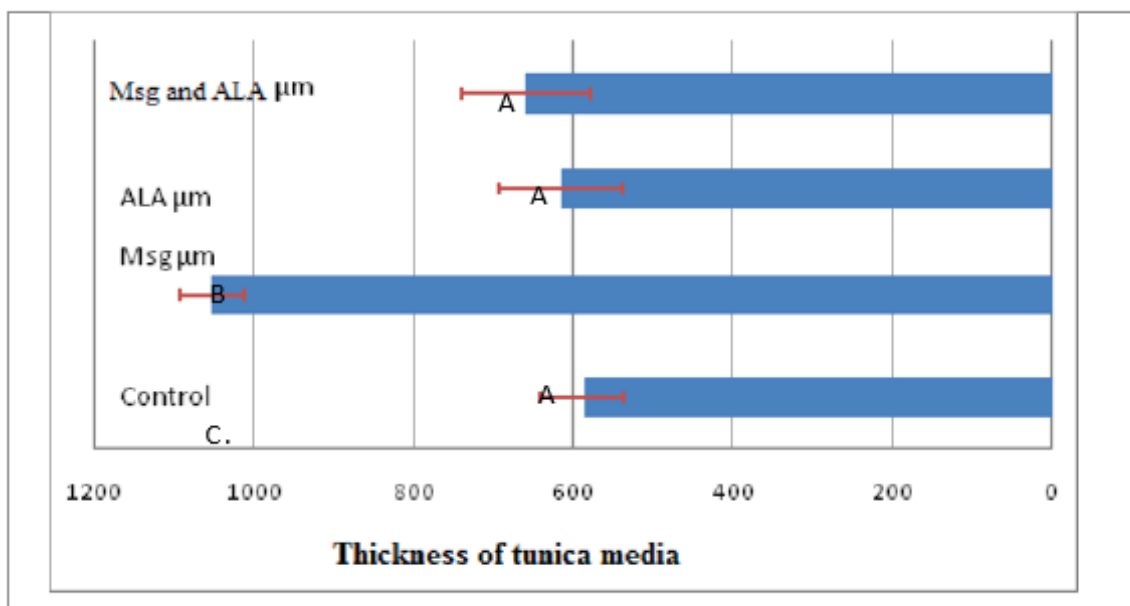
The diabetic and hypertension rats treated with ALA the endothelial cells of intimal layer having squamous property and appear smoother with fewer defect so the smooth muscles don't reactively proliferation and organization of the lamina fibers of tunica media<sup>18, 19</sup> theses results of author similar of our investigation research. In microscopic section examined of the MSG &ALA supplementation rabbits group that shows histomorphological architectural near from the control groups the endothelial cells of intimal layer squamous characteristic so that, when we image analysis observed, decreased aortic media layer thickness, was (660.12  $\pm$ 81),fig.(1) table (1) compared with the treated MSG rabbits group and appear more regulars', more organized structure of lamina fibers and reduced proliferate smooth muscles in tunica media figs. (2, E, F; 3, G, H).

Thioctic acid (ALA) was easily converts dihydrolipoic acid represented reduced form, so it was neutralizes free radicals in both the fatty and watery regions of cells, ,,<sup>20,21</sup> Our outcomes of research, three layers of the aorta in ALA treated rabbit groups (intima, media and serosa) had of normal microscopical details structures and decreased thickened in aortic media evaluated was ( 615.8  $\pm$  77.5) fig (1) table(1) when comperes with MSG treated rabbits group these revealed micrograph (2,G,H;3,C,D) this described assembly who reported author<sup>22</sup>.

**Table (1):** measured thickness tunica media of aortic control and treated rabbits group. Values represent means±SD. Different letters were means significantly (P<0.05) different.

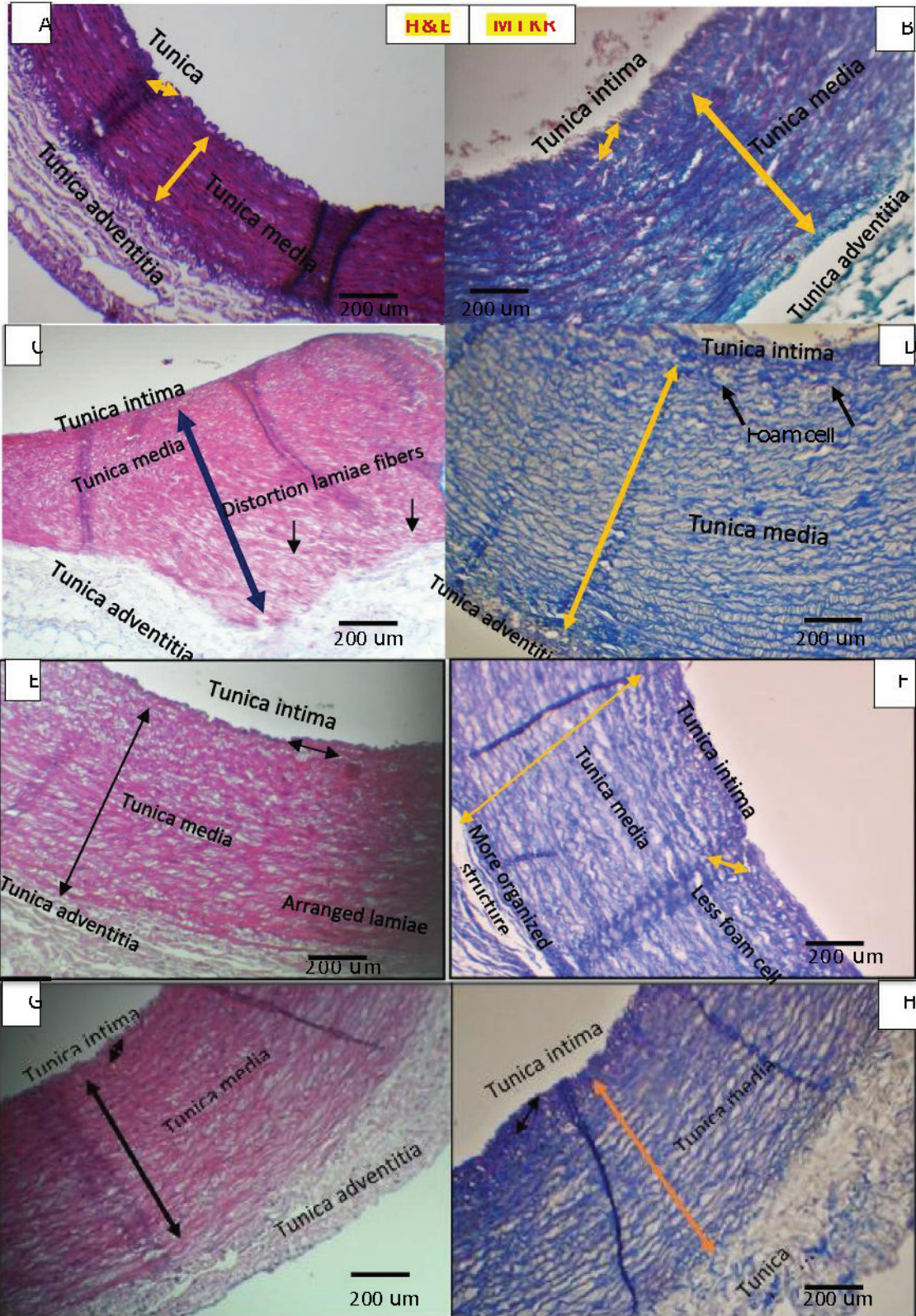
	<b>Control</b>	<b>Msg</b>	<b>Msg &amp; ALA</b>	<b>ALA</b>	<b>P value</b>
parameters	588.4±52.8	1054.3±39.9	660.12 ±81	615.8 ± 77.5	<b>0.04</b>
	A	B	A	A	

The different mean of all three (treatments or parameters) were significantly different from mean of the control group (P<0.05; one-way ANOVA with Turkeys’ method)

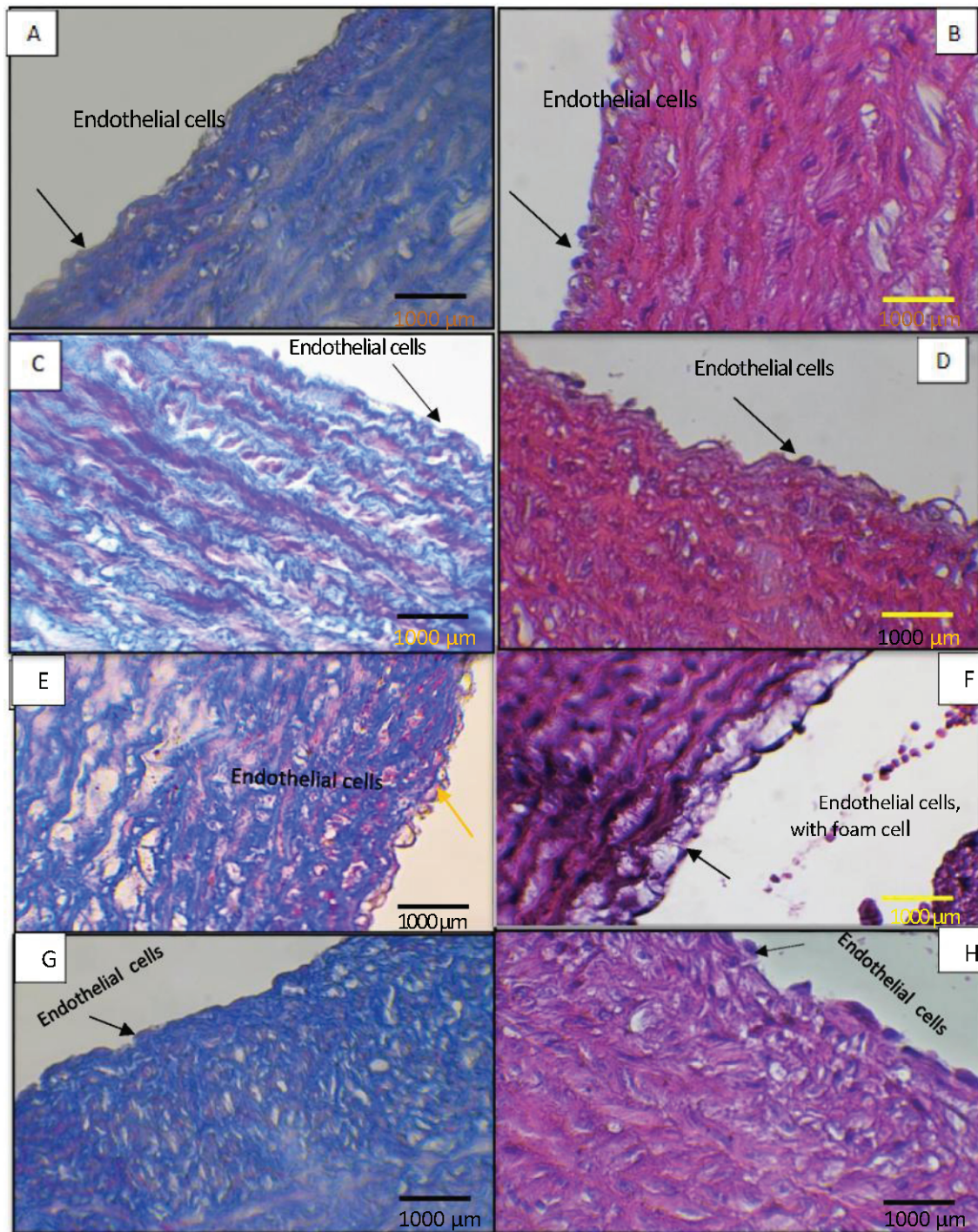


**Figure (1):** The thickness of tunica media of aortic artery in both control and treated male rabbits group. Values represent means±SD. Different letters means significantly (P<0.05) different. Where,

Control male group (C.); monosodium glutamate treated male group (Msg); alpha lipoic acid treated male group (ALA); companied monosodium glutamate and alpha lipoic acid treated male group (Msg & ALA).



**Figure (2)** :A-B. Sections belonging to the control rabbits group, C-D. Belonging to the MSG treated rabbits group revealed thickened in aortic media with disarranged laminae fibers in addition endothelial cells lost squamous structure, E-F. Belonging to the MSG & ALA treated rabbits group, which shows return the normal histological organized, G-H. Belonging to the ALA treated rabbits group, that appear assembly control structure, and Stained with H&E, A, C, E&G stained with MTKR B, D,F&H Scale bar 200 μm



treated rabbits group, which shows return the normal histological organized, and Stained with MTKR: A, C, E&G stained with H&E: B, D,F&H Scale bar 1000 µm

Figure (3): A-B. Sections belonging to the control rabbits group, C-D. Belonging to the ALA treated rabbits group that appear assembly control structure, E-F. Belonging to the MSG treated rabbits group revealed nucleus dis-normal poison so endothelial cells lost squamous structure, with foam cell, G-H. Belonging to the MSG & ALA treated rabbits group, which shows return the normal histological organized, and Stained with MTKR: A, C, E&G stained with H&E: B, D,F&H Scale bar 1000 µm

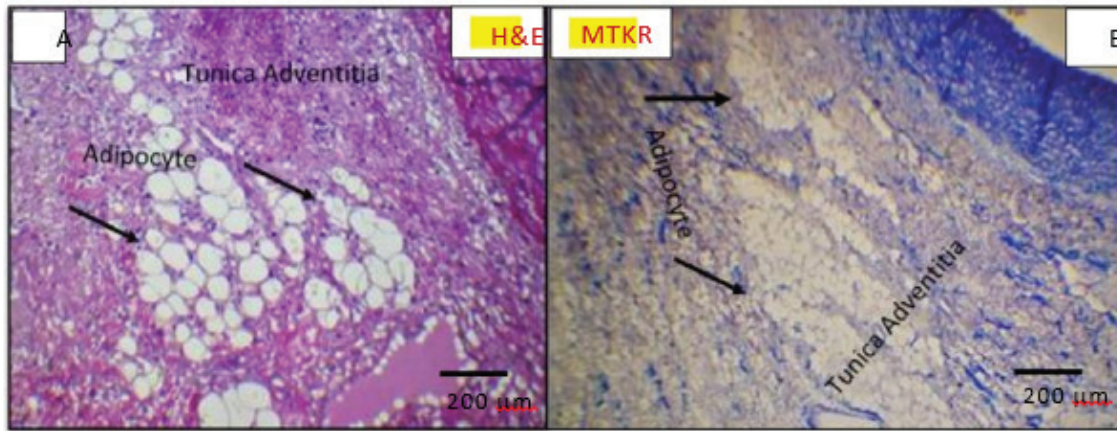


Figure (4): A-B.Sections belonging to the MSG supplementation rabbits group, shows the invaded fat tissue in the tunica adventitia, and Stained with H&E, A.Stained with MTKR B, Scale bar 200 µm

### Conclusion

Study Demonstrated the (ALA) cause improvement the negative changes in the aortic artery.

Key word: ALA, Histological alteration, MSG, Aortic

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