The Healing Effect Of Ferulic Acid in Monosodium Glutamate-Induced Liver Injury

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Background incl. aims
Monosodium glutamate (MSG), a flavor enhancer in prepared foods, can lead to harmful effects in different organs and systems. Based on the literature data, monosodium glutamate is known to cause liver injury by generation of reactive oxygen species leading to damage of lipids, proteins, and DNA by the formation of free radicals (1). Ferulic acid, as a potent antioxidant, is mentioned to ameliorate the harmful effect of biomolecules by suppressing the production of reactive species and the oxidative stress. In this experimental study, MSG-induced liver injury putative healing effect of ferulic acid were assessed at histochemical, transmission electron microscopical and biochemical levels.

Methods
In this study, male Wistar albino rats (7 weeks old, 160-200g) were used and kept in a laboratory environment (Acıbadem University Experimental Animal Laboratory) with a temperature of 22±2°C and a standard light/dark (12/12 hours) cycle throughout the experimental period. Rats were randomly divided into 5 groups (n:8/group). Experimental groups were fed by a standard rat chow and tap water. Control group (Gr 1) was treated with 1 ml of distilled water by gavage every day during the experiment for 38 days. Rats in the DMSO+FA group (Gr 2) were given 1 ml of dimethyl sulfoxide (DMSO) for 28 days and FA solution (25mg/kg, dissolved in DMSO) by gavage in the last 10 days of the experiment. To create an MSG-induced liver injury model, MSG solution (600 mg/kg, dissolved in DMSO) was orally administered to the rats (MSG group-Gr 3) for 28 days (2). MSG+DMSO group (Gr 4) was treated by MSG solution (600 mg/kg, dissolved in DMSO) by gavage for 28 days and 1 ml of DMSO was given by gavage on the last 10 days of the experiment. MSG solution (600 mg/kg) for 28 days and then FA solution (25 mg/kg) on the last 10 days of the experiment were administered by gavage to the rats in the treatment group (MSG+FA-Gr 5) (3). At the end of the experiment the rats were sacrificed under anesthesia. Liver tissues samples were processed for light and transmission electron microscopical evaluations. Paraffin sections were stained with Hematoxylin-eosin (H&E), Masson's trichrome stains and Periodic acid-Schiff reaction (PAS). Histopathological scoring of the liver tissue was performed according to; vacuolization in hepatocyte cytoplasm, sinusoidal dilatation, leukocyte cell infiltration and distribution and amount of connective tissue in the parenchyme, as well as glycogen content within the hepatocytes. Oxidative stress markers, as malondialdehyde (MDA), glutathione (GSH), superoxide dismutase (SOD), total antioxidant capacity (TAS), total oxidant capacity (TOS) and oxidative stress index (OSI) values were measured for biochemical assesments (4).

Results
The light microscopical examinations revealed normal morphology of liver parenchyme in control and DMSO+FA groups. Steatosis and vacuolization in hepatocytes, sinusoidal dilatation, leukocyte infiltration, increased connective tissue in the parenchyme and decreased amount of glycogen in hepatocyte cytoplasm were detected in MSG and MSG+DMSO groups. Based on histopathological scoring, liver tissue injury was significantly reduced in MSG+FA group, compared to MSG and MSG+DMSO groups. Transmission electron microscopy revealed the similar ultrastructural data as in light microscopy to point out a prominent recovery in MSG+FA group. In MSG and MSG+DMSO groups, an increase in MDA,

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TOS and OSI levels were detected whilst GSH, TAS and SOD were decreased. Deteriorated biochemical data has been reversed and ameliorated in MSG+FA group, as the treatment group.

Conclusion
Based on the current biochemical and histopathological data, we could suggest that administration of ferulic acid to rats in this experimental model of MSG-induced liver injury contribute significantly to ameliorate/heal the hepatic damage by regulating the formation of reactive oxygen species.

Keywords:

MSG, Ferulic Acid,Liver, Microscopy.

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