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Effects Of Monosodium Glutamate (MSG) On The Histological Features Of The Spinal Cord Of Adult Wister Rat

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ABSTRACT

An investigation was carried out on the effects of monosodium glutamate (MSG), a commonly used food additive, on the spinal cord of adult Wistar rats. Twenty-four adult Wistar rats weighing between 180-250g were divided into four groups of six rats per group. Graduated does of 6mg, 12mg and 18mg per kilogram body weight were administered orally to three groups of animals labeled A, B and C. The fourth group served as control and received normal physiological saline. The spinal cord of the animals were dissected out and fixed in 10% formal saline. Spinal cord tissues were processed and stained by the Haematoxyline Eosine method. The results showed increased weight in the experimental animals, which is dose dependent. Histological examination of spinal cord tissues revealed a decreased haematoxylin uptake, which is suggestive of increased metabolic activities. This increase was also observed to be dose dependent. Evidence of cell damage and degeneration within the group also seem to be dose dependent.

Keyword: Monosodium Glutamate, Spinal Cord, Food Additive.

In Nigeria, Monosodium glutamate (MSG) is one of the two prevalent industrial food additives. MSG is the common or usual name assigned by the Food Drug Agency (FDA) to the ingredient that contains approximately 78 percent free glutamic acid, 22 percent sodium, and a maximum of 1 percent contaminant (Adrienne 1999). Its origin is from Japan. It was discovered from a nutritious vegetable used by Japanese to enhance the taste of a food called "Kombu" The taste-enhancing component was successively extracted from "Kombu" in 1908 by Dr. Ikeda Kikunae a professor of physical chemistry. He, with Dr. S. Suzuki formed the Ajinomoto Company that began the production and marketing of MSG (Mark Gold 1995).

MSG has no nutritional value and is not a preservative. (Oliver et al, 1991), it does nothing to food, but it does affect the person using it. It is a neurotoxin, which is a poisonous protein complex that acts on the brain and the nervous system. (Phelix, 1990), neurons are over stimulated to the point of exhaustion and cell death. MSG goes to the brain through membranes in the mouth and throat. It also enters the blood stream as MSG laden foods are digested. It leaves the brain with the false impression that it is feeling something tasty. (Merrit, 1990), these effects on the brain will further affect other body functions under its control. If a person has a genetic weakness in a specific part of the brain or had an injury or stroke, the damaged area will be the part that is easily affected and vulnerable to toxins (Mark Gold 1995)

MATERIALS AND METHOD

Twenty-four (24) in-bred adult Wister rats weighing between 180-250 g were purchased from the animal house of the Department of Biochemistry College of Medical Science, University of Calabar. The animals were delivered into four groups of six rats per group they were fed on rat chow and water ad labitum for two weeks in order to acclimatize them to the environment. MSG was purchased in the open market in 3g sachets of well-labeled vedan MSG bags. The crystals were weighed using electronic weighing balance and graduated does of 6m, 12mg and 18mg per kilogram body weight were administered orally to three (3) groups of animals labelled A. B, and C respectively. The fourth group served as control and received normal physiological saline. All the groups were fed on rat chow. At the end of the treatment period of seven weeks all the animals were sacrificed by decapitation in Batches. The spinal cord of the animals were dissected out and fixed in 10% formal saline. The spinal cord tissues were also processed and stained by the haematoxyurin and eosin method.

RESULT

The result is broken into morphological and Histological observations.

Morphological observation:

There was a marked difference in increase of the body weights of the treated group than the control group. Also within the treated group, there was difference in the increase of their body weights, which is dose dependent up the group. It was also noticed that higher dosage groups had more appetites for food than the lower dosage groups and control. An onset of diarrhea around the 5th week of experiment was noticed in the higher dosage groups, which was most pronounced in the highest dosage group.

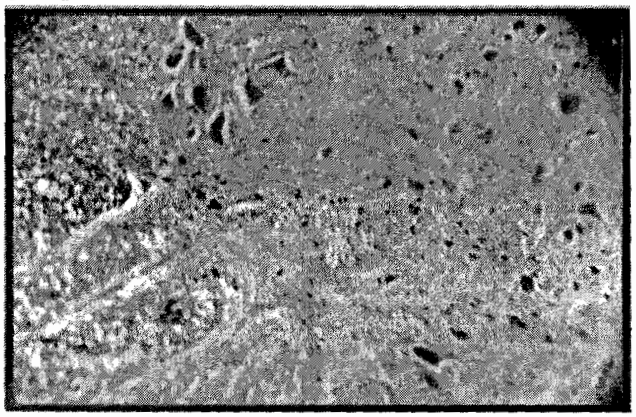

Fig. 1: Section of groups treated with 6mg/kg body weight.

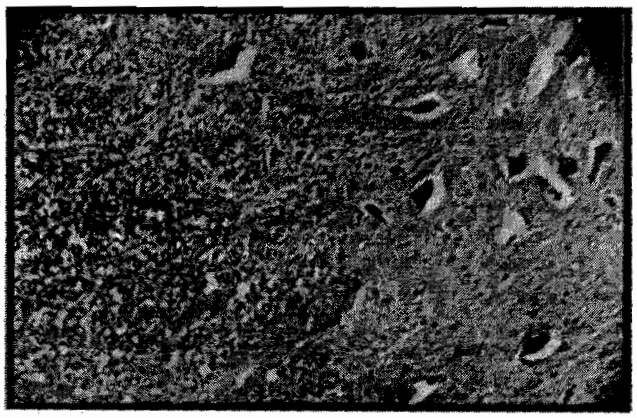

Fig. 2: Histological section of groups treated with 12mg/kg body weight.

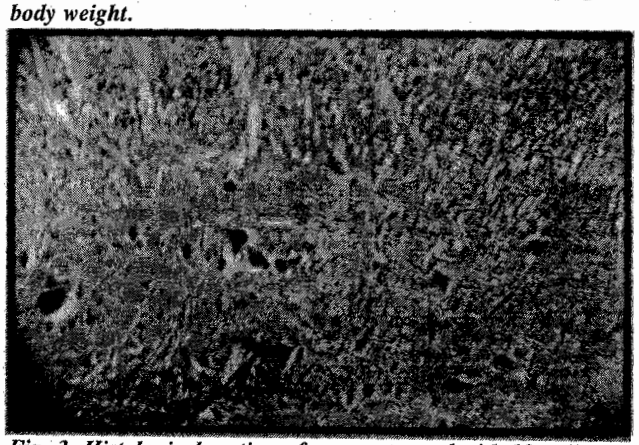

Fig. 3: Histological section of groups treated with 18mg/kg body weight.

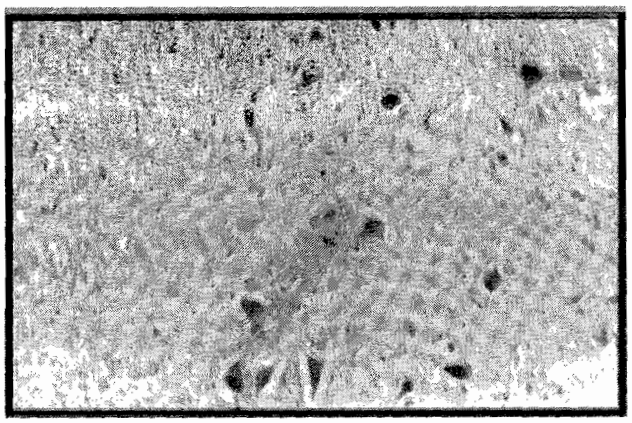

Fig. 4 Control: Groups treated with 0mg of MSS per kg body weight of rats.

Histological Observation:

In the control group the neurons were faintly stained. The cells of the multipoler neurons were deeply basophilic. Section of groups A, B and C (Figs 1,2 and 3) had the nuclei of their cells exhibiting eosinophilia with signs of cell damage including evidence of karyolysis. This neuronal degeneration, which reflects toxicity, was also shown to be dose dependent

DISCUSSION

The pattern of dye up takes across the section from the different groups show intense synthetic activities of these cells, which are dose, dependent. (carlos et al 1983, Russel, 1994) This increase in metabolism is as a result of the excessive absorption of MSG into the Central Nervous system, which leads to exhaustion and cell death. Thus conforming to the name given to it by Russel; "Excitotoxin" (Russel 1994). The evident cell damage, degeneration and karyolysis of the cells of the tissues in the treated groups is evidence of the high toxicity of MSG. This neurotoxicity has been apparent in so many studies before now (Oliver et al 1990, Marrosu et al, 1990, Phelix and Harfle 1990) and in so many other systems of the body (Merrit & Williams 1990, Maiter et al 1991).

Since Researchers have implicated MSG as a contributing factor in learning (MSG controversy 1984) and from the obvious countless reports of risk exposures, disorders and toxicity associated with MSG, it becomes unethical, for the government and the affected agencies to allow the promotion and sale of such industrial product. Today thousands of metric tons of MSG are produced and added to food every year, and in most cases it is not listed on the label, but is hidden by being included as part of other

ingredients, making up as high as 60%. (Russel 1994). Immediate actions ought to be taken and regulations and sale of such industrial products MSG band this product made and the product banned. Where this is not possible, then limitation in the use of the product should be made until further researches on the full side effects come up.

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