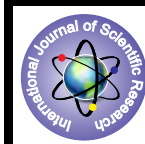


Neurohistopathological Effects of Mercury on Cerebrum of Adult Albino Rat

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Medical Science

KEYWORDS: Albino rats, cerebrum, mercuric chloride, neurotoxicity

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ABSTRACT

Mercury is virtually toxic to every organ of body, including central nervous system. The present study is aimed to observe the histopathological changes in the cerebrum of rat induced by oral administration of mercuric chloride in adult albino rats. A total number of 20 adult albino rats of either sex were included in the present study, consisting of equal numbers in both control and experimental groups. Experimental group received mercuric chloride in distilled water for a period of 15 days, then animals of both groups were anaesthetized with ether and perfused with 10% formalin. Cerebrum was dissected. 10 μ thick sections were obtained by usual histological procedure and were stained with H&E. On light microscopic observation, cerebrum from experimental group revealed pleomorphic changes with pyknosis of nuclei, dense clustering with prominent spongiosis, multiple foci of necrosis with gliosis and congestion of blood capillaries with prominent perivascular fibrosis. It was concluded that mercury has toxic effects on the central nervous system including cerebrum which may explain the clinical manifestation of mercury neurotoxicity.

Introduction

Exposure of mercury can take place more through inhalation rather than through ingestion of contaminated foods and drinks. In Japan, deposition of industrial waste with large quantities of mercury, drew the attention of the scientific society when it affected the local population by triggering signs and symptoms like ataxia, speech impairment, visual field constriction, sensory disturbance, deafness, blindness, tremors, involuntary movements, mental retardation, coma and death (1). Mercury is an occupational hazard for dental staff (2), chloralkali factory workers (3), goldminers (4) etc. Mothers consuming diet containing mercury pass the toxicant to foetus (5) and to infants through breast milk (6). Subtle neurological disorders in children over mercury exposure have been widely reported (7). Disruption of attention, fine motor function and verbal memory due to exposure to low mercury levels in fish eating adults, has been documented (8). Neurohistopathological effects of distortion, diffusion of cells and a widespread necrosis of the cortical neurons, due to mercury intoxication, has been reported (9). In another significant study, microstructural anomalies were seen in cortical region following mercury intoxication (10). The aim of present study was to see the effect of mercury on the histology of cerebrum which may explain the clinical signs and symptoms following mercury intoxication.

Material and Method

Total number of 20 adult albino rats (10 male and 10 female) weighing approximately 120g were used in the present study. 10 rats with equal number of either sex were treated with mercuric chloride (0.330 mg/kg body weight while the remaining 10 rats (5 male and 5 female) served as control group and were given distilled water. Freshly prepared sterile solution of mercuric chloride in distilled water was used for oral administration as drinking water. This concentration was ascertained after a careful trial in order to find maximum survival days, which were 15 days. Then, rats were anaesthetized with ether and perfused with buffered 10% formalin. Brain was dissected out, meninges removed and 3 mm thick coronally sliced pieces were cut from cerebrum and processed for paraffin embedding. Then, 10 μ thick sections were cut with rotary microtome. These sections were stained with H & E and observed under the light microscope.

Observations

Cerebrum of (control group) shows normal distribution of the neurons and the different cells like astrocytes and oligodendrocytes at 40x. On examination, under the light microscope,

the cerebrum of the treated group showed markedly pleomorphic neurons in dense clustering with prominent spongiosis at 40X (Figure 2). Cerebral cortex of experimental group was suggestive of multiple foci of necrosis with gliosis and marked congestion of blood capillaries with prominent perivascular fibrosis (Figure 3)

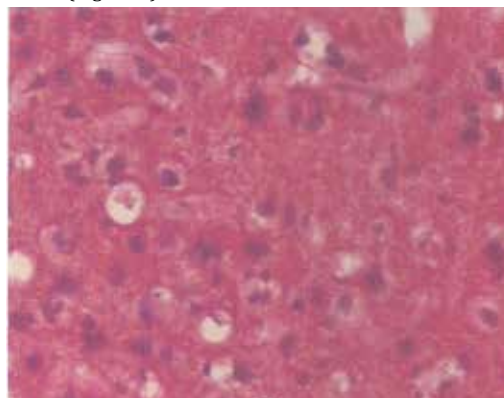


Figure 1: Photomicrograph of cerebrum (control group) shows normal distribution of the neurons and the different cells like astrocytes and oligodendrocytes. Haematoxylin and Eosin \times 40X.

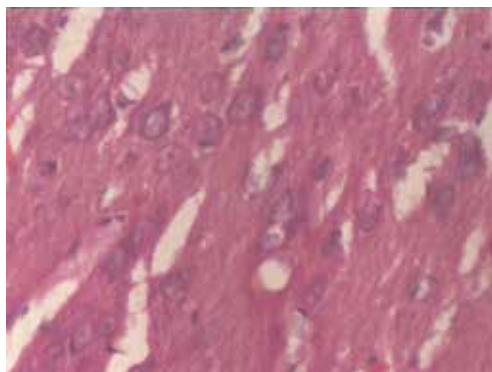


Figure 2: Photomicrograph of cerebrum (experimental group) shows markedly pleomorphic neurons in dense clustering with prominent spongiosis. Haematoxylin and Eosin \times 40X.

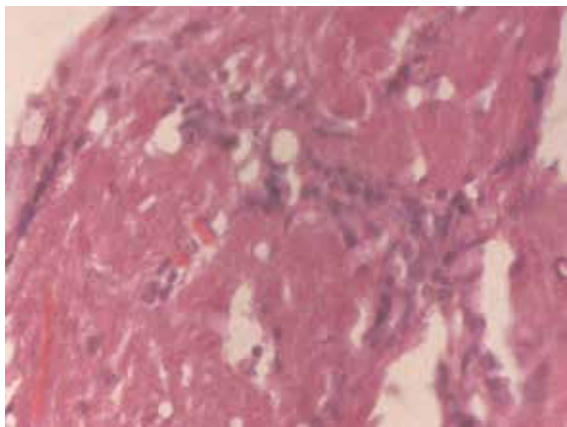


Figure: 3. Photomicrograph of cerebrum (experimental group) shows multiple foci of necrosis with gliosis, congestion of blood capillaries and perivascular fibrosis. Haematoxylin and Eosin x 40X.

Discussion

Histological findings in the present study were suggestive of neurotoxic and degenerative effects of mercury on the cerebrum. These findings are in conformity with other neurohistological studies. In one of the studies, shrinkage of neurons containing pyknotic nuclei in cerebral cortex, was shown (11). Earlier, It was also reported that mercury has neurotoxic effects reflected in its ability to penetrate and damage Blood Brain Barrier system (12), (13). It has also been documented that devel-

oping brain, being a sensitive structure, is vulnerable to the devastating effects of heavy metals like mercury and lead (14). One of the studies, showed pathological lesions in brain secondary to mercuric chloride poisoning (15). Another study has shown that metallic mercury caused necrosis in the brain of rabbits and mice (16). Still another study revealed distortion and diffusion of cells, widespread necrosis of the cortical neurons and multiple foci of necrosis with gliosis (17). The histological findings observed in our study confirmed the cerebral neurotoxicity following mercury poisoning and correlated very well with the histological findings of the other studies.

Conclusion

Exposure of rat to mercury for 15 days produces demonstrable microscopic alterations in the cerebrum.

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