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Developmental changes in adult male albino rat due to manganese

Deepshikha, B.P.Yadav Bipra & Arun Kumar*

University Department of Zoology, B.N.M. University, Madhepura, Bihar, India

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Abstract: Manganese is a compound which is essential for normal physiological functions of the body but however when taken in excessive amount may lead to physiological disorders which may even lead to abnormal development of the reproductive tissues & several structural changes with certain hormonal changes too. Food, water, tea etc. etc are the basic sources of Mn in our daily life, however pesticides and other occupational exposure are also considered as toxic potential source.

Key words: Manganese, Parkinson disease, myometrium, morphological changes

INTRODUCTION

Metals are the constituents that are found in nature in considerable amount all over the earth, crust, in plants, in animals, water bodies etc, such as lead, mercury, cobalt, zinc etc. Most of these metals are very important for the physiological as well as biological functions of the body & when taken in inadequate amount may lead to deficiency or some other disease in different organisms at different levels¹. Excessive Mn may also cause manganism, which is a type of neurodegenerative disorder which has the symptoms like those of Parkinson's disease^{2,3}. Metal manufacturing industries, compounds containing metals such as pesticides, fertilizers are the important source of metal toxicity that reaches to human & animals through its diffusion & transportation to water bodies.⁴ Manganese is regarded as one of the very important dietary elements. In the body of human approximately 12 mg of Mn is present

and usually in bones. There are several studies which suggest that most of the neurological effects or dysfunction is usually related to dose⁵. The normal requirements of Mn are constitutively fulfilled by diet, which is the basic source of Mn while in very minor amount contributed by air & water. There are several studies which show that manganese in air & water may lead to intellectual impairment in school children. There are numbers of research done that shows the several biochemical changes due to manganese intake. There are various papers related to toxic effects of manganese on the mammalian reproductive cells leading to lower sperm count and quality of semen⁶.

MATERIAL & METHODS

Animals treated

For carrying out the research based on the effect of manganese on development of mice 20 female pregnant mice were bought from the local market of Madhepura.

*Corresponding author :

Phone : 9006991000

E-mail : prf.arunkumar@gmail.com

These mice were then kept in the cage in university department under the 12 hours day and night cycles at normal room temperature.

Experiment performed

The selected pregnant female mice were then divided into four groups group a, group b, group c and group d. In group a, mice of control group were kept which were fed with normal tap water and food. Group b mice were fed with 1.0mg/kg manganese mixed in diet, group c mice were fed with 10mg/kg of Mn^{2+} while group d mice were fed with 30mg/kg of Mn^{2+} .

Physical Evaluation

For the physical evaluation all the physical status including weight of the mice were noted down so that study on physical status can be observed easily.

Histological evaluation

For histological evaluation the treated mice were sacrificed & the different reproductive tissues including ovary, oviduct & uterus were dissected out for the further studies following different steps. The step includes the following:-

- Sacrificing of animals
- Taking out of reproductive tissue.
- Keeping the tissue in 4% paraformaldehyde
- Dehydrating of the tissue in xylene or ethanol
- Embedding of the tissue in paraffin
- Sectioning of the tissue
- Staining of the sectioned tissue by Eosin
- Observation under the microscope.

For the analysis of FSH & LH levels ELISA test was performed for its complete study.

RESULT & DISCUSSION

The result on the toxic effect of manganese on the female mice shows that there was great variation in the functional activity of both groups of the mice.

Weight of the tissue

When the weight of the ovary, uterus oviduct was done there was found great variation in the mice treated with manganese compared to control group. The weight of the ovary of group 4 was very less in contrast to other group of mice which has been shown below:-

Group a> Group b> Group c> Group d

Similar result was obtained with the weight of uterus & oviduct.

Histological observation

When the thin section of the reproductive tissues was observed under the electronic microscope there was seen certain morphological changes in the structure, these findings has also been given in different investigations⁷. The myometrium layer became thick with exposure to Mn^{2+} . Thus there was increase in the thickness of myometrium with increase in the magnesium dose. Several studies on the thickening of the myometrium shows that it can leads to reduction of proliferation activity bringing about irregularity in the fetus development.

There was also seen certain drawback in FSH & LH level with intake of higher doses of Mg. FSH level decreased with increase in the dose, thus mice kept in group d had less FSH formation which is one of the symptoms of infertility. One of the factors resulting in the hormonal changes may be due to structural changes of the ovary due to excessive Mn intake. While observation on LH showed that there was very minute change in its level due to Mn^{2+} intake.

Thus the studies shows that exposure of Mn^{2+} in the female mice lead to variation in the weight as well as histological morphology of the reproductive tissues which is one of the drawback for increasing the fertility rate of mammals and thus functioning as toxic to both the fetus & embryo⁸.

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