

Research Article

Evaluation of Impact of Endosulfan on Histopathological Alteration of Kidney of Mice

J.K.Singh, A.Nath, Arun Kumar, Md.Ali and Ranjit Kumar*

Mahavir Cancer Institute & Research Centre, Phulwarisharif,

Patna (Bihar), India

ABSTRACT

It is now well understood that the indiscriminate use of agrochemicals under conventional agriculture not only causes severe health hazards for human beings but also has numerous other side effects on the environment including destruction of the biodiversity. Endosulfan is a pesticide belonging to the organochlorine group of pesticides, under the Cyclodiene subgroup. It is used in vegetables, fruits and timber crops. Present study illustrates effect of endosulfan on histopathology of Kidney of mice. Mice were divided into group of 10 for each control and treated group. Treated group receives 2 mg/kg b.w/day endosulfan for three and five weeks. It is observed that in control group cortex and medulla region of kidney were well organized. Glomerulus, bowmens capsule, PCT and DCT were normal. While in endosulfan 2mg/kg b.w/ day for three weeks administered group clustered cells of bowmens capsule and glomerulus with prominent vacuolization in cortex region of kidney were observed. Degenerated medulla region were also observed. Endosulfan 2mg/kg b.w/ day for five weeks administered group show Clustered nuclei in Glomerulus, rudimentary bowmens capsule were also observed. Vacuolization were observed in glomerulus scattered cytoplasm were also observed on cortex region of kidney cortex region of kidney. Distal convoluted tubule and collecting duct were observed with degenerated cytoplasm which causes improper absorption of water causing polyuria condition. It finally indicates that histopathological alteration in kidney with degenerated Glomerulus, proximal convoluted tubule and collecting duct leading to renal disfunction in mice due to improper filtration, absorption and re-absorption process.

Key words: Glomerulus, PCT, DCT, Polyuria, renal dysfunction.

INTRODUCTION

Now a day's farmers were using pesticide frequently for their crops. After green revolution Indian economy become self-reliant in food production as well as also been able to generate a sizable surplus for export. However, the high doses of chemical fertilizers and pesticides, which have been used under this 'conventional' farming technology are now causing severe environmental and health hazards, including the contamination of ground water. It is now well understood that the indiscriminate use of agrochemicals under conventional agriculture not only causes severe health hazards for human beings but also has numerous other side effects on the environment including destruction of the biodiversity. Endosulfan is a pesticide belonging to the organochlorine group of pesticides, under the Cyclodiene subgroup. It is used in vegetables, fruits, paddy, cotton, cashew, tea, coffee, tobacco and timber crops¹. It is also used as a wood preservative and to control tse-tse flies and termites². It is not recommended for household use. Intentional misuse of endosulfan for killing fish^{3,4} and snails has also been reported. Endosulfan was also reported as used deliberately as a method of removing unwanted fish from lakes before restoring⁵. In India it is used against 48 crops out of 68 mainly harvested crops. It is mainly used in cotton field as well as wheat and rice

field. The cyclodiene compounds antagonize the action of the neurotransmitter gamma-aminobutyric acid (GABA), which induces the uptake of chloride ions by neurons. The blockage of this activity by cyclodiene insecticides results in only partial repolarization of the neuron and a state of uncontrolled excitation. These contaminant also affect corpus leuteum and follicular cells In-Vitro fertilization⁶.

Present study illustrate effect of endosulfan on histopathology of Kidney of mice.

MATERIALS AND METHODS

Experiments were done on Swiss albino mice (*Mus musculus*). The weights of the mice were ranging from 30-35 gm of 10 weeks of age. The temperature of the mice experimentation room is in the range of 24⁰C–28⁰C. Twelve hours of light and twelve hours of darkness have been provided in the room for their optimal growth and reproduction. The light intensity and humidity of the room was optimal which were susceptible to the mice. As the mice have acute sense of hearing the level of noise in the room was reduced to the minimum. The laboratory mice were fed on "In laboratory prepared enriched bread". Mice were divided into group of 10 for each control and treated group. Treated group receives 2 mg/kg b.w/day endosulfan for three and five weeks. After completion of period mice were sacrificed and kidney were

*Author for correspondence: ranjitzool17@gmail.com

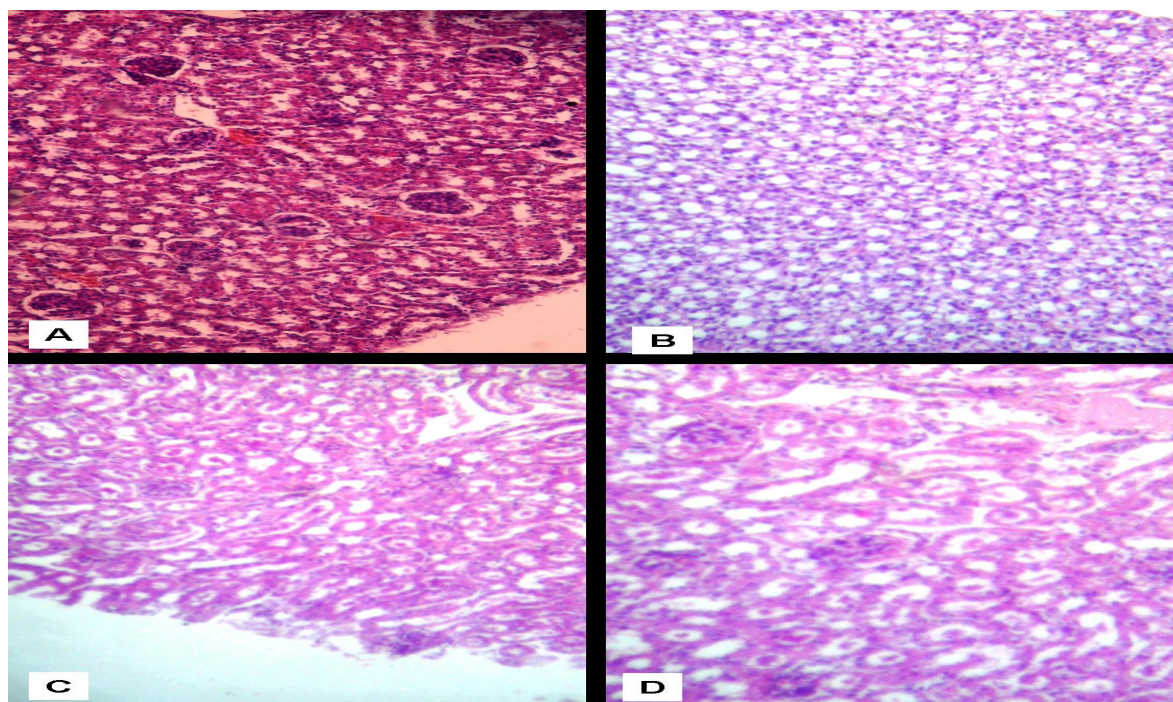


PLATE -I

Microphotographs section of Kidney of control and endosulfan three weeks administered mice stained with haematoxyline and eosin

- Fig .A. T.S of kidney of control mice showing well organized cortex and medulla region of kidney. X200
- Fig .B. T.S of kidney of control mice showing Glomerulus, bowmens capsule, PCT and DCT in normal condition. X200
- Fig .C. T.S of kidney of endosulfan administered mice for three weeks @ 2mg/kg b.w/ day showing clustered cells of bowmens capsule and glomerulus with prominent vacuolization in cortex region of kidney. Degenerated medulla region were also observed. X200
- Fig .D. T.S of kidney of endosulfan administered mice for three weeks @ 2mg/kg b.w/ day showing degeneration in proximal convoluted tubule and Distal convoluted tubules. X300

removed washed properly in normal saline and fixed in neutral formaline for light microscopy.

RESULTS

It is observed that in control group cortex and medulla region of kidney were well organized. Glomerulus, bowmens capsule, PCT and DCT were normal (Plate-I, Fig-A&B). While in endosulfan 2mg/kg b.w/ day for three weeks administered group show clustered cells of bowmens capsule and glomerulus with prominent vacuolization in cortex region of kidney. Degenerated medulla region were also observed (Plate-I, Fig-C). Degeneration were observed in proximal convoluted tubule and Distal convoluted tubules (Plate-I, Fig-D).

Endosulfan 2mg/kg b.w/ day for five weeks administered group show Clustered nuclei in Glomerulus, rudimentary bowmens capsule were also observed (Plate-II, Fig-A). Vacuolization were observed in glomerulus scattered cytoplasm were also observed on cortex region of kidney cortex region of kidney (Plate-II, Fig-B). Degenerated medulla region were also observed with scanty nucleus on distal

convoluted tubules (Plate-II, Fig-C). Degeneration was observed in proximal convoluted tubule and Distal convoluted tubules with rudimentary cytoplasmic material (Plate-II, Fig-D).

Discussion

The toxicity of various pesticides is of general importance because of their wide use in agriculture. While these pesticides destroy insects, they may have a direct action on the reproduction of birds and mammals confined to the treated fields. Diminished renal function of various species following consumption of diets containing residues of DDT (organochlorine compound) have been suggested by several reports ^{7, 8, 9}. It has found that DDT and its closely related compounds exhibited estrogenic effects ¹⁰. Reports indicate that o-p'-DDT and p-p'-DDT mimic various hormonal actions of oestrogen in various species of birds and mammals ⁷. Dichlorodiphenylchloroethylene (p,p0-DDE), the metabolite of DDT (dichlorodiphenylchloroethane), is one of the most abundant persistent metabolites of

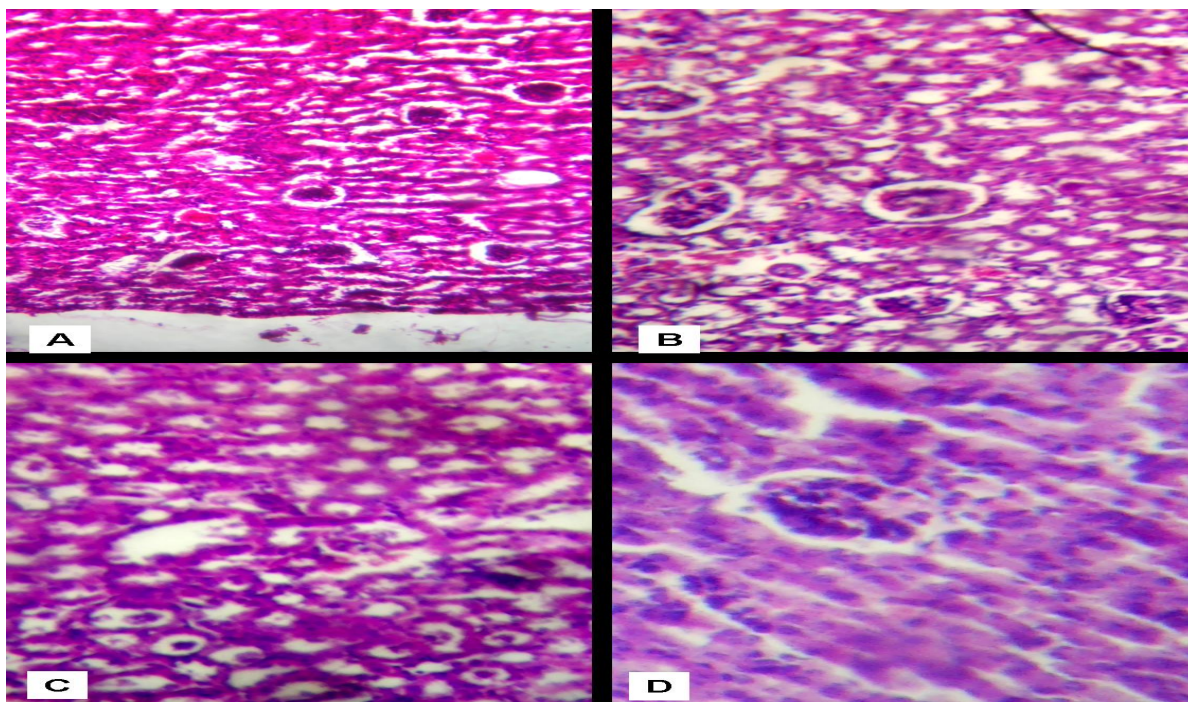


PLATE –II

Microphotographs section of kidney of endosulfan five weeks administered mice stained with haematoxyline and eosin

- Fig .A. T.S of kidney of endosulfan administered mice for five weeks @ 2mg/kg b.w/ day showing clustered nuclei in glomerulus and rudimentary bowmens capsule were also observed. X200
- Fig .B. T.S of kidney of endosulfan administered mice for five weeks @ 2mg/kg b.w/ day showing vacuolization in glomerulus scattered cytoplasm. X400
- Fig .C. T.S of kidney of endosulfan administered mice for five weeks @ 2mg/kg b.w/ day showing degenerated medulla region with scanty nuclus on distal convoluted tubules. X400
- Fig .D. T.S of ovary of endosulfan administered mice for five weeks @ 2mg/kg b.w/ day showing degeneration in proximal convoluted tubule and Distal convoluted tubules with rudimentary cytoplasmic material. X600

insecticides found in the environment ¹¹. Present study illustrates effect of pesticidal exposure on renal imbalance due to degeneration of glomerulus and bowmens capsule of kidney. Proximal convoluted tubule were also rudimentary in structure which hampers reabsorption of water, sugar, some protein and required ions causing electrolyte imbalance in body. Distal convoluted tubule and collecting duct were observed with degenerated cytoplasm which causes improper absorption of water causing polyuria condition. These impacts were increased after increased period of dose of endosulfan.

Conclusion:

It is finally concluded that histopathological alteration in kidney with degenerated Glomerulus, proximal convoluted tubule and collecting duct leading to renal disfunction in mice due to improper filtration, absorption and re-absorption process.

Acknowledgement

The authors are thankful to Mahavir Cancer Sansthan for providing infrastructural facility during this work.

We are also thankful to our entire research team who provide us every support durin this study.

References

1. Schaefer WR, Hermann T, Meinhold-Heerlein I, Deppert WR & Zahradnik HP 2000, Exposure of human endometrium to environmental estrogens, antiandrogens, and organochlorine compounds. *Fertility and Sterility* 74 558–563.
2. Anon (1984). Environment Health Criteria 40- Endosulfan. IPCS (International Programme on Chemical Safety) – WHO Geneva.
3. Anon (Dec 2002).Regional Based Assessment of Persistent Toxic Substances – Indian Ocean Regional Report – Chemicals – United Nations Environmental Programme – Global Environment Facility (UNEP – GEF).
4. Anon (2002) Death in Small Doses; Combodia’s Pesticide problems and Solutions- A report by Environmental Justice

- Foundation, London, UK . Internet site-
www.ejfoundation.org.
5. Medina D. Current concepts of selenium and mammary tumorigenesis. In: Medina D, Kidwell W, Heppner GH, Anderson E, editors. Cellular and molecular biology of mammary cancer. New York: Plenum press; 1991, p 479.
 6. Younglai EV, Foster WG, Hughes EG, Trim K & Jarrell JF 2002 Levels of environmental contaminants in human follicular fluid, serum and seminal plasma of couples undergoing in vitro fertilization. Archives of Environmental Contamination and Toxicology 43 121–126.
 7. Bitman J., Cecil H.C., Harris S.J. and Fries G.F. (1968) : Estrogenic activity of o-p'-DDT in mammalian uterus and avian oviduct. Science, 162:371-372.
 8. Welch R.M., Levin W. and Conney A.H. (1969) : Estrogenic action of DDT and its analogs. Toxicol. Appl. Pharmacol. 14:358-367.
 9. Kupfer D. and Bulger W.H. (1976) : Studies on the mechanism of estrogenic actions of o,p'-DDT : interactions with the estrogen receptors. Pesticide Biochem. And Physiol. 6:561- 570.
 10. Heinrichs W.L., Gellert R.J., Bakke J.L. and Lawrence N.L.(1971) : DDT administrated to neonatal rats induced persistent estrus. Science, N.Y. 173:642- 643.
 11. Wagner U, Schlebusch H, van der Ven H, van der Ven K, Diedrich K & Krebs D 1990 Accumulation of pollutants in the genital tract of sterility patients. Journal of Clinical Chemistry and Clinical Biochemistry 28 683–688.