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NEUROHISTOLOGICAL STUDY ON THE EFFECT OF PRALLETHRIN VAPOURS ON SPINAL CORD OF ALBINO RAT

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ABSTRACT

The Prallethrin is a synthetic form of natural Pyrethrin and due to their highly insecticidal properties has achieved widespread agricultural and environmental health applications. This is commonly used as mosquito repellent in most houses throughout the year, during night. Exposing the adults and children to its vapour.Adult male Charles Foster rats were exposed to 3.2%w/v of prallethrin for 12hrs daily for a period of 90 days. Neurohistological examination showed that inhalation of Prallethrin based MR can damage the grey and white matter of spinal cord.Hence it was concluded that prolonged exposure to the prallethrin vapours are neurotoxic and one should be cautious,while using.

Keywords: Neurohistological study, Prallethrin,insecticide,spinal cord,adult rats.

INTRODUCTION

The prallethrin is a form of Pyrethroids which are derivatives of natural Pyrethrins [1,2]. The latter are highly insecticidal, therefore considered for agricultural and environmental health applications. These are commonly used as mosquito repellent to protect humans against attack by mosquitoes.In developing countries,such repellents are widely used in most houses for years especially during nights. As a result,adults and children are exposed to the vapour of Pyrethroid containing mosquito repellent[3] Male mice exposed to the smoke of mosquito coil containing D-allethrin(at airborne particle concentration) have shown morphological changes in the repiratory system[4]. Short term exposure to bioallethrin has been reported to cause irritation of eyes,skin and respiratory tract along with neurotoxic effects[5,6,7]. Studies have demonstrated that the developing nervous system is especially vulnerable if exposed to MR during early stages of development(critical brain growth period).Most of the toxicological and physiological investigations concerning the effects of pyrethroids have been performed on adult animals receiving high doses and on in vitro systems using nerve membrane preparations[8,9,10] The study by takes into account the neurotoxic effects of Pyrthroids on the immature mouse brain[11].There are also literatures pertaining to the adverse effect of Pyrethroid based mosquito repellent on infants causing significant abnormalities affecting the CNS by breaching blood brain barrier.With reports of increased incidence of

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Pyrethroid induced neurotoxicity and increased usage of Pyrethroid based compounds for household pest control,the study of their effect on general masses becomes relevant,especially when there is growing evidence that indoor exposure to pesticide is worldwide[12,13,14]and it is interesting to note that there is higher pesticide concentration in urban compared to rural areas[15]. Although there are several studies on the neurotoxic effects and the effects on functional integrity of developing blood brain barrier following exposure to pyrethroids,there are very few studies on the structural integrity of CNS after exposure to mosquito repellent containing pyrethroids.The aim of present study is to assess whether Pyrethroid based mosquito repellent can affect the white and grey matter of spinal cord on prolonged inhalation in adult albino rats.

MATERIAL AND METHODS

ANIMALS- Adult male Charles Foster rats,weighing between 120-150 gm were used in this experiment.They were housed in unit plastic cages (36cm × 22cm × 14cm) and provided with standard pellet laboratory diet(LIPTON INDIA LIMITED)and water ad-libitum.The cages were placed in a closed room (180/240cm). The animals in experimental group were exposed to 3.2%w/v of prallethrin for 12hrs daily for a period of 90 days.The control animals were kept under ideal conditions without exposure to prallethrin vapours.The permission was sought from Institutional Animals Ethics Committee,for using rats for study.

NEUROHISTOLOGICAL TECHNIQUES

After 90 days of exposure the animals from both groups were anaesthetized and perfused.The brain was dissected out from dorsal aspects.Sections of 5μm thickness from spinal cord were prepared for neurohistological examination. Histological stains used were (a) Haematoxylin and eosin (b) Kluver barara.

OBSERVATION AND RESULT

Haematoxylin and Eosin

H&E stained section of spinal cord of the experimental animals showed numerous small to medium sized vacuoles with fewer and lightly stained nuclei(Fig 1.1&1. 2).The high power magnification showed well stained nuclei with abundant nissl's substance in the control,The experimental showed smudgy nuclei,disintegrating neuron,nissl's dissolution and vacuoles(fig 2.1&2.2)

Kluver Barrara Techinque

On 100x magnification showed an intact meshwork of myelinated nerve fibre bundles taking intense blue stain.The experimental showed an increase in vascularity and disruption of fibre bundles(fig 5&6)

On 400x magnification-The control showed intact meshwork of fibres.The experimental showed dilated capillaries,numerous vacuoles,disruption of fibre bundle and engulfment of damaged myelin(fig 4.1, 4.2)

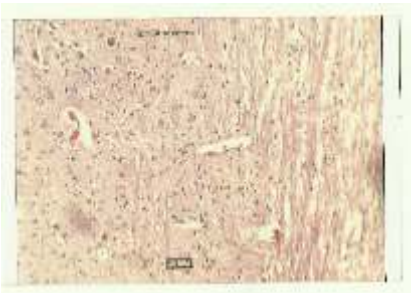

Fig 1- H&E, Stain Control (LP)

Fig 2- H&E, Experimental (10X, LP)

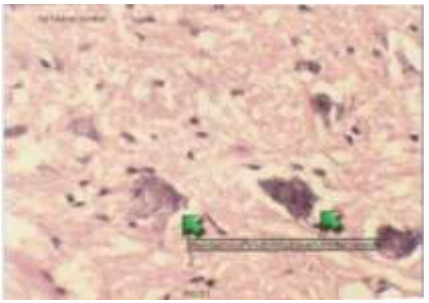

Fig 3- H&E,Control,(HP, 40X)

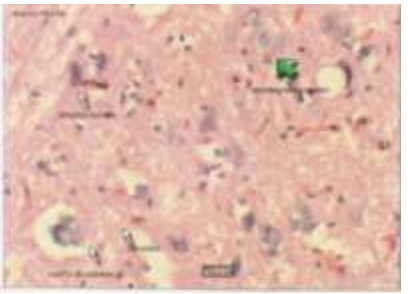

Fig 4- H&E, (Experimental,HP, 40X)

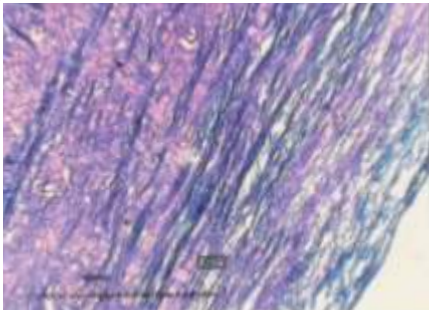

Fig 5- kluver Barrara,Control, (LP, 10X)

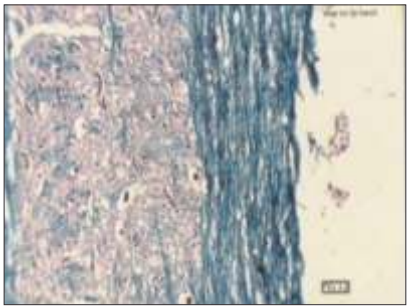

Fig 6- Kluver Barrara, Experimental,(LP, 10X)

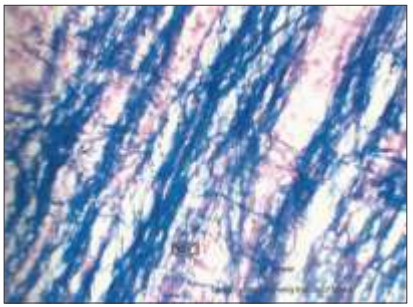

Fig 7- Spinal Cord Control albino rat, Kluver Barrara technique (400X)

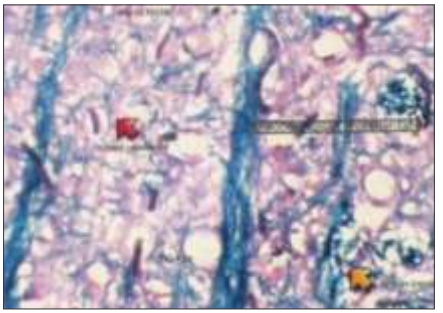

Fig 8- Kluver Barrara Experimental (HP, 40X)

DISCUSSION

Post-exposure symptoms of pyrethroid compounds are tremor, choreoathetosis and salivation.[11] (Pyrethroids are reported to prolong the sodium ion channel opening,thereby increasing in the sodium current inflow,which in turn may lead to hypertension and convulsion,followed by paralysis; studies show the relative potencies for acute effects of pyrethroids on motor function in rats and found that all pyrethroids,regardless of structural class,produced dose-dependent decreases in motor activity.The dosage and route of administration was acute and oral.[16,17]

The present study has shown that there were changes in the spinal cord of adult male rat following exposure to 3.2% w/v of prallethrin vapours.

CONCLUSION

In the presence of such profound effects,evident in the histological sections there are possibilities of effect on behavior and learning i.e psychomotor effect which maybe associated with biochemical changes,which require further study.

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