

Effect of Parathion, an Organophosphorous Compound on estrous cycle of female *Rattus ratus*

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Abstract

20 adult female rats *Rattus ratus* were exposed with 5 ppm of parathion (organophosphorus compound) for 60 days and their vaginal smears were examined to observe the estrous cycle. It is very axiomatic from the results that estrous cycle has been disrupted in experimental animal treated with parathion, which has been observed by direct fall in number of estrous cycles in treated animal as compared to control.

Introduction

During reproductive life span of female mammals the ovary exhibits cyclic changes under the influence of pituitary gonadotropins and expels ova periodically. The exposure of various organophosphorous pesticide or insecticides determines the detrimental effect on reproductive function (Ronald 1997, Wevstorand Wringnaate 1968). These are highly toxic agricultural chemicals with wide variation in toxicity between different species (Janardhan *et al.* 1986). In women if primordial follicle are destroyed extensively they cannot be regenerated. This can cause premature ovarian failure, early menopause (Hirhifield 1991, Hoyer and Sipes 1996). During the estrous cycle the vaginal epithelium shows marked changes resulting in corresponding changes in the luminal cell population. These change provide a reliable index of ovarian activity to determine the reproductive stage of the animal vaginal smear taken at different stages for the cycle, shows characteristic cell population. An attempt has been made to analyze the reproductive toxicity of parathion on female *Rattus ratus*.

Material and Methods

The animal taken- Three months old female *Rattus ratus* mice, weighing between 28-35g showing regular 4-5 days estrous cycle were selected randomly from breeding stock. The mice were housed two per cage of ten groups in 30x30x15 cm stainless steel wires with proper aeration and

Parathion Administration: Technical grade commercial Parathion "KILDOT-D" of Kilpest India Ltd. Bhopal was dissolved in sterile distilled water at the concentration of 5 ppm and supplied as sole source of drinking water. Two groups of mice were supplied with sterile drinking water and observed as control.

The mice were maintained at environment temperature and 12h : 12h L/D light periods and supplied the pellet diet "Gold Mohar" (Hindustan Lever Ltd. Mumbai) throughout the study.

Vaginal smear preparation: Beginning from first day of administration of water. The phases of estrous cycle was determined by observing the vaginal smear in the morning (0800 h to 1000h) as described by Cooper *et al.* The Vaginal smear was Stained with giemsa solution (20-30 min) and observed by light microscope. Care was taken to avoid mechanical stimulation of the cervix during this procedure, to prevent pseudopregnancy. Only one attempt was made to obtain each smear.

Results

The controlled mice exhibited regular estrous cycle and normal duration of each phases of estrous cycle while treated female has shown a drastic and significant decrease in the number of estrous cycle. It is very apparent that there are irregular and disrupted changes occurs in administered animals. As per the results in given table it is very axiomatic that control animal shows 13 ± 0.22 to 14 ± 0.25 estrous cycles while in treated animal it has found to be 08 ± 0.00 to 11 ± 0.23 cycle with standard deviation of 10 ± 2.21 cycles during treatment of 60 days.

Table: Effect on estrous cycle in *Rattus rattus* mice after oral exposure to parathion

Group	Treatment Dose of Parathion	Number of Mice	Number of Cycles
Control-1	Nil	2	14 ± 0.25
Control-2	Nil	2	13 ± 0.22
Group-1	5ppm	2	11 ± 0.25
Group-2	5ppm	2	08 ± 0.00
Group-3	5ppm	2	13 ± 2.00
Group-4	5ppm	2	09 ± 0.16
Group-5	5ppm	2	10 ± 2.21
Group-6	5ppm	2	09 ± 0.28
Group-7	5ppm	2	11 ± 0.23
Group-8	5ppm	2	09 ± 0.19

Discussion

A significant change has been observed in estrous cycle of parathion administered female *Rattus rattus*. Cyclic changes of the vaginal smear observed in the estrous cycle gives a reasonable index of the ovarian activity and its hormonal synthesis of estrogen and progesterone (Prakash *et al.*). The levels of these hormones are controlled by hypothalamus releasing gonadal hormones and pituitary gonadotropins (Lener 1969). As per the results obtained from the controlled mice the duration of estrous cycle in normal female rat is 4-5 days while in treated animals an irregular, incomplete and interrupted estrous duration has been observed; it may be due to the hormonal imbalance, immature follicle formation and inhibition of cellular activities in ovary. Recently similar results have been reported that the rats treated with a carbamate fungicide mancozeb causes a significant decrease in the number of estrous cycle and the duration of proestrus, estrus and metestrus with a concomitant significant increase in diestrus phase (Gupta and Kadal 1989). Similar results have been reported with other organochlorine pesticides like DDT, chlordane, methoxychlor and dicofol showed a capacity to induce the persistent vaginal estrus, thereby affecting the number of estrous cycle resulting from the hormonal imbalance and prolonged estrus (Welch *et al.* 1969, Jadav and Kanti 1999). The reason behind the drastic decrease in estrous cycles is the reduced synthesis of steroids in the ovary, causing imbalance in the estrogen: progesterone ratio. Further investigation on the mechanism of parathion ovarian toxicity will be necessary.

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