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INFLUENCE OF LAMBDA (SYNTHETIC PYRETHROIDS) ON FERTILITY AND BLOOD PARAMETERS IN MALE RATS.

By

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SUMMARY

Oral administration of lambda in a doses of 1.6 and 4.0mg/kg b.wt. daily for 65 successive days significantly decreased the weight of sexual organs, sperm cell concentration, sperm motility and the percentage of seminiferous tubules containing spermatozoa while, the sperm abnormalities were increased. Moreover, the red blood cells, packed cell volume and haemoglobin concentrations were decreased while, the white blood cells were increased due to the neutrophilia and lymphopenia. The level of testosterone was not changed. The residual pattern of lambda in liver and muscle was also detected.

INTRODUCTION

Synthetic pyrethroids are widely used in compating ectoparasites affecting farm animals and pests of agricultural crops (Stubbs, et al., 1982 and Nepoklonova et al., 1983). The insecticidal activity, metabolism and residues of most pyrethroids were investigated (Elliott et al., 1976; Gaughan, et al., 1977; Nolan. et al., 1979; Guaguere. et al., 1980; Arther and Young, 1985 and Flanagan, et al., 1989).

The study regarding the effect of pyrethroids on male fertility are rare, therefore, the present work was designed to elucidate the effect of the commonly used pyrethroid insecticide "Lambda" on the fertility of male rats, residual activity and some haematological parameters.

MATERIAL AND METHODS

Drug:

Lambda-Cyhalothrin; Karate { a-cyano- 3-phenoxy benzyl-3- (2-chloro 3, 3, 3-trifloroprop-I-enyl)-2, 2 dimethylcyclopropane carboxylate} was obtained from ICI Company, Cairo, Egypt.

Experimental design:

Fourty five mature male albino rats (175-200 g.) were divided into three groups. The first group was kept as control. The second and third groups were given orally lambda in a doses of 1.6 and 4.0mg/kg b.wt. daily for 65 successive days. respectively (equivalent to 1/50 and 1/20 of LD_{50}).

Blood samples of 5 rats from each group were taken after 65 days of administration (day 0) for haematological studies. Then these rats were weighed and sacrificed for studying the testicular parameters and the residual content. In addition, five rats were sacrificed from each group at 30 and 60 days after stopping administration to determine the residual content of the tested material.

Testicular and secondary sex organs studies:

Testes, seminal vesicle and prostate glands were dissected out and weighed in relation to its body weight. The epididymal sperm cell count, motility and abnormalities were performed and described by Bearden and Fluquary (1980). Total testoste-

rone level in citrated plasma was determined by radioimmunoassay (Abraham et al., 1975). Also, testes was taken for histopathogical examination using Harris haematoxylin and Eosin method (Luna, 1968). The percentage of seminiferous tubules containing spermatozoa was also determined.

Residual studies:

Concentration of the tested pyrethroid in muscle and liver at 0, 30 and 60 days after stopping administration was determined by Gas Chromatography (Saleh et al., 1985).

Haematological studies:

Citrated blood samples were used for determination of red cell count, haemoglobin, PCV, total leucocytic count and differential leucocytic count.

Statistical analysis:

The significance of the data were calculated using student t-test according to Snedecor and Cochran (1967).

RESULTS

Oral administration of synthetic pyrethroid lambda for 65 successive days showed a significant decrease in the weights of testes, seminal vesicle and prostate gland (Table 1).

Lambda at both dose levels showed a significant decrease in epididymal sperm cell concentration, sperm motility and seminiferous tubules containg spermatozoa and a significant increase in sperm cell abnormalities, while the testosterone level did not change (Table 2).

Histopathology of the testes (Fig. 1,2 and 3) revelaed that lambda (1.6 mg/kg b.wt) induced early degeneration of seminiferous tubules with loss of many germinal cells. The testes of rats treated with 4 mg/kg b.wt. lambda showed empty seminiferous tubules and presence of intraluminal cellular debris. The leydig and sertoli cells did not change at the two dose levels.

The effect of lambda on hematological pa (Table 3 and 4) showed a significant decrea cell count, hemoglobin concentration, pac volume and lymphocyte % and a significan in total leucocytic count and neutrophil %.

The concentration of lambda in liver an (Table 5) were decreased at 30 and 60 d stopping of administration compared to th gorup.

Fig. (1): Cross section of the rat testes showed no niferous tubnles (x40)

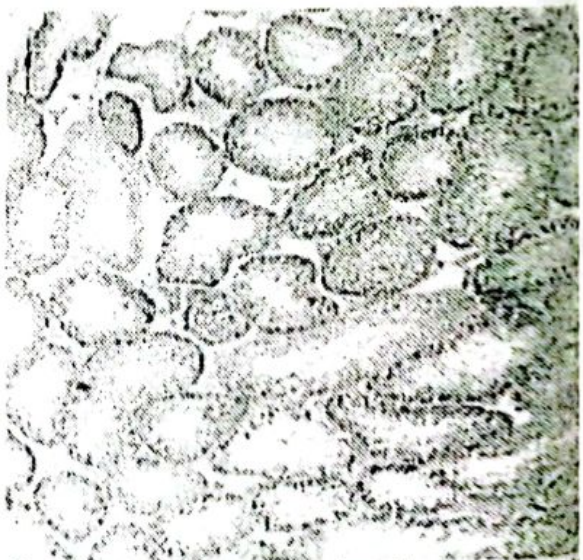

Fig. (2): Effect of lambda (1.6 mg/kg b.wt.) on seminiferous tubules showed early degener- loss of many germinal cells (x40).

Fig. (3):Effect of lambda (4.0 mg/kg b.wt.) on testes. The seminiferous tubules showed empty tubules and intraluminal cellular debris (x40).

Table (1): Changes in weight ofsexual organs of male rats after 65 days administration of lambda.

Group	Dose in Mg/kg b.wt.	Weight of sexual organs (g/100g b.wt)		
		Testes	Seminal vesicle	Prostate
Control	0.0	1.55 ± 0.02	0.40 ± 0.03	0.20 ± 0.02
Lambda	1.6	1.28 ± 0.05*	0.15 ± 0.02**	0.09 ± 0.01*
Lambda	4.0	1.10 ± 0.04**	0.11 ± 0.05**	0.06 ± 0.01**

* Significant at P < 0.05 ** Significant at P < 0.01

Table (2): Changes in epididymal sperm characters and testosterone level of rats after 65 day administration of lambda (n =5).

Group	Dose in Mg/kg b.wt.	Epididymal sperm characters			Seminiferous tubules containing Spermatozoa %	Testosterone (mg/ml)
		Concentration (x 10^6/ml)	Progressive motility (%)	Abnormalities (%)		
Control	0.00	326±6.7	87.8±2.46	4.00±0.35	93.4±1.21	4.00±0.35
Lambda	1.6	180±3.54**	60.0±2.24**	11.00±0.71**	73.6±1.86**	11.00±0.71**
Lambda	4.0	162±4.64**	40.0±3.54**	18.80±1.43**	60.20±1.77**	18.80±1.43**

* Significant at P < 0.05 ** Significant at P < 0.01

Table (3): Effect of lambda on some hematological parameters of rat (n=5).

Group	Dose in Mg/kg b.wt.	RBCs (x 10^6/ul)	Hb (g/dl)	PCV (%)
Control	0.00	8.250±0.25	15.00±0.35	46.00±0.71
Lambda	1.6	5.731±0.44*	12.40±0.43*	40.60±0.68*
Lambda	4.0	5.331±0.21**	12.00±0.45*	40.20±0.58**

* Significant at P < 0.05 ** Significant at P < 0.01

Table (4): Effect of lambda on total and differential leucocytic count.

Group	Dose in Mg/kg b.wt.	Differential leucocytic count (%)					WB x 10
		Lymphocytes	Monocytes	Basophils	Eosinophils	Neutrophils	
Control	0.00	40.4±1.57	3.8±0.25	0.4±0.25	2.4±0.68	23.0±2.12	11.000
Lambda (1/50 LD_{50})	1.6	60.0±1.12*	3.0±0.32	0.6±0.25	3.0±0.55	32.8±1.53*	13.500
Lambda (1/50 LD_{50})	4.0	56.6±2.25*	2.8±0.58	0.6±0.25	3.4±0.51	36.6±1.51*	16.500

* Significant at P < 0.05 ** Significant at P < 0.01

Table (5): Residues of lambda after oral administration for 65 successive days in rats (n = 5).

Group	Dose in Mg/kg b.wt.	Concentration of lambda (p.p.m.) after stopping of administration			
		Tissue	0 days	30 days	60 days
Lambda (1/50 LD_{50})	1.6	Muscle	0.094	0.064	0.040
		Liver	0.282	0.191	0.120
Lambda (1/50 LD_{50})	4.0	Muscle	0.196	0.169	0.098
		Liver	0.589	0.506	0.293

DISCUSSION

Synthetic pyrethroids are considered one of the most widely and effectively used pesticides for control of many types of parasites of animals (Rshaid, et al., 1985 and Ron and Bakken, 1986).

Oral administration of lambda in doses of 1.6 and 4.0 mg/kg b.wt. for 65 success days to male albino rats leads to decrease in the weight of testes, seminal vesicle and prostate glands, as well as sperm cell concentration, sperm motility and the percentage of seminiferous tubules containing spermatozoa. while the sperm abnormalities were increased. These results are in accordance to the data obtained by Sobbhy (1991) who found that sumicidin and S-3206 gave the same results. In addition, histopathological examination of the testes characterized by its degenerative changes in seminiferous tubules. These changes explain the decrease in sperm cell count and sperm motility and the increase in sperm abnormlities in the experimental animals.

Serum total testosterone concentration w changed and it could be explained by histo logical examination of the testes, which re that there is no any changes in leydig and cells.

Haematological studies showed decrease blood cell, haemoglobin concentration, cell volume and increase in total leucocyt due to neutrophilia and lymphopenia. The are in agreement with that of Hassan et al who found that decamethrin (synthetic pyr induces the same results in rabbits.

The concentration of lambda in liver and was decreased at 30 and 60 days after stop administration. This indicates that the stud rethroid is slowly excreted.

The impairment of fertility in male rats c lambda indicated the importance of prote male animals and human from their exp the studied pyrethroid.

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REFERENCES

Abraham, G.E.; Manlimos, F.S.; Solis, M. and Wickman, A.C. (1975): Combined RIA of 4 steroids in 1 ml of plasma: II. Androgens. Clinic. Biochem., 8: 374.

Arther, R.G. and Young, R. (1985): Efficacy of rotenone/ pyrethrin dip for control of fleas and ticks. Vet. Med., 80 (9), 53, 56-57.

Bearden, H.J. and Fluquary, J. (1980): Applied Animal Reproduction". Restor Published Co. Inc. Reston, Virginia, P. 158-160.

Elliott, M.; James, N.F.; Pulman, D.A.; Gaughan, L.C.; Unai, T. and Casida, J.E. (1976): Radio-synthesis and metabolism in rats of the IR isomers of the insecticide permethrin. J. Agric. Fd. Chem., 24, 270-274.

Flanagan, P.; Parker, R.C.; Prested, C. and Thompson, H.M. (1989): Residues in calves muscle, liver, kidney and fat produced by the external application of emulsions containing permethrin. Wellcome Research Laboratories, Berkhamsted HIBH, 77-2.

Gaughan, L.C.; Unai, T. and Casida, J.R. (1977): Permethrin metabolism in rats. J. Agric. Fd. Chem., 25, 9-17.

Guaguere, E.; Dorchies, P.; France, M. and Lahitte, J.D. DE (1980): treatment of demodecosis of the dog with a synthetic pyrethroid: Cypermethrin. Preliminary results. Revue de Medecine Veterinaire, 131, (12), 857-859.

H.M. Sobbhy (1991): Efffect of sumivcidin an S-3206 insecticides (synthetic pyrethroids) on fetal development and male fertility in rats. Ph. D. Thesis, Department of Pharmacology, Cairo Univ.

Hassan, G.A.; Salem, M.H.; Abd-Allah, G.A.; Shaker, N. and Abo-Elezz, Z. (1988): Effect of organophosphorus (dimethoate) and pyrethroid (decamethrin) pesticides on plasma level of cortisol and thyroxine and on some haematological characteristics in growing male rabbits.

Luna, L.G. (1968): "Manual of histopathologic stainign methods of armed forces institute of Patholgy". McGraw-Hill Book Co., New York, P. 58.

Saleh, M.A.; Ibrahim, N.A.I Soliman, N.Z. and El-Sheimy, M.K. (1985): Persistence and distribution of cypermethrin, deltamethrin and fenvalerate in laying chickens. J. Agric. Fd. Chem., 34, (5).

Nepoklonova, M.I.; Belyaeva, A.P. and Nepokonov, A.A. (1983): Efficacy of permethrin against cattle ticks, including the prevention of babesiasis and damage of hides. Shornik Hauchnykh Trudov. Moskovskaya Veterinaranaya Akademiya, 93-5.

Nolan, J.; Roulston, W.J. and Schnitzerling, H.J. (1979): The potenial of some synthetic pyrethrins for control of cattle ticks (Boophilus microplus). Aust. Vet. J., 55 (10), 463-466.

Ron, I. and Bakken, G. (1986): Insecticide-impregnated ear tags in the contraol of summer mastitis in cows and heifers. Norsk Veterinartidsskrift, 98 (6), 445-447.

Rshaid, G.; Briozzo, C.; Valera, A. and Volonte, E. (1985): Efficacy of cypermethrin by spray application for the control of bovine psoroptic mange. Veterinaria Argentina, 11 (13), 265-269.

Snedecor, G.W. and Cochran, W.G. (1967): Statistical methods. Iows State Univ. Press, Ames, Iows, USA.

Stubbs, V.K.; Wilshire, C. and Webber, L.C. (1982): Cyhalothrin- a novel acaricidal an insecticidal synthetic pyrethroid for the control of the cattle tick (Boophilus microplus) and the buffalo fly (Haematobia irritans exigua). Aust. Vet. J.,, 59 (5), 152-155.