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The Effect Of Brodifacoum On The Reproduction Of Male Wild House Mouse *Mus musculus* (Muridae : Rodentia)

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Abstract

The study dealt with the effect of the anticoagulant rodenticide Brodifacom on the reproduction of male *mus musculus* trapped from different localities of Baghdad province and fed with different doses (50 ,75 ,100 mg) of pellets of this rodenticide. The results showed a significant decrease ($p< 0.01$) in testicular weight and volume, epididymal (head and tail) weight and numbers of different spermatogenic cells. The rodenticide caused a significant decrease in sperms concentration and a significant increase in dead and abnormal sperms in testes and epididymis.

Introduction

During the last three decades several acute and anticoagulant rodenticides were used in Iraq, among which the anticoagulant rodenticides Brodifacoum are known with the trade mark klerat (1,2). The different toxic aspects of this rodenticide were well studied in many countries (3,5), but little is known about its effects on the reproduction of mammals in general and rodents in particular .

There are only few investigation about the genotoxic and cytoxic effects of Brodifacoum on a lbino mice in Iraq (4,6 ,7,8) . The aim of this study is to throw more light on the sterilizing effect of this rodenticide on

the reproduction of male *Mus musculus* which is considered as one of the widely distributed commensal rodents species in fields and buildings in Iraq (1). By this way, the effects of Brodifacoum on the reproduction of non target wild animals (birds and mammals) could be cleared and this may help the specialists to protect the wild life when using such a rodenticide.

Materials and Methods

Thirty five males *Mus musculus* were collected from different localities in Baghdad province using life traps baited with fry bread and onions . The animals were kept in constant room temperature (about 28° c) and light as in nature . Befor and after the duration of treatments, the animals were provided with pelleted food purchased from IPA center for agricultural reseaechs.

The rodenticide was used in the form of pellets containing 50 ppm of the active ingredient Brodifacoum (ZENECA production).

Five mice were used as acontrol fed with normal pellets, while the others were divided in the three groups (10 mice each). The first group received 50 mg. of Brodifacoum pellets, the second 75mg. and the third group 100mg. All thess portions are less than the LD50 of the rodenticide (LD50 in mg. of baits/mouse is 200 mg.) (9). In all groups the substance was given once at 9-10 a.m. immediately after the treated pellets were eaten, the animals were given the normal diet and water *ad libitium*.

Ten days post Brodifacoum administration the, mice were sacrificed and the testes and epididymis were removed and weighted . The epididymis removed from the right testis was divided into head and tail region and together with this testis were quickly fixed in Bouin's fluid for three days (6).Smears from testes and epididymis were done in addition to 5 microns slides stained with hematoxylin and eosin. Testicular and epididymal sperms were counted, seminiforous tubules diameters, epididymal diameter and histological changes were measured.

Testis volume was measured using the equation: $v = 2/3\ (abc)\ \pi$, where, (a) is testis length, (b) is testis width, (c) is testis thickness, and $\pi = 3.1416$(10). The results were analyzed using the statistical computer of SHS, 1992(11).

Results and Discussion

A significant decrease was found in testicular weight and volume in all treated groups as compared to the control, sucha decrease was recorded too in epididymal weight fig. (1).

In comparison with the control, the treated groups showed a significant differences ($p<0.01$) in seminiferous tubules diameters and seminiferous tubules wall thickness with highly a significant decrease in 75mg. dose fig. (2). Data from fig. (3) demonstrated a real decrease in numbers of the spermatogenic cells in all treated groups except those of primary spermatocytes and spermatids which showed a significant increase in comparison with the control.

Measurements of the epididymal diameters (head and tail) in treated groups reflected a significant decrease ($p<0.01$) in the value of this parameter in comparison with the control group fig. (4)

Total sperm count in testes and epididymis (per mm^3 and per gm. of testicular and epididymal tissue) in treated groups showed a significant decrease as compared with the control group figs. (5, 6)

Concerning the percentages of dead and abnormal sperms, a highly significant increase of such sperms was recorded in all treated groups when compared with the control fig. (7)

It is unfortunate that the authors were unable to come across references concerning the effects of Brodifacoum on the different parameter of the reproduction of *M. musculus*.

The decrease in both testicular weight and volume and epididymal weight could be explained as a result of the direct effect of this substance on the testes rendering them less responsive to regulating hormouns (decrease in receptors) or interfering with steroidal synthesis, as seen in other toxicants (11), such a substance may act centrally by chemical blocking of gonadotropin releasing hormones.The marked decrease in seminiferous tubles diameters in treated groups, together with the decrease in the numbers of different spermatogenic cells may be attributed to the same cause, i.e., cytotoxic effect.

The decrease in the sperm concentration seen in the treated groups may be considered as avidence of decreased cellular multiplication, in addition to the decrease in mitotic index.

The toxic effect of Brodifacoum on leydig cells may inhibit the hormonal activity of these cells, i.e., leads to the decrease of testosterons support necessary for spermatogenesis. Decreased testosterone production may have been behind structural changes encountered in the epididymis.
It is well - known that the epididymal growth and activity is regulated by this hormone.

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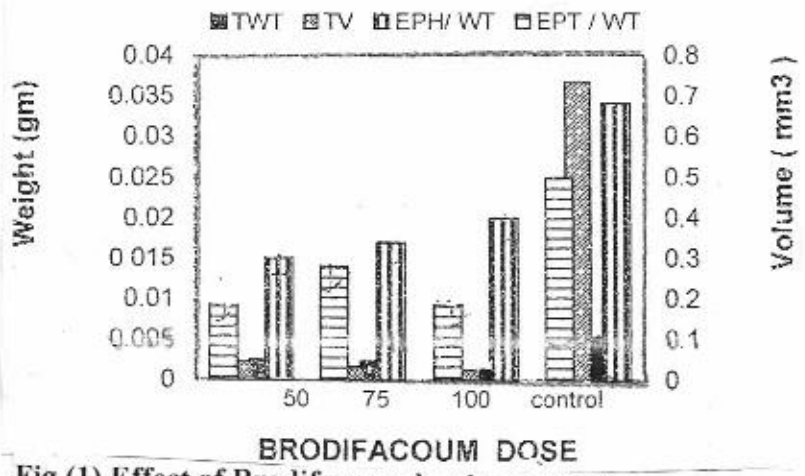

Fig.(1) Effect of Brodifacoum level on weight and volume of testes and weight of Epididymis (head and tail) of wild mice

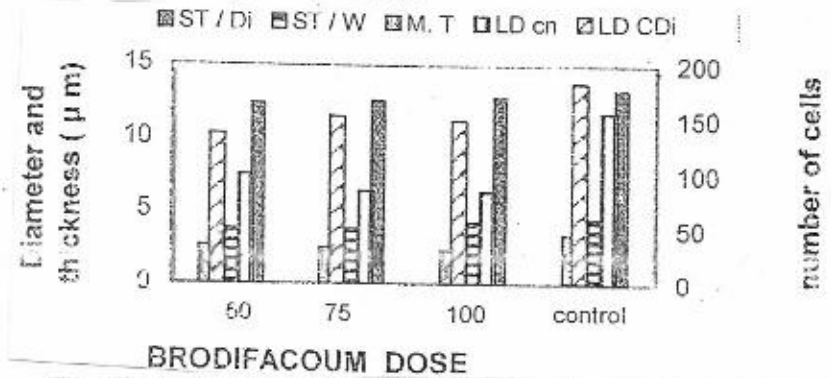

Fig.(2) Effect of Brodifacoum treatment on seminiferous tubule diameter and wall thickness (µ m),mitotic index (%), leydig

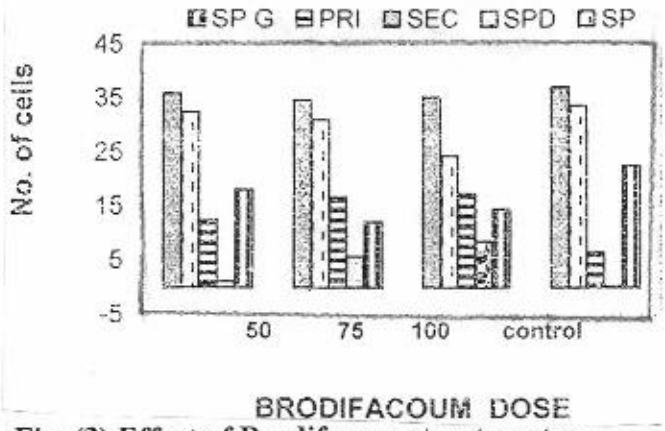

Fig. (3) Effect of Brodifacoum treatment on perscentage of different spermatogonic cells (spermatogonia, primary and secondary spermatocyte and sperm number) of willed mice

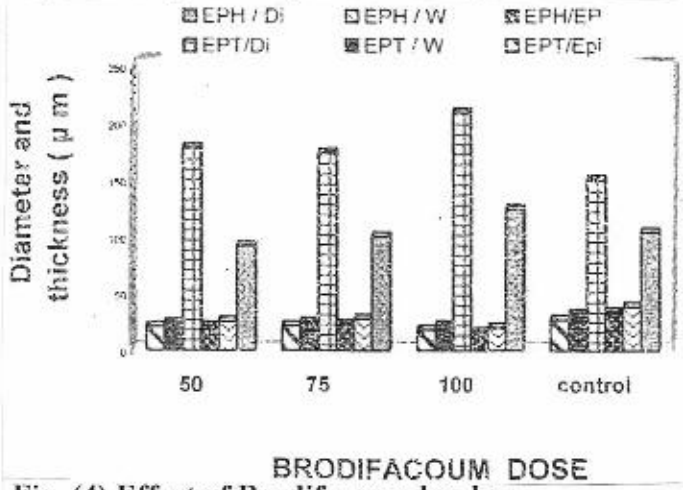

Fig. (4) Effect of Brodifacoum level on epididymal (head and tail) tubular diameter, wall thickness and height of epithelial lining cells of wild mice

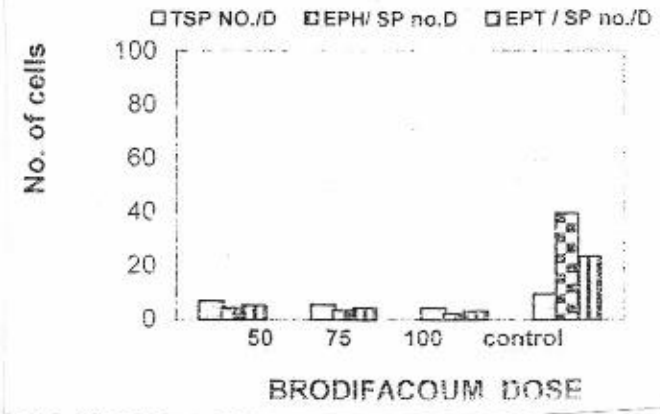

Fig. (5) Effect of Brodifacoum treatment on sperm number per mm3 in tests and epdidiymal head and tail) of wild mice

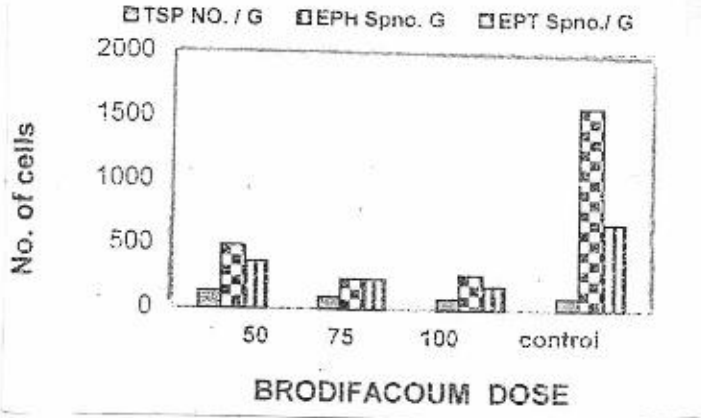

Fig (6) Effect of Brodifacoum treatment on sperm number per gm- tissue weight in testes and epdidiymis (head and tail) of wild mice

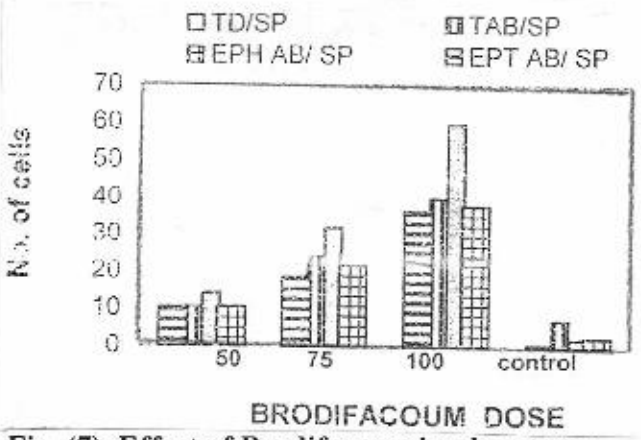

Fig. (7) Effect of Brodifacome levelon sperm characteristics in both testes and epdidymis (head and tail) of wild mice

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تأثير الـ Brodifacoumعلى تكاثر ذكور فأر البيت البريـــة *Mus musculus*

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الخلاصة

تمت دراسة تأثـير مبـيـد القوارض مانع التخثر Brodifacoum علـى تكـاثر ذكـــور فأر البيت *Mus musculus* المصطادة من مواقع مختلفة في محافظة بغـداد، بعد تغذيتها على عليقة حاوية على (ملغم 100.75.50) من الطعوم الحاوية على المـادة الفعالة ، او ضحت النتائج حصول انخفاضا معنويا ($P<0.01$) في اوزان وحجوم الخصى ووزن البربخ (الرأس والذنب) و في اعداد الخلايا النطفية المختلفة وسبب المبيد انخفاضا معنويا لتركيز النطف وارتفاعا معنويا للنطف الميتة وغير الطبيعية في كل مـن الخصـى والبرابخ.