The Iraqi J. Vet. Med. 12 (1988)

THE EFFICACY OF NITROXYNIL AGAINST MATURE AND IMMATURE FASCIOLA GIGANTICA IN EXPERIMENTALLY INFECTED SHEEP

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SUMMARY

The anthelmintic efficacy of nitroxynil was tested in three groups (A, B and C) of artificially infected sheep with *Fasciola gigantica*. Each animal was given six metacercariae/kg body weight. All animals were weighed weekly. Two groups of animals (A and B) were treated with a single dose of nitroxynil given subcutaneously. Group A was treated at a dose rate of 15 mg/kg b.w. 8 weeks post infection, while group B drenched at a dose rate of 10 mg/kg b.w. 19 weeks post infection.

During the study, it was observed that the average prepatent period of infected animals was 114 days. The results of the experiment were assessed by faecal egg count and autopsy examinations. All groups of animals were slaughtered at 21 weeks post infection. The fluke burden in group A was ranging from 2-7 worms in 5 animals out of 6 animals, whilst from group B no flukes recovered. Doses of 10 and 15 mg/kg proved 100 and 89.9% effective respectively, against mature and immature *F. gigantica*.

INTRODUCTION

Studies indicated that fascioliasis is a general epidimiological disease of economic importance in Iraq (Altaif, 1970; AL-Barwari, 1977; AL-Naamy, 1978). A vaccine is not available and this reflects the continuous demand for highly effective anthelmintics, which should be cheap, easy to administer, nontoxic and highly effective against both mature and immature parasites.

The considerable benefits that are gained by using anthelmintic to control liver fluke disease are those result from lower death rates, increase in growth rates, better food utilization and improved fleece quality (Altaif, 1979). An efficacy greater than 90% against immature *F. gigantica* of nitroxynil has been reported by various authors following treatment with 15 mg/kg b.w. and 100% against mature *F. gigantica* following treatment with 10 mg/kg b.w. (Boray, 1969; Stammers, 1976; Soulsby, 1982).

This paper describes the results of trials carried out to test efficacy of nitroxynil against experimentally infected sheep with *F. gigantica*.

MATERIALS AND METHODS

Sixteen, 4-6 months old male Awassi lambs with initial weight of 24.3 kg, were used. Their parasite status was checked by regular faecal examinations. The lambs were divided into three groups (A of six animals, B and C of five animals each). Each animal was experimentally infected with six viable (7 days old) metacercariae per kg b.w. of *F. gigantica* in a soft gelatin capsule orally. The metacercariae were obtained from laboratory infected *Lymnaea lagotis euphratica* kept at a constant temperature of 26 °C as described by Kadhim and Altaif (1970).

Two groups (A&B) were treated with a single dose of nitroxynil* given subcutaneously. Group A was treated at a dose rate of 15 mg/kg b.w. 8 weeks post infection and group B was treated at a dose rate of 10 mg/kg b.w. 19 weeks post infection, while group C was left as a control for other groups.

All animals were weighed weekly and slaughtered at 21 weeks post infection, flukes were recovered by cutting the whole liver into small pieces, and then squeezed by a moderate pressure using worm physiological saline, left for a few hours, decanted to facilitate the migration of flukes from the tissues, the flukes were recovered and counted according to Boray (1969).

The length of the flukes were measured by a ruler after putting the parasite between two slides. Rectal faecal samples were taken from all animals daily and detection of fluke's eggs were made by sedimentation technique as described by Boray & Pearson (1960).

RESULTS

No signs of toxicity has appeared in all animals following treatment, they ate normally and showed no other signs. The average weight of animal is presented in Fig. 1. The difference, however, was not statistically significant ($P > 0.05$). The mean prepatent period of the animals was 114 days table 1.

In response to treatment in term of mean faecal egg output which is illustrated in Fig.2. It showed significant egg reduction ($P<0.05$) after treatment in both groups A & B as compared with group C. No eggs were detected in faeces or gall bladder at the time of autopsy in group B. Table 1 shows the mean prepatent period of infected animals. Table 2 shows the percentage of

* Trodax May & Baker veterinary product. Dagenham.

Table 1: Prepatent period (in days) of infected animals

No. of infected animals	Prepatent period (days)
315	105
342	106
181	111
376	111
316	115
390	119
327	120
323	125
Mean	114
Standard error	2.31

Table 2: Number of *F. gigantica* in treated and nontreated animals.

Animals	Nontreated C (Control)	Group A 15mg/kg	Group B 10mg/kg
1	66	7	0
2	60	2	0
3	42	5	0
4	57	5	0
5	21	7	0
6	-	0	-
Mean	49.2 ± 8.08	4.33 ± 1.14	0
Percent reduction Compared with C	---	91.19	100

Group A had 6 animals, B and C had 5 animals.
± = Standard error of mean

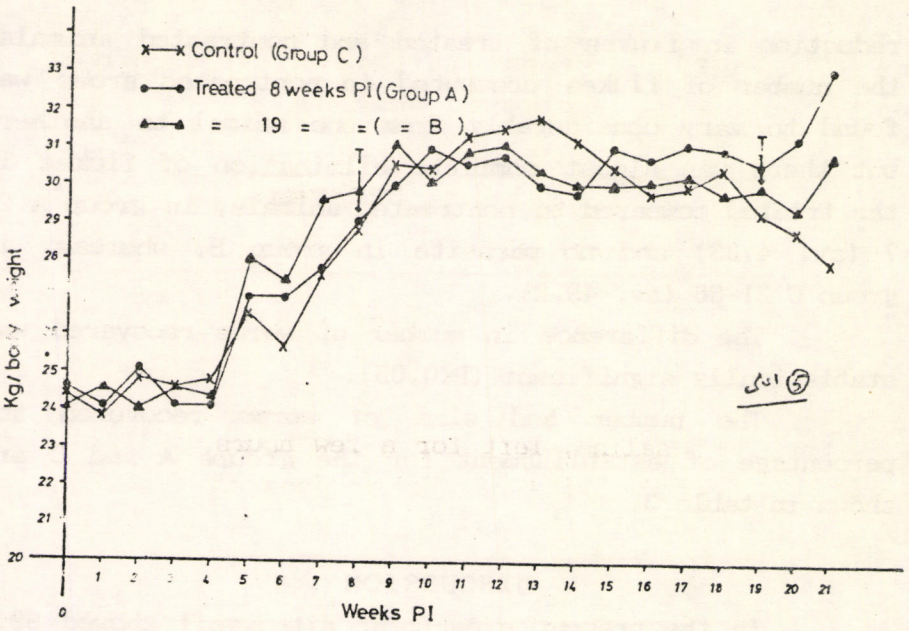

Figure 1: Weight of animals infected with *F. gigantica* and treated with Nitroxynil.

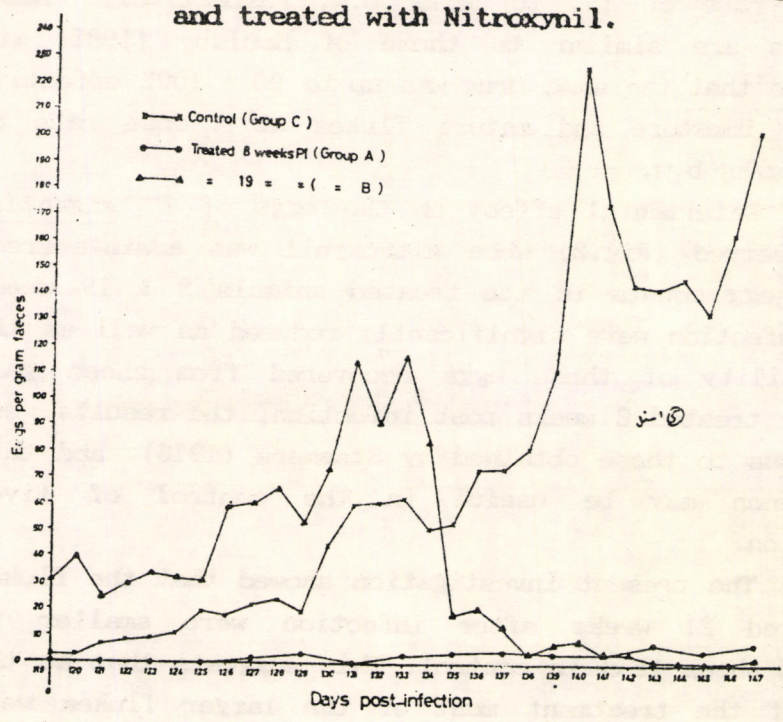

Figure 2: Eggs per gram faeces of animals infected with *F. gigantica* & treated with Nitroxynil.

reduction in flukes of treated and nontreated animals, the number of flukes presented in nontreated group was found to vary considerably from one animal to another, but there was almost complete elimination of flukes in the treated compared to nontreated animals, in group A 2-7 (av. 4.33) and no parasite in group B, whereas, in group C 21-66 (av. 49.2).

The difference in number of worms recovered was statistically significant ($P<0.05$).

The number and size of worms recovered and percentage of establishment for the groups A and C are shown in table 3.

DISCUSSION

In the present experiment nitroxynil showed 89.9 and 100% efficiency against immature and mature flukes at a dose rate of 15, 10 mg/kg b.w. respectively. These findings are similar to those of Soulsby (1982) who reported that the same drug was up to 90 & 100% effective against immature and mature flukes at a dose rate of 15.10 mg/kg b.w.

Determental effect on the eggs of *F. gigantica* was observed (Fig.2) when nitroxynil was administered. Faecal egg counts in the treated animals 8 & 19 weeks post infection were significantly reduced as well as the hatchability of these eggs recovered from sheep gall bladder treated 8 weeks post infection, the results were analogous to those obtained by Stammers (1976), and this phenomenon may be useful in the control of liver infection.

The present investigation showed that the flukes recovered 21 weeks after infection were smaller in treated sheep than in control. This suggests that at the time of the treatment most of the larger flukes were

Table 3: Number of worms recovered from sheep 21 weeks PI

	Animal number	No. of m.c.	No. of worms recovered	Mean no. of worm measurement in (mm)	Infection (% of m.c.* in infective dose)
Animals treated 8 weeks PI	373	126	2	13 x 3	1.58%
	367	180	5	17.3 x 6.3	2.77%
	308	180	5	20.2 x 7.6	2.77%
	311	102	7	39.2 x 7	6.86%
	313	150	7	27.5 x 7.5	4.66%
	347	150	0	No worms recovered	-
	Mean	148	4.33	23.44 x 6.28	3.72%
	St. error	12.45	1.14	6.33 x 1.23	0.97%
Control Group	346	126	66	23.3 x 5.5	52.3%
	312	138	60	22.3 x 5.8	43.4%
	327	186	57	31.6 x 9.8	30.6%
	370	150	42	31.5 x 9	28%
	316	120	21	27.2 x 9.2	17.5%
	Mean	144	49.2	27.18 x 7.86	34.3%
	St. error	11.69	8.08	1.89 x 0.01	6.09%

* M.C. = metacercariae

killed and that those that survived did so after administration of the drug 8 weeks post infection to their immaturity at the time of the dosing and therefore less susceptible to treatment with nitroxynil, this immaturity may have resulted from the biological variation in development caused by protracted migration to the liver or to poor nutrition (Stammers, 1976). Their development may have been retarded during the growth and maturation period.

The efficacy of treatment with nitroxynil was found to be directly related to the age of the flukes and to the dose rate used (Boray, 1969). This is confirmed by the results that are shown in table 2.

Boray and Happich (1966) suggested that stunted flukes surviving treatment with tribromsalan was only because their development was already slower than normal and further suggested that physiological state of the parasite is important in its response to anthelmintics.

In conclusion treatment is necessary to control fascioliasis because it affects the survived flukes by reducing their number, rendering some remaining flukes abnormal and deleteriously influencing the hatchability of their viable eggs that are produced and reached pasture.

It is clear from the results reported here that nitroxynil at a dose rate of 15 mg/kg b.w. is not highly efficient against early stages of *F. gigantica* in sheep, that urges the manager to give the drug twice inorder to eliminate all worms that resists the first dose.

No significant difference in the weight of the treated and nontreated animals was observed.

REFERENCES

Al-Barwari, S. E. (1977). Asurvey on liver infections with *Fasciola gigantica* among slaughtered animals in Iraq. Bulletine of Endemic disease. 18.75-92.

Al-Naamy, R.A. (1978). Studies on some aspects of ovine fascioliasis in Iraq with particular reference to pathology and haematology of the disease due to *Fasciola gigantica* infection. M.Sc. Thesis, University of Baghdad.

Altaif, K. I. (1970). Observation on the incidence and seasonal variation of some helminth eggs and larvae in sheep in Iraq. Bull. End. Dis. 12, 99-104.

Altaif, K. I. (1979). Effect of anthelmintic treatment on the performance of awassi sheep in Iraq. Trop. Anim. Hlth. Prod. 11, 241-245.

Boray, J. C. (1969). Experimental fascioliasis in Australia. In "Advances in parasitology" Dawes, B. (Ed.) London and Newyork, Academic press, 7, 95-210.

Boray, J. C. and Happich, F. A. (1966). Tests on the anthelmintic efficiency of Hilomid against immature and mature *Fasciola hepatica* in sheep and on its toxicity. Vet. Rec., 79, 358-363.

Boray, J. C. and Pearson, I. G. (1960). The anthelmintic efficiency of tetrachloroethane in sheep infested with *Fasciola hepatica*. Aust. Vet. J. 36, 331-337.

Kadhim, J. K. and Altaif, K. I. (1970). The experimental demonstration of *Lymnaea lagotis euphratica* as an intermediate host of *Fasciola gigantica* in Iraq. Ann. Trop. Med. parasit. 64, 335-337.

Soulsby, E. J. L. (1982). Helminths, Arthropods and Protozoa of domesticated animals. PP. 48, Baillier, Tindall, London.

Stammers, B. M. (1976). The effect of Nitroxynil on the survival, growth and morphology of Fasciola hepatica in sheep. Res. Vet. Sci. 20, 174-179.

دراسة فعالية دواء (Nitroxynil) ضد طوري الدودة الكبدية Fasciola gignatica البالغ وغير البالغ مختبريا في الاغنام

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الخلاصة

اجريت دراسة مختبرية لمعرفة مدى تاثير دواء الـ Nitroxynil على الدودة الكبدية من نوع Fasciola gigantica بتخميج ثلاثة مجاميع من الاغنام (أ، ب، جـ) بعذنبات متكيسة للدودة جمعت من قواقع مخمجة مختبريا وبمعدل (6) عذنبات متكيسة/كغم من وزن الجسم، حقنت المجموعة (أ) كمية من الدواء قدرها (15) ملغم/كغم من وزن الجسم تحت الجلد بعد ثمانية اسابيع من الخمج وحقنت المجموعة (ب) مقدار (10) ملغم/كغم من وزن الجسم تحت الجلد بعد تسعة عشر اسبوعا وتركت المجموعة (جـ) كضابط للتجربة.

وزنت الحيوانات اسبوعيا ولوحظ خلال التجربة بان معدل الفترة البائنة كان (114) يوما قدرت النتائج من حساب عدد البيوض في نماذج البراز بعد العلاج وعدد الديدان المستحطة بعد الذبح في الاسبوع الحادي والعشرون بعد الخمج.

نتيجة الفحوصات لوحظ عدد من الديدان (2-7) في اكباد خمسة حيوانات من مجموع ستة حيوانات في المجموعة (أ) بعد الذبح، وكانت نسبة الديدان والبيوض المستحطة في هذه المجموعة قليلة مقارنة مع المجموعة الضابطة (جـ)، بينما لم نعثر على اية ديدان في اكباد حيوانات المجموعة (ب) بعد الذبح مع تناقص عدد البيوض في البراز.

نستدل من النتائج بان تاثير الدواء على ديدان الـ Fasciola gigantica تتناسب طرديا مع عمر الخمج اضافة ما للعلاج من تاثير ضار على نمو الديدان ويقلل من عدد البيوض في البراز حيث وجد ان فعالية الدواء كانت (100٪) عند حقنه بمعدل (10) ملغم/كغم من وزن الجسم ضد الديدان البالغة بينما كانت فعاليته (89.9٪) عند حقنه بمعدل (15) ملغم/كغم من وزن الجسم ضد الديدان غير البالغة وبعمر (8) اسابيع بعد الخمج.