U. of K. J. Vet. Med. Anim. Prod., Vol.6, Issue 1 (2015) p 1-6

ISSN: 243456

UNIVERSITY OF KHARTOUM
Journal of Veterinary Medicine and Animal Production

Some Pharmacological Observations on Albendazole in Chicks Experimentally Infected with *Raillietina tetraqona*

Abdelrahman M. A. Saeed

Department of Pharmacology and Toxicology, Faculty of Veterinary Medicine,

P.O . Box 32 Khartoum North, Sudan.

E-mail: saeedabdelrahman@yahoo.com

Abstract

The efficacy of Albendazole against experimental *Raillietina tetragona* infection in poultry was evaluated in this study. Thirty six, one day-old male Lohmann layer chicks were purchased and reared at the premises of the Faculty of Veterinary Medicine, University of Khartoum. The birds were randomly divided into three groups (twelves birds each group). All birds in each group were experimentally infected with the infective stage of the parasite at a dose rate of three cysticercoids administered orally. Three weeks post-infection, Group 1 was kept as infected untreated control, whereas group 2 and 3 were treated with Albendazole orally at dose rates of 2.5 mg and 25 mg per kg per day for 3-7 days, respectively. Seven days from cessation of Albendazole treatment, all birds in the three groups were slaughtered. Necropsy findings were recorded and blood samples were collected for biochemical analysis. The presented data indicated that oral administration of Albendazole at a dose rate of 25 mg/kg/day for 3-7 successive days provide an effective treatment against this poultry cestodes. The efficacy of the drug was estimated to be 100% as judged by adult worms' recovery, faecal eggs counts and by comparison of lesions in treated chicks and untreated infected controls. It is recommended that Albendazole should be used as an effective drug for treatment of *R. tetraqona* infection in susceptible birds.

Key words: Albendazole, R. tetraqona, poultry cestodes, Chemotherapy

المستخلص.

في هذه الدراسة تم تقييم فعالية الألبندازول في علاج الاصابة بالديدان الشريطية ريتيلنا تتراقونا في الدواجن. تم شراء ستة وثلاثين كتكوت (ذكور) عمر يوم واحد من نوع لوهمان وتمت رعايتها في كلية الطب البيطري، جامعة الخرطوم. قسمت الطيور عشوائياً الى ثلاثة مجموعات (12 طائر لكل مجموعة). تم عمل عدوى تجريبية للطيور في كل المجموعات باستخدام الطور المعدي للطفيل وكان مقدار الجرعة عدد ثلاثة سيستيسيركويد عن طريق الفم لكل طائر. بعد مضي ثلاثة اسابيع من الاصابة, استخدمت المجموعة الاولى كمجموعة قياسية غير معالجة. بينما المجموعتان الثانية والثالثة تم علاجهما بالألبندازول عن طريق الفم بجرعات تتراوح بين 2.5-25ملجم/ كجم من الوزن لمدة 3-7 أيام على التوالي. ذبحت الثلاثة مجموعات بعد سبعة ايام من العلاج بالألبندازول. سجلت النتائج وتم جمع عينات الدم للتحليل البيوكيميائي. المعلومات

المتحصل عليها في هذه التجربة دلت على أن إعطاء الألبندازول عن طريق الفم عند الجرعة 25 ملجم/كجم من الوزن لمدة 3-7 ايام فعالة تجاه الديدان الشريطية ريتيلنا تتراقونا في الدواجن بنسبة 100% .وقد تم تقييم هذه الفعالية عن طريق تعداد الديدان الشريطية البالغة وعد البيض في عينات البراز وكذلك بمقارنة الأفات في الكتاكيت المعالجة وغير المعالجة(القياسية). وبناءاً على نتيجة هذه التجربة تمت التوصية باستعمال الألبندازول كعلاج فعال للاصابة بالديدان الشريطية ريتيلنا تتراقونا في الطيور. كثافةً على هلام كبريتات دوديكل الصوديوم متعدد الأكريلامايد وهلام التركيز عند التعادل الكهربى مما يُشير إلى محتواه العالى نسبياً فى لبن الابل.

Introduction

There has been a growing awareness in the chemotherapy of cestode parasites in man and poultry over the last thirty years. A number of synthetic drugs have been manufactured and used for the treatment of cestode infection. It is well documented that Niclosamide is effective against *Hymenolepis nana* infection in man (Salem and El Allaf, 1969). Albendazole and praziquantel have been shown to eliminate completely *H. diminuta* infection in rats when given at 800 and 250 mg/kg/day for 3 consecutive days and against adult *H. nana* in mice (Thomas and Gonnert, 1977; Schenone 1980). However, studies on the efficacy of Albendazole against chicken cestodes have not yet been fully investigated. *R. tetragona*, *R. cesticillus and R. echinobothrida* are important chicken cestodes. In the Sudan, *R. tetragona* is considered a common chicken cestode and is found in the small intestine. It also infects guinea fowls and pigeons and is of cosmopolitan distribution. Soulsby (1968) stated that *R. tetragona* is one of the largest of chicken tapeworms measuring up to 25 cm in length with a long thin neck and small scolex having about 100 minute hooks, 6-8 micron long in one row on the restellum. The objective of the present study was to evaluate the efficacy of Albendazole as an effective treatment against experimental *R. tetragona* infection in chickens.

Materials and Methods

Experimental Birds

Thirty six, one day-old male Lohmann layer chicks were purchased from the Sudanese African Poultry Company, Bagair. Gazira State and reared at the premises of the Faculty of Veterinary Medicine, University of Khartoum. The experimental birds were kept in enclosed facility, provided with starter ration with free access to water. The chickens were then assigned at random to 3 groups (twelves birds each). Group 1 was kept as infected untreated controls. Group 2 and 3 were infected with *R. tetragona* by administration of 3 cysticercoids to each birds. Albendazole (Avico, Amman, Jordan) thereby was started 3 weeks post-infection and the drug was given in drinking water for 3 consecutive days at a dose rate of 2.5 and 25 mg/kg/day for group 2 and 3, respectively. All chicks in group 1, 2 and 3 were slaughtered after 7 days from the cessation of albendazole treatment.

The parasites

Cysticercoids of *R. tetragona* were obtained from the intermediate hosts, naturally-infected adult ants of the genus Tetramorium (*T. caespitum and T. Semilaeve*) found in poultry farms around the Faculty of Veterinary Medicine at Shambat. The ants were brought to the laboratory of Veterinary Parasitology in empty clean bottles, transferred to a mortar containing normal saline and were mechanically crushed to release cysticercoids from the intestines (Soulsby, 1968). The cysticercoids were counted individually under the dissecting microscope, placed

in gelatin capsules and given to chicks by the oral route at the rate of three cysticercoids per bird.

Necropsy findings

At the end of the experiments all chickens were slaughtered. The tape worms were recovered from chicks' intestines and then counted individually. Specimens of intestines, liver, heart, kidneys and spleen were fixed in 10% formol-saline and processed for histopathological examination. Samples of blood were obtained from chicks at slaughtering.Total serum protein concentrations were measured using a commercial Kit (Arcomex, Arab Company for Medical Diagnostics, Amman, Jordan).

Results

No significant clinical manifestations were observed in chicks infected with R. tetragona or in chicks following oral therapy with Albendazole at 25 mg/kg/day for 3 successive days. Albendazole was well tolarated by the chicks and no mortalities were recorded among the experimentally infected birds. The experimentally infected birds started to pass eggs after 19 days post infection. The infection became patent in all birds at day 21 post-infection. Adult *R. tetragona* in the intestines of infected and albendazole-treated chicks were recovered and counted individually at necropsy. The total number of worms present in the intestines of *R. tetragona*-infected chicks at 3 cysticercoids (group 1) was 36 worms. In chicks treated with Albendazole at 2.5 mg/kg/day for 3 consecutive days (group 2), the total number of worms found in the intestine 7 days post-treatment was 22 (38.88% efficacy) while in those treated with Albendazole at 25 mg/kg/day for 3 successive days (group 3), no adult worms were detected in the intestines indicating 100% efficacy (Table 1). In birds infected with *R. tetragona* in group 1, the lesions were mainly seen in the intestines. These consisted of focal erosions on the intestinal epithelium, enteritis and accumulation of lymphocytes particularly around the scattered deeply located scolicial parts of the worm in the congested Lamina propria of the intestinal mucosa. The spleen, kidneys and heart showed no changes but the liver, in some instances, revealed fatty vacuolation of the hepatocytes and isolated lymphocytic. In chicks treated with albendazole at 2.5 mg/kg/day (group 2) and 25 mg/kg/day (group 3) for 3 successive days, the inflammatory changes in the intestine were less marked and persisted for 7 days after the cessation of treatment. Neither scolicial structure of the worm in the intestinal Lamina propria nor lesions in vital organs of albendazole-treated chicks were detected. The primary lesions of *R. tetragona* infection were mainly confined to the intestine and comprised enteritis, erosion on the epithelium, lymphocytic infiltration and scolicial parts deeply situated in the intestinal lamina propria. Extra-intestinal findings were aggregates of lymphocytes in the hepatic parenchyma and between the cardiac muscle fibers

Table 1: Efficacy of Albendazole against *R. tetragona* infections in chicks

Group	No. of chicks Per group	No of cysticer-Coids per chick	No of cysticer-Coids per group	Age of infection (day)	Dose of drug (mg/kg)	No of daily doses	Total no of worms per group	Efficacy (%)
1 Infected controls	12	3	36	21	-	-	36	-
2 Albendazole (2.5 mg/kg/day)	12	3	36	21	2.5	3	22	38.88
3 Albendazole (2.5 mg/kg/day)	12	3	36	21	25	3	Nil	100

Table 2: Effect of Albendazole therapy on the concentration of serum constituents of chicks Infected with 3 cysticercoids/chick of *R. tetragona*

Group	Inorganic Phosphorus	Uric acid	Cholesterol	Total lipid	Total protein Gm/dl	AST i.u
1 Infected controls	**3.73 + 0.3**	**5.78 + 1.55**	**217.57 + 16.01**	**514.54 + 2.87**	**4.14 + 0.09**	**67.18 + 0.57**
2 Albendazole 2.5 mg/kg/day For 3 days	**NS 2.83 + 0.04**	**+ 9.69 + 0.04**	**+ + 138.87 + 2.93**	**NS 559.87 + 22.28**	**NS 4.23 + 0.11**	**+ + 88.99 1.56**
3 Albendazole 2.5 mg/kg/day For 3 days	**+ 2.56 + 0.14**	**+ 11.27 + 0.19**	**++ 132.61 + 4.94**	**NS 548.68 + 18.34**	**+ 3.63 + 0.08**	**++ 87.22 + 4.25**

N.S = Not significant; + = P < 0.05, ++ P < 0.01

Changes in the concentration of inorganic phosphorus, uric acid, cholesterol, total lipid and total protein and in the activity of AST in the serum of *R. tetragona*-infected chicks (group 1) and albendazole-treated chicks at 2.5 mg/kg/day (group 2) and 25 mg/kg/day (group 3) for 3 successive days are presented in Table 2. There was a significant increase in AST activity (P<0.01) and uric acid concentration (P< 0.05) and decrease in cholesterol concentration (P< 0.01) in albendazole treated chicks of groups 2 and 3. In albendazole-treated chicks of group 3, the concentration of total protein and inorganic phosphorus was lower (P< 0.05) than groups 1 and 2. No significant differences in the concentration of total

lipid between the infected controls (group 1) and albendazole-treated chicks at 2.5 mg/kg/day (group 2) or 25 mg/kg/day (group 3) for 3 consecutive days were observed.

Discussion

The results of the present experiments indicate that chicks are susceptible to infection with *R. tetragona* and that the cestode produces lesions mainly in the intestine. It appears that at levels of infection, 2-6 cysticercoids/chick, the tapeworms could achieve their potential of egg laying and/or segment shedding within 3 weeks post-infection. These low levels of infection are not associated with any important signs of morbidity or death. As the adult tape worms were recovered from the intestinal contents with normal saline, it is assumed that they were free in the intestinal lumen or only partially embedded in the mucosa.

The findings obtained had also showed that the fecal egg count and adult worm recovery as well as comparison of lesion between untreated infected controls and infected treated birds should be given special consideration for evaluation of an anticestodal drugs. It is known that in farm animals, investigations on anthelmintic are generally concerned with the assessment of drug activity in terms of the percentage reduction in worm burden at slaughter. The treatment of *R. tetragona* infected chicks with albendazole at 2.5 and 25 mg/kg/day for 3 consecutive days showed efficacy of 38.8% and 100% in group 2 and 3, respectively.

In the present experiments, changes in serum constituents were in general within the normal ranges. The absence of hypo-proteinaemia has been previously shown to occur in chicks fed 2% dietary Cassia Senna (Omer, 1990) and Lupinus termis (Mohamed, 1992) and decrease in serum total proten in has been osbserved in chicks fed low levels of dietary Ricinus communis or J. curcas (El Badwi et al, 1992) and Abrus precatorius (Omer, 1990). It is well known that plasma cholesterol concentration is increased in a number of disease state primarily liver disease, diabetes mellitus and hypothyroidism (Bush, 1970). Treatment with Albendazole caused an increase in the concentration of serum uric acid. It is probably that the livers of chickens produce hypoxanthine which is then oxidized to uric acid by xanthine oxidase. Increase in serum uric acid concentration was found in chicks fed with dietary selenium (Dafalla and Adam. 1986),

The scientific data presented in this study indicated that the efficacy of Albendazole, as an anticestodal drug, at a dose rate of 25 mg/kg/day for 3-7 successive days, was estimated to be 100% as judged by adult worm counts, faecal examination for egg counts or by comparison of lesions in treated chicks and non-treated infected controls. In conclusion, based on this study, it is recommended that Albendazole should be used as a suitable drug for effective treatment of *R. tetraqona* infection in susceptible birds.

Acknowledgment

The author would like to thank the staff of the Department of Microbiology and the Department of Medicine, Pharmacology and Toxicology for technical assistance.

References

Bush, B. M. (1970). The effect of dietary iodine on blood cholesterol levels in the dog. Res., Vet, Sci., 11: 597-599.

Dafalla, R. and Adam, S.E.I. (1986). Effect of various levels of dietary selenium on Hybro-type chicks. Vet. Hum. Toxicol., 28: 105-100.

El Badwi, S. M. A.; Adam, S. E. I and Hapke, H. J. (1992b). Toxic effects of low levels of dietary *Jatropha curcas* seed on Brown Hisex chicks.Vet., Hum. Toicol., 34: 112-117.

Mohamed, A. B. (1992). Effect of various levels of Dietary *Lupinus termis* and *Cucurbita maxima* on chicks, M. V. Sc. Thesis University of Khartoum, *Sudan*

Omer, S. A. (1990). Toxic Enterohepatonephropathy in Lohmann- type broiler chicks due to *Abus precatiorius* and *Cassia senna*. M. V. Sc. Thesis, University of Khartoum. Sudan.

Salem, H. H. and El Allat. G. (1969). Treatment of *Taenia saqinata* and *Hymenolepis nana* infection with praramomycin Trana. Roy. Soc. Trop. Med. Hyg., 63: 833-838.

Schenome, H. (1980). Praziquantel in the treatment of *Hymenolepis nana* infection in children, Am. J. Trop. Med. Hyg., 29: 320-325.

Soulsby, E. J. L. (1968). Helminths, Arthropods and Protozoa of Domesticated Animal, 6th ed. Bailliere, Tindall and Cassell. London, U.K.

Thomas, H. and Gonnert, R. (1977). The efficacy of Praziquantel against castodes in animals, Z. Parasite, 52: 117-120.