Evaluation the effect of albendazole against nematodes in sheep in Mosul, Iraq

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Abstract

Six sheep farms in Mosul city, Iraq randomly selected, were surveyed for gastrointestinal nematodes resistant to Albendazole. On each of 6 sheep farms, 20 lambs were randomly distributed into two equal groups untreated control group, and albendazole (benzimidazole) group (10 mg/kg BW). Faecal egg counts and larval cultures were done at 7, 14, and 21 days after anthelmintic treatment. Resistance was apparent for albendazole on 4 farms out of 6 (66.7%). Post-treatment larval cultures indicated: *Strongyloides papillosus*, *Marshalligia marshalli, Nematodirus spathiger* and *Haemonchus contortus*.

Keywords: Albandazole; Nematodes; Sheep

تقييم تأثير البندازول على الديدان الاسطوانية في الضأن في الموصل، العراق

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الخلاصة

اختيرت ستة حقول للضأن في مدينة الموصل عشوائيا للمسح عن مقاومة الديدان الاسطوانية ضد البندازول. ومن ضمن حقول الضأن الستة اختير ٢٠ حملا عشوائياً, إذ قسمت الحيوانات إلى مجموعتين بالتساوي المجموعة غير المعالجة (السيطرة), ومجموعة البندازول (عولجت عن طريق التجريع الفموي بــ١٠ ملغم/كغم من وزن الجسم). حسبت أعداد البيوض, وأجري اختبار زرع اليرقات عند الأيام ٧ و١٤ و٢١ بعد العلاج. لوحظت المقاومة في دراستنا في أربعة حقول من الحقول الستة التي شملتها الدراسة أي بنسبة (٦٦,٧%), وكما ظهرت يرقات الديدان الآتية بعد العلاج:

Strongyloides papillosus،Marshalligia marshalli، Nematodirus spathiger ،Haemonchus contortus.

Introduction

Parasitism, and gastrointestinal nematode parasitism in particular, is arguably the most serious constraint affecting small ruminant production worldwide. Eco-nomic losses are caused by decreased production, cost of prevention, cost of treatment, and the death of infected animals (1). Intensification of animal production has led to an increasing reliance on effective anthelmintic drugs to control helminth diseases. Regular suppressive dosing of susceptible animals has been shown to result in the development of resistance in sheep nematodes (1,2). Resistance to anthelmintic is usually first recognized by a clinical failure in response to anthelmintic therapy and by the persistence of positive faecal egg counts, or the presence of worms following treatment (3). Resistance to anthelmintics in a range of sheep gastrointestinal helminths has been reported from several countries (4). Resistance has been reported most frequently in *Haemonchus contortus* and it can involve benzimida-zole, salicynilides, levamizole, morantel and ivermectin. In Europe, resistance in sheep nematodes has been reported from several countries including France (5). Ivermectin resistant Haemonchus contortus in Louisiana lambs in U.S.A. (6), and benzimidazole resistant to

stronglyes of sheep in Nigeria (7) have been reported. In Iraq, there are few reports of anthelmintic resistance in gastrointestinal nematodes of small ruminants. The current study was designed to examine resistance of nematodes to albendazole in a sample of randomly selected sheep farms in Mosul city (Iraq).

Materials and Methods

Six sheep farms located in Mosul city (Iraq) were randomly selected for this study. Most of the sheep originated from the northern part of Mosul city. No history of anthelmintic usage and other management procedures could be ascertained from the owners.

The general procedure to detect anthelmintic resistance in nematodes was that recommended by the World Association for the Advancement of the Veterinary Parasitology (WAAVP) (8). None the tested animals had received any anthelmintic treatment for at least 6 weeks prior to the start of the study. ON each of the six sheep farms, 20 lambs from both sexes, 2 to 6 months old, were selected, individually identified, and randomly distributed into 2 equal groups. The untreated control group and Albendazole group (Albendazole 2.5% suspension, Al-Salam Factory for drug production, Baghdad, Iraq) given orally at 10 mg/ kg BW.

Seven, 14 and 21 days after anthelmintic treatment, individual faecal samples were taken once from all the animals and processed for faecal egg counting by a modified McMaster technique in which one counted egg equated to 50 eggs per gram of faeces (epg) (9). The mean faecal egg count for each treatment group (epg t) was caculated and compared with that of control group (epg c). The faecal egg count reduction (FECR) was determined using the formula (8):

$FECR = [1-(epg\ t\ /\ epg\ c)] \times 100$.

According to WAAVP recommendations (8,10) resistance is present if:

1- The percentage reduction in egg count is less than 95% and,

2- The lower limit of the 95 % confidence intervals is less than 90 %.

On farms where anthelmintic resistance was detected, a group larval culture was performed to assess the percentage of nematode genera *Strongyloides papillosus*, *Marshalligia marshalli*, *Nematodirus spathiger* and *Haemonchus contortus* by counting at least 100 third-stage larva (L3).

Results

The mean faecal egg count (FEC) and FEC reduction (FECRs) in Table 1. The mean reduction in egg counts after treatment with albendazole ranged from 21.0 to 72.3%, and all farms except farms 2 and 4 showed values lower than

95%. Furthermore, in the above mentioned farm, the lower limit of the 95% confidence intervals was 43.0 suggesting that virtually in all the farms, albendazole resistance nematodes occurred. (Anthelmintic resistance is suspected when there is less than 80% reduction in nematodes egg output following therapeutic dosage with anthlemintics). By the criteria described, resistance was apparent for albendazole on 4 farms out of 6 (66.7%). Post-treatment larval cultures indicated: *Strongyloides papillosus*, *Marshalligia marshalli, Nematodirus spathiger* and *Haemonchus contortus*. The *Strongyloides papillosus* was the pre-dominant larval type in 3 farms, where as *Haemonchus contortus* was the dominant genus in one farm (Table 2).

Table 1: Number (mean ± SE) for fecal egg count (egg per gram), percentage of fecal egg count reduction (FECR) after treatment with albendazole (10 mg/kg,orally) in sheep farms.

Days	Control (epg)	Albendazole (epg)	FECR %
0	3100 ± 14	2800 ± 17	-
7	4700 ± 12	1300 ± 12*	72.3
14	4870 ± 15	3000 ± 17*	38.4
21	5200 ± 13	4100 ± 12*	21.0

Significantly different from day 0 value at $p < 0.05$.

Table 2: Post treatment larval cultures (in %) in sheep farms after seven days

| Farms | Larval culture | | | |
	St. papillosus	*H. contortus*	*M. marshalli*	*N. spathiger*
1	90	10	0	0
2	9	67	10	14
3	83	4	10	3
4	78	17	0	5

Discussion

The results of this study indicate that low levels of albendazole are effective against nematdes of sheep in the 4 farms out of 6 sheep farms examined. Anthelmintic resistance is suspected in these farms. However, benzimidazole resistance has been described earlier in sheep farms in the many countries (11-13). The control of nematode parasites traditionally relies on grazing

management, anthelmintic treatment, or both. However, grazing management schemes are often impractical due to expense or to the hardiness of infective larvae on pasture. In addition, the evolution of anthelmintic resistance in nematode populations threatens the success of drug treatment programs (1). Benzimidazole were thought to bind to parasite tubulin and the loss of this binding in benzimidazole resistant isolates of sheep parasites toge-ther with alterations in the β tubulin isotype distribution in these compared with susceptible worms were decisive in confirming the mechanism of action of the benzi-midazole drugs as well as their mechanism of resistance (14). There are two main reasons for the very high prevalence of albendazole resistance in sheep nematodes in this survey. First albendazole drugs were used very frequently (> 5 annual treatments) when compared with control practices in neighbouring Germany with only 2 or 3 treatments per year (15), secondly albendazole compounds were by far the most frequently used anthelmintic due to, it is a very cheap than other anthel-mintic families. The repeated and exclusive use of albendazole products obviously led to the development of resistant nematode strains (16,17) where as the impact of a continuous suboptimal dosage is more controversial (12,18). Post-treatment larval cultures indicated *Strongyloides papillosus* was the predominant larval type in 3 farms, where as *Haemonchus contortus* was the dominant genus in one farm. Albendazole resistance was mostly multispecific i.e developing on one farm in several species of nematodes with the resistant nematode genera involved being *Teladorsagia, Trichostrongylus, Haemonchus, Cooperia*. In other European countries benzimidazole resistance in sheep was more often related to *Haemonchus contortus* in Belgium (19) and to *Teladorsagia circumcincta* in Great-Britain (8).

Acknowledgments

References

1. Radostits OM, Gay CC, Blood DC, Hinchlff KW. Veterinary Medicine: A textbook of the Diseases of Cattle, Sheep, Pigs, Goats and Horses. 10th ed. Philadelphia: WB Saunders Com 2007.
2. Coles GC, Bauer C, Borgsteede FHM, Geerts S. Recommendations for the control of anthelmintic resistance nematodes of farm animals in the EU. Vet Rec 1994; 134: 205–206.
3. Rang HP, Dale MM, Ritter JM, Moore P. Pharmacology. 5th ed. Churchill: Livingostone 2003: 690-692.
4. Waller PJ. Anthelmintic resistance and the future for roundworm control. Vet Parasitol 1987; 25: 177.
5. Waller PJ. Control strategies to prevent resistance. Vet Parasitol 1993; 46: 133-142.
6. Miller J, Barras SR. Ivermectin resistant *Haemonchus contortus* in Louisiana lambs. Vet Parasitol 1994; 455: 343-346.
7. Mbah AH, Ogunrinade AF, Dina OA. Benzimidazole resistance in *Haemonchus contortus* of sheep in Ibadan, Nigeria. African Livestock Res 1992; 11: 16-17.
8. Coles GC, Bauer C, Borgsteede FH M, Geerts S, Klei TR, Taylor M, Waller PJ. World association for the advancement of Veterinary Parasitology (WAAVP) methods for the detection of anthelmintic resistance in nematodes of veterinary importance. Vet Parasitol 1992; 44: 35.
9. Coles EH. Veterinary clinical pathology. 4th ed. WB Saunders Co. Philadelphia, London: Toronto 1986: 10-75.
10. Kumsa B, Wossenes A. Efficacy of albendazole and tetramidazole anthelmintics against *H. contortus* in experiment-tally infected lambs. Intern J Appl Res Vet Med 2006; 4: 216-221.
11. Mortensen LL, Williamson LH, Terrill TH. Evaluation of prevalence and clinical implications of anthelmintic resistance in gastrointestinal nematodes of goats. J Am Vet Med Assoc 2003; 23: 495-500.
12. Abbott KA, Taylor M, Stubbings LA. Sustaible control of parasite in sheep. Annual meeting for Vet Surgeons and Advisers 2004.
13. Fleming ShA, Craig T, Kaplan RM, Miller JE, Navarre Ch, Rings M. Anthelmintic resistance of gastrointestinal parasite in small ruminants. J Vet Intern Med 2006; 20: 435-44.
14. Lacey E. Role of cytokeletal protein, tubulin in the mode of action and mechanism of drug resistance to benzimidazole. Int J Parasite 1988; 18: 885-936.
15. Bauer C, Failing K. Einsatz von Anthelmintika zur matoden-bekampfung bei Schafen in Westdeutschland: ergebnisse einer Umfrage. [Use of anthelmintic to control nematode in sheep in West Germany: replies to a questionnaire. Deutsche Tieraerztl] Wochenschrift, 1992; 99: 365-370.
16. Sykes AR, Mcfarlane RG, Familton AS. Parasites immunity and anthelmintic resistance in progress in sheep and goats research. UK: CAB International, Wallingford 1992: 179-191.
17. Margo H. Manging internal parasite in sheep and goats. NCAT Agriculture Specialist 2006: 289-293.
18. Borgsteede FHM, Roos MH, Smith G, Prichard K. Workshop summary: anthelmintic resistance. Vet Parasitol 1996; 64: 129-132.
19. Vercruysse J, Dorny P, Meurens K. Benzimidazole resistance nematodes in sheep in Belgium. Vet Rec 1989; 125: 602-603.