EFFICACY OF ANTHELMINTIC TREATMENT TO CONTROL HELMINTHIASIS IN SHEEP OF VETERINARY INSTITUTE

SABARIAH B.*, MAIZATUL AZLINA A.M., CHAMIAN D., HASHIM N., JAMAL S., MARLIAH A. AND MARIA J.

Malaysia Veterinary Institute, P.O.Box. 520, Jalan Batu Pahat, 86009 Kluang, Johor.
* Corresponding author: sabariah@dvs.gov.my

ABSTRACT. Nematodes resistant to anthelmintics are of increasing concern to sheep farms in Malaysia. Thus to ascertain the degree of anthelmintic resistance in the sheep population, faecal egg count reduction (FECR) trials were conducted on sheep in the Veterinary Institute, Kluang. A total of 60 weaned sheep were selected and divided into six (6) equivalent groups. Group A was treated with ivermectin, Group B with Closantel, Group C with Fenbendazole, Group D with Levamisole, Group E with Cydectin and the remaining 10 were untreated controls. Faecal samples were collected from each sheep before treatment and repeated on day 14, 30, 45 and 60 post treatment. The worm egg counts were estimated by using McMaster's method. The population of worm was classified as resistant if the adjusted percentage reduction was less than 90%. It is concluded that only levamisole can be used for helminthiasis control. The results showed that worms at the Sheep Unit of the Veterinary Institute, Kluang was suspected to be resistant to Ivermectin, Closantel and Cydectin. The worm population showed total resistance to fenbendazole. The strongyle population is mainly made up of 80% *Haemonchus contortus* and 20% of species were *Oesophagostomum* and *Bunostomum*.

Keywords: anthelmintic resistance, helminthiasis, sheep

INTRODUCTION

Helminthiasis is one of the major constraints affecting sheep production in Malaysia. Mortality and affected growth due to helminthiasis is an economic loss to the producers. Anthelminthic resistance is the major problem in small ruminants in Malaysia (Khadijah Saad *et al*., 2005). A study on four sheep farms by Pandey and Sivaraj (1994) showed that all four farms had high resistance levels of *Haemonchus contortus* to benzimidazole. Deworming with anthelmintic is usually carried out as a routine measure in many farms. However applying regular use of a single anthelmintic can create worm resistance after some duration. Worm infestations was noted in the Sheep Unit of the Veterinary Institute, Kluang. Faecal samples were taken every month from 10% of population and were sent to the Institute's laboratory for worm egg count. Anthelmintic treatment was given at approximately one-month intervals based on the result of the test and analysis. Rotational grazing was recommended to lessen the infection of infective larvae but worm infestation was still critical. Thus an experiment was conducted to study

the efficacy of anthelmintics used by the Institute through the faecal egg count reduction test (FECRT) method. FECRT was the first test developed for evaluating anthelmintic efficiency and remains the most widely used for routine diagnosis in commercial flocks and herds. The test provides an estimation of anthelmintic efficacy by comparing worm egg counts from hosts treated or not, before and after treatment and thus evaluating faecal egg count reduction (Coles *et al*., 1992; Wood *et al*., 1995)

MATERIALS

Animals

Sixty wean sheep were selected, identified and divided into six experimental groups. Each group consists of 10 sheep. All sheep were weighed before anthelmintic drugs were given.

Grazing Management

Rotational grazing for three days in one paddock was practised during the experiment to reduce the worm burden by natural challenge (Figure 1).

Treatment and doses

Group A was treated with ivermectin (0.5 ml/25 kg of body weight), Group B received closantel (1 ml/5 kg of body weight), Group C was treated with febendazole (6 ml/25 kg of body weight), Group D was treated with levamisole (5 ml/10 kg of body weight), Group E was treated with cydectin (1 ml/5 kg of body weight) whereas group F was a control group and remain untreated. All compounds were in paste form. They

Figure 1. Rotational grazing of sheep in a paddock

Figure 2. Drug administered orally

Figure 3. Drug administered by subcutaneous injection

were administered orally (Figure 2) except for Ivermectin and closantel which were administered by subcutaneous injection (Figure 3).

Collection of faecal samples and laboratory test

Faecal samples were collected from each sheep prior to treatment (pre-treatment 1 and 11) and repeated on day 14, 30, 45, and 60 post treatment (Figure 4). The worm egg counts were performed by using the McMaster technique (Zajac A.Z. *et al.*, 2012)

Pooled group faecal cultures were carried out to determine the anthelmintic resistance status to each species of strongyle. The helminth population was classified as sensitive if the adjusted percentage reduction was more than 90% to a particular drug, suspected resistant if the percentage reduction was 80-90% and resistant if the percentage reduction was less than 80% (Panday *et al.,* 1994). Many nematode eggs are alike and species such

Figure 4. Faecal sampling per recta

Calculations

The results of anthelmintic tests were calculated from the mean number of eggs per gram for each group. The percentage reduction in the faecal egg count was calculated using the change in faecal egg count of the control group as a correction factor (Coles *et al.*, 1992 and Wood *et al.*, 1995). The formula is as the follows:

Table 1. Efficacy trial for ivermectin, closantel, fenbendazole, levamisole, cydectin on sheep at day 14, 30, 45 and 60 post-treatment.

Drug (n= 10)	Pre-treatment	Day 14 post-treatment	Day 30 post-treatment	Day 45 post-treatment	Day 60 post-treatment	Status of Resistance
Ivermectin						
Min - max egg count	200 – 10800	500 – 5800	0 – 4900	0 – 8000	0 – 1500	Suspect Resistant
Mean faecal egg count	4970 ±3241.76	2590±1699.97	1570±2041.81	1550±2756.10	260±471.88	
Reduction (%)		82.14	82.07	59.01	55.31	
Closantel						
Min - max egg count	300-9000	300-7000	0-6400	0-5200	0-900	Suspect Resistant
Mean faecal egg count	4940±2952.66	2660±2141.24	1150±2060.88	1260±1512.32	210±351.03	
Reduction (%)		86.10	90.40	75.66	73.64	
Fenbendazole						
Min - max egg count	100 -10700	0 -13300	0 - 6300	0 - 11000	0 - 1500	Resistant
Mean faecal egg count	4960±3345.38	4340±4297.60	1850±2353.37	1560±3393.20	290±566.57	
Reduction (%)		72.14	80.33	61.59	53.60	
Levamisole						
Min - max egg count	100 - 9900	0 - 100	0 - 6600	100 - 11900	0 - 2900	susceptible
Mean faecal egg count	4980±3178.33	30±48.30	1120±2042.22	2570±3603.72	350±904.62	
Reduction (%)		99.86	91.35	54.07	59.34	
Cydectin						
Min - max egg count	100 - 9000	0 - 9700	0 - 6700	0 - 9600	0 - 3200	Suspect resistant
Mean faecal egg count	4980±3002.89	2170±2844.90	1080±2053.61	1800±3042.66	330±1008.90	
Reduction (%)		88.03	90.13	61.92	54.63	

* std deviations are in parenthesis

% Reduction = 100 (1 - [T3/C3] X [C1 + C2] / 2 [T1 + T2]/2)
where
T1 = Pre-treatment 1
mean faecal egg count of the treated group.
T2 = Pre-treatment 11
mean faecal egg count of the treated group
T3 = Post-treatment
mean faecal egg count of the treated group
C1 = Pre-treatment 1
mean faecal egg count of the control group
C2 = Pre-treatment 11
mean faecal egg count of the control group
C3 = Post-treatment
mean faecal egg count of the control group

RESULTS

All data were tabulated and summarised in Table 1 and Figure 5.

The results showed that levamisole is the effective anthelmintic to control helminthiasis where the reduction percentage is 99.86% and 91.35% on day 14 and day 30 post-treatment consecutively.

However, closantel, cydectin and ivermectin showed doubtful efficacy of treating helminths. Closantel has 86.10%

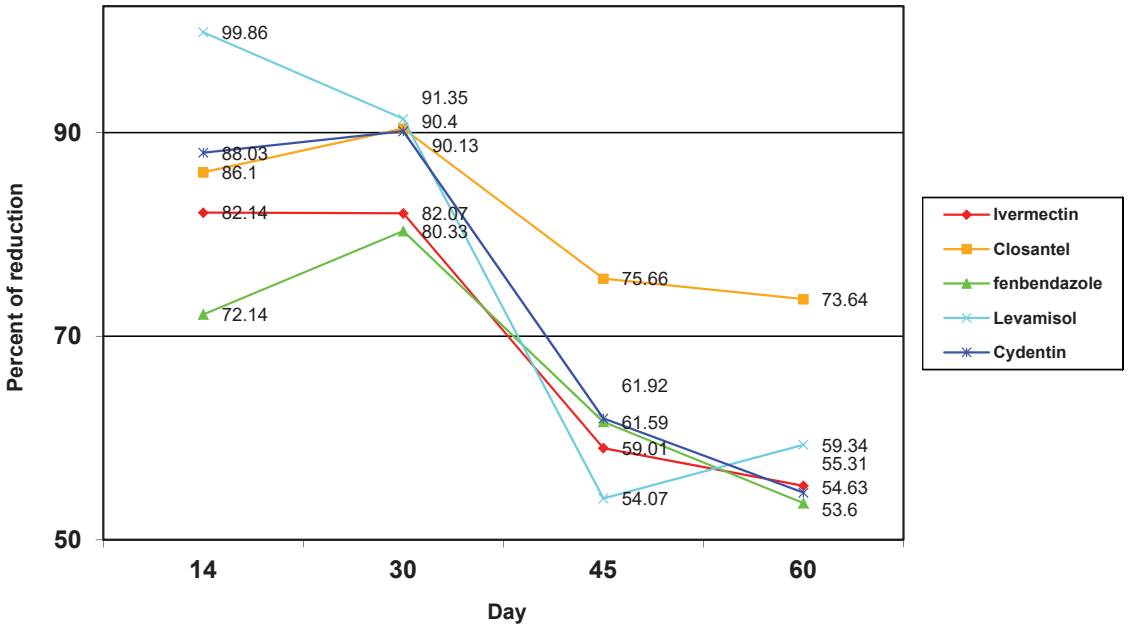

Figure 5. Percent of reduction for ivermectin, closantel, fenbendazole, levamisole and cydectin in sheep on days 14 , 30, 45 and 60 post-treatment

reduction on day 14. However, it increased to 90.4% on day 30 post-treatment. Cydectin had 88.03% reduction on day 14 and increased to 90.13% on day 30. Ivermectin showed 82.14% reduction on day 14 and dropped slightly to 82.07% reduction on day 30 post-treatment.

Fenbendazole has 72.14% reduction on days 14 and 80 and 33% reduction on day 30 post-treatment. Hence, helminths have built up resistance to it.

From a helminth culture at larval stage 3 (L3), it was discovered that 80% of the helminth population were *Haemonchus contortus* and 20% were from *Oesophagostomum* sp. and *Bunostomum* sp.

DISCUSSION

Anthelmintic resistance is the major problem in small ruminants in Malaysia (Khadijah Saad *et al.*, 2005). A study on four sheep farms by Pandey *et al.* (1994) showed that all four farms had high resistance level of *Haemonchus contortus* to benzimidazole. A helminth population was classified as sensitive if the adjusted percentage reduction was more than 90% to a particular drug, suspected resistant if the percentage reduction was 80-90% and resistant if the percentage reduction was less than 80%. (Panday *et al.,* 1994)

Fenbendazole has 72.14% reduction on day 14 post-treatment. Hence helminths had built up resistance to it. It was reported that

gastrointestinal parasites of goat and sheep have developed resistance to benzimidazole (Donney *et al.*, 1994).

The results showed that worms was suspected to be resistant to ivermectin, closantel and cydectin. Over the past 10 to 15 years, there has been a rapid increase in both the prevalence and magnitude of anthelmintic resistance, and this increase appears to be a worldwide phenomenon. Reports of anthelmintic resistance to multiple drugs in individual parasite species, and in multiple parasite species across virtually all livestock hosts, are increasingly common (Ray M. Kaplan *et al.*, 2012). Our understanding of the factors which select rapidly for resistance has increased and programmes of worm control which minimise selection for anthelmintic resistance are being developed and tested (Prichad R.K., 1990)

The results showed that levamisole can be used for helminthiasis control where the percentage reduction was more than 90%. The Sheep Unit of the Veterinary Institute, Kluang has been using cydectin for 3 years, closantel for 4 years, fenbendazole was used in salt lick since 1990 and ivermectin has been frequently used to treat bottle jaw cases.

Several methods were introduced in facing anthelmintic resistance in sheep at the Sheep Unit of Veterinary Institute, Kluang as follows:

1. Rotational grazing. This method was introduced to the farms with large acreage of pasture. The flock of sheep is allowed to graze in a paddock for 3 days only. Then the flock is moved to the next paddock. The grazed paddock is left empty for at least 30 days to reduce the chances of the survival of existing larvae. Experimental work showed that this method was highly successful in maintaining low worm burdens (Chandrawathani *et al.*, 2004).
2. Improved nutrition. As improved nutrition has been implicated to positively affect worm population, management of Sheep Unit are encouraged to improve the quantity and quality of feeding through provision of supplements, concentrates, urea molasses blocks as well as improved pastures for animals (Knox *et al.*, 1998).
3. The use of effective microbes or Useful Microbes (UM) fluid in drinking water for worm control. The UM was produced by the Department of Veterinary Services Pulau Pinang (Chandrawathani *et al.*, 2011).

CONCLUSION

Ivermectin, closantel and cydectin showed poor efficacy in treating helminthiasis. Fenbendazole is no longer effective and should not be used anymore. Only levamisole should be used due to its reliable efficacy on treating helminthiasis in sheep at the Veterinary Institute.

REFERENCES

1. Chandrawathani P., Adnan M., Maria J., Hong K.S. and Wan Zahari M. (1996). Uptake of fenbendazole by sheep fed with medicated urea molasses blocks. In: *Proceeding of the 8th Veterinary Association Malaysia Scientific Congress*, August 1996, Ipoh, Malaysia pp 53-54

2. Chandawathani P., Nurulaini R., Premaalatha B., Zaini C.M., Adnan M., Zawida Z., Rusydi A.H., Wan M.K. and Mohamed Zainudeen M.H. (2011). The use of effective microbes for worm control in goats. *Malaysian Journal of Veterinary Research.* **2(2):**57-60
3. Coles *et al*., 1992; Wood *et al*., 1995. FECR test provides an estimation of anthelmintic efficacy by comparing worm egg counts from hosts treated or not, before and after treatment and thus evaluating faecal egg count reduction. *Veterinary Parasitology* **157**(2008):267-274
4. Khadijah S., Chandrawathani P., Wahab A.R., Hassan G.D., Vasuge M. and Adnan M. (2005). Anthelmintic resistance in smallholder ruminant farm in Perak. In: *Proceeding of the 17th Veterinary Association Malaysia Scientific Congress*, Julai 2005, Mines Resort City, Kuala Lumpur pp 134-135.
5. Knox K. and Wan Zahari M. (1998). Urea-molasses blocks for parasite control: (2012). *Malaysian Journal of Veterinary Research*, **3(1):**23-28
6. Maria J., Chandrawathani P., Adnan M., Wan Zahari M., Subramaniam K. and Ahmad A. (1996). The effectiveness of medicated urea molasses block to control helminthiasis in sheep. In: *Proceedings of the 8th Veterinary Association Malaysia Scientific Congress*, August 1996, Ipoh, Malaysia pp 55-57.
7. Panday V.S. Sivaraj, (1994). Anthelmintic resistance in *Haemonchus contortus* from sheep in Malaysia. *Veterinary Parasitology* **53:**67-74
8. Prichad R.K. (1990). Anthelmintic resistance in nematodes: Extent, recent understanding and future directions for control and research. *International Journal for Parasitology*, **20:**515-523
9. Rajamanickam C., Cheah T.S., Hasnah Yaakob and Chandrawathani P. (1990). The control of nematode infentions in sheep using ivermectin, *Jurnal Veterinar Malaysia,* **2(1):**19-24 Ray M. Kaplan and Anand N. An inconvenient truth: Global worming and anthelmintic resistance. *Veterinary Parasitology,* **186:**70-78
10. Soulsby E.J.L. (1982). *Helminths, arthropods and protozoa of domesticated animal 7th Edition*. pp 231-238
11. Zajac A.Z. and Conboy G.A. (2012). *Veterinary Clinical Parasitology 8th Edition,* pp 8-11.