

## Severe Anthelmintic Resistance in Two Free Grazing Small holder Goat Farms in Malaysia

Chandrawathani P<sup>1\*</sup>, Premaalatha B<sup>1</sup>, Nurulaini R<sup>1</sup>, Erwanas AI<sup>1</sup>, Zaini CM<sup>1</sup>, Aizan M<sup>2</sup>, Ramlian M<sup>1</sup> and Khadijah S<sup>3</sup>

<sup>1</sup>Veterinary Research Institute, 59, Jalan Sultan Azlan Shah, 31400 Ipoh, Perak, Malaysia

<sup>2</sup>Perak State Department of Veterinary Services, 31400 Ipoh, Perak, Malaysia

<sup>3</sup>Department of Biological Sciences, Faculty of Science and Technology, Universiti Malaysia Terengganu, 21030 Kuala Terengganu, Terengganu, Malaysia

### Abstract

The use of anthelmintics in Kinta district has been ineffective in varying degrees in small ruminants due to anthelmintic resistance. In 2012, two goat farms experiencing severe mortality up to 30% in the flock were tested for anthelmintic resistance using the Faecal Egg Count Reduction Test (FECRT) with four anthelmintic from the group; Benzimidazoles, Imidazothiazoles, Macrocytic Lactones and Salicylanilides. Fifteen animals were used in each group and treated according to the recommended dose rates based on body weights and faecal egg counts and larval cultures were conducted. Results showed that *Haemonchus contortus* and *Trichostrongylus colubriformis* in these two farms were resistant to all the four anthelmintic group tested. As these two farms were actively exporting their animals to the other farm, the results in this paper indicate that nematode resistant worms are actively dispersed to the other farms in the country. This would be a factor that will hinder the actions taken to alleviate the nematode anthelmintic resistance problem in Malaysia.

**Keywords:** Anthelmintic resistance; Helminthiasis; Goat farms; Anthelmintic drugs

### Introduction

Helminthiasis in small ruminants has been identified as the second most important cause of mortality and morbidity in small ruminants of Malaysia [1]. Consequently, anthelmintic resistance has been reported in the small ruminant farms over the years [2-4].

In one government sheep breeding farm, multiple resistance was reported towards oxfendazole (Benzimidazoles - Bz), levamisole (Imidazothiazoles - Leva), ivermectin (Macrocytic lactones - ML), with suspected resistance towards moxidectin (ML) [5]. Total anthelmintic failure of all five commercially available anthelmintic drug classes - Bz, Leva, ML and Salicylanilides (Clos) was also reported in five small ruminant government farms in Sabah, East Malaysia [5] and in five small ruminant government farms in Peninsular Malaysia [6].

In small ruminant private farms in Malaysia, the occurrence of multiple resistance towards two or more anthelmintics from different drug groups was reported by various authors [3,6]. Since government and private small ruminant farms in Malaysia are actively distributing their animals to other smallholder farmers throughout the country through trading, the severity of this problem is likely to have been widely dispersed.

In 2011, one goat farm located in Ipoh Perak had recorded mortality of 33% per month with worm infection as the main cause despite injectable ivermectin given to the animals once a year. In another farm, mortality of animals was much lower, 13-40% mortality annually even though the animals were never treated with anthelmintics. Thus a study was conducted to evaluate the current status of nematode anthelmintic resistance in these farms, as anthelmintic resistance was never evaluated on these farms and it is suspected to occur at least on one farm.

### Materials and Methods

Faecal Egg Count Reduction Test (FECRT) [7] was conducted on 2 goat farms in Ipoh, Perak to evaluate the status of resistance of nematode to four types of anthelmintics; Benzimidazoles (Albendazole, Vetpharm Laboratories (S) Pte. Ltd.), Imidazothiazoles (Levamisole,

Bovet Pharmaceutical Ltd.), Macrocytic Lactones (Ivermectin, Man./Fab: KELA N.V.) and Salicylanilides (Closantel, Janssen Pharmaceutical N.V.). In each farm, animals were divided into 5 equal groups of 8-10 animals and then the animals were treated according to the manufacturers' recommended dose rates based on individual body weight. The animals in the control group were not given any treatment.

In each farm, pre-treatment rectal faecal samples were collected from each animal. The animals in each group were treated, while the animals in the control group were identified and no treatment was given. Faecal samples were subjected to faecal egg count using the McMaster method [8] with one egg counted equivalent to 100 eggs per gram faeces. Rectal faecal samples were collected again 10 to 14 days post treatment, for faecal egg count. Faecal culture (MAFF, 1986) was conducted following the faecal egg count by pooling all samples in each farm (pre-treatment) and by treatment groups in each farm (post-treatment) to identify the species of nematodes present. Identification of species was conducted using the identification keys by Manual of Veterinary Parasitological Laboratory Techniques (1971).

Analysis of data to evaluate the status of resistance was conducted based on the calculations outlined by Coles et al. [7]. Resistance to a particular anthelmintic was considered to be present if the reduction in faecal egg count was less than 95% and the 95% lower confidence limit was less than 90%. If only one of two criteria was met, the status was considered as suspected resistance. If the reduction in faecal egg

**\*Corresponding author:** Chandrawathani P, Veterinary Research Institute, 59, Jalan Sultan Azlan Shah, 31400 Ipoh, Perak, Malaysia, E-mail: [chandra1959@gmail.com](mailto:chandra1959@gmail.com)

**Received** March 01, 2013; **Accepted** July 10, 2013; **Published** July 12, 2013

**Citation:** Chandrawathani P, Premaalatha B, Nurulaini R, Erwanas AI, Zaini CM, et al. (2013) Severe Anthelmintic Resistance in Two Free Grazing Small holder Goat Farms in Malaysia. J Veterinar Sci Technol 4: 137. doi:10.4172/2157-7579.1000137

**Copyright:** © 2013 Chandrawathani P, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

count was more than 95% and the lower confidence limit was more than 90%, the status was considered as susceptible [7].

## Results

### Managements

Information on the management of the animals in the farms are summarized in Table 1.

Both farms are privately owned farms with animal numbers ranging between 60-90 heads per farm. In both of the farms, the goats were crossbreds Boer and Jamnapari, as the farmers kept various breeds together in their farm since they had started farming. The two farms practised semi-intensive management, where by animals grazed for 4 hours during the day and housed in raised-floor, wooden sheds during the night.

Animals in the shed were supplied with water *ad libitum*, salt or mineral blocks and one of farm also provided with commercial pelleted feed. Only in one farm (Farm A) the animals were dewormed once a year with ivermectin. Another farm (Farm B) the animals were never dewormed.

### Anthelmintic resistance

Farm A was found to be resistant to all drugs tested - Bz, Leva, ML and Clo while Farm B was resistant to all three drugs tested- Bz, Leva and Clo. Leva is still effective in Farm B (Table 2). The egg counts for each treatment group are given in Table 3. Pre-treatment L3 identification in Farm A indicated that *Haemonchus contortus* is predominant species (96%) followed by *Trichostrongylus* sp (3%) and *Cooperia* sp (1%). Post treatment in Farm A showed resistance of *Haemonchus contortus*, *Trichostrongylus* sp and *Cooperia* sp to Benzimidazoles, Levamisole, Macrocytic Lactones (Ivermectin, Man./Fab: KELA N.V.) and Salicylanilides (Closantel, Janssen Pharmaceutical N.V.) *Haemonchus contortus* is predominant species (50%) followed by *Oesophagostomum* sp. (38%) and *Trichostrongylus* sp (12%) in Farm B. Post treatment in

Farm B showed resistance of *Haemonchus contortus*, *Oesophagostomum* sp. and *Trichostrongylus* sp to Benzimidazoles, Levamisole and Salicylanilides (Table 4) (Closantel, Janssen Pharmaceutical N.V.) and Macrocytic Lactones (Ivermectin, Man./Fab: KELA N.V.) is the effective drug for Farm B.

### Discussion

Anthelmintic drugs such as benzimidazoles, levamisole and closantel are commonly used in Malaysian goat and sheep farms to control helminthiasis. However, over the past two decades there have been complaints of ineffectiveness of these drugs as farmers can buy these easily from veterinary drug distributors. Investigations by the Veterinary Research Institute have revealed a steady increase in sheep and goats being resistant to these drugs and of late even ivermectin. Anthelmintic resistance survey conducted by Dorny et al. [2] revealed 36% of goat farms to be resistant to benzimidazoles from a survey involving 92 farms locally. It was seen that the strongyles showing resistance to benzimidazoles are *Haemonchus contortus* and *Trichostrongylus* spp. Other workers, have reported up to 75% of goat farms to be resistant to benzimidazoles [3,8]. In this study, both farms showed critical resistance to benzimidazoles and ivermectin indirectly indicating that these 2 drugs may have been used frequently and excessively in goats. According to Coles et al. [8] Farm 2 had a susceptible worm population which could be controlled with levamisole. In a situation like this, alternative methods of worm control such as rotational grazing, or herbal remedies can be used to alleviate the helminthiasis problem. In Malaysia, commercial farms are advised to practise zero grazing or cut and carry feeding to reduce worm infestation as drug therapy with a less than effective product would considerably increase costs. There is tremendous pressure to turn towards ecofarming, reduce drug use and implementation of sustainable practises to control helminthiasis in small ruminants, the biggest cause of production losses in the tropics.

After the nationwide survey reports were published [3,8,9], the

	Number of animals	Breed of animals	Management type	Feed	Grazing area	Mortality rate	Deworming frequency	Drug used
Farm A	60	Mix	Semi-intensive	Grass when grazing and pellets while penned	Free roaming at oil palm plantation, always on the same area.	33% a month	1/year	Ivermectin
Farm B	90	Mix	Semi intensive	Only when grazing	Free roaming, always on the same area	13-40% a year	0	Animals were never dewormed

Table 1: Summary of farm management in the two farms involved in this study.

	FECRT Percentage			
	Bz	Leva	ML	Clo
Farm A	94%	33%	-297%	25%
Farm B	54%	-46%	97%	-6%

Note : FECR <50%-critical resistance; FECR 50% to 90% -severe resistance; FECR 91% to 95%- moderate resistance

Table 2 : Anthelmintic resistance status on two smallholder farms.

		Faecal egg count (epg)				
		Control	Bz	Leva	ML	Clo
Farm A	Pre-treatment	625	2729	1775	2538	843
	Post-treatment	1550	2267	43	1643	713
Farm B	Pre-treatment	1010	937	1175	1362	3787
	Post-treatment	463	350	312	28	1842

Table 3: Faecal egg count from treatment and control groups for each farm.

		Control	Bz	Leva	ML	Clo
Farm A	Pre-treatment	<i>H. contortus</i> (96%), <i>Trichostrongylus</i> sp. (3%), <i>Cooperia</i> sp. (1%)				
	Post-treatment	<i>H. contortus</i> (84%) <i>Trichostrongylus</i> sp. (11%) <i>Cooperia</i> sp. (5%)	<i>H. contortus</i> (86%) <i>Trichostrongylus</i> sp. (1%) <i>Cooperia</i> sp. (13%)	<i>H. contortus</i> (97%) <i>Trichostrongylus</i> sp. (3%)	<i>H. contortus</i> (76%) <i>Trichostrongylus</i> sp. (19%) <i>Cooperia</i> sp. (5%)	<i>H. contortus</i> (86%) <i>Trichostrongylus</i> sp. (1%) <i>Cooperia</i> sp. (13%)
Farm B	Pre-treatment	<i>H. contortus</i> (50%), <i>Oesophagostomum</i> sp. (38%), <i>Trichostrongylus</i> sp. (12%)				
	Post-treatment	<i>H. contortus</i> (47%) <i>Trichostrongylus</i> sp. (22%) <i>Cooperia</i> sp. (2%) <i>Oesophagostomum</i> sp. (29%)	<i>H. contortus</i> (50%) <i>Trichostrongylus</i> sp. (49%) <i>Cooperia</i> sp. (1%) <i>Oesophagostomum</i> sp. (0%)	<i>H. contortus</i> (6%) <i>Trichostrongylus</i> sp. (28%) <i>Cooperia</i> sp. (1%) <i>Oesophagostomum</i> sp. (65%)	<i>H. contortus</i> (84%) <i>Trichostrongylus</i> sp. (16%) <i>Cooperia</i> sp. (0%) <i>Oesophagostomum</i> sp. (0%)	<i>H. contortus</i> (33%) <i>Trichostrongylus</i> sp. (43%) <i>Cooperia</i> sp. (3%) <i>Oesophagostomum</i> sp. (21%)

**Table 4:** Species percentage of third stage larvae from treatment groups and control.

Department of Veterinary Services have been actively advising the farmers to reduce the severity of anthelmintic resistance. Farmers were advised to improve the grazing management by rotational grazing.

#### Acknowledgements

The authors would like to thank the Director General, Department of Veterinary Services for granting permission to publish this paper. We also would like to thank the Director and the staff from Perak State Department of Veterinary Services, as well as the farmers involved in this study.

#### References

1. Fatimah I, Ranjit KD, Jainudeen MR (1985) Causes of mortality of Dorset Horn Sheep in Malaysia. *Kaj Vet* 17: 62-67.
2. Domy P, Claerebout E, Vercruyse J, Sani R, Jalila A (1994) Anthelmintic resistance in goats in peninsular Malaysia. *Vet Parasitol* 55: 327-342.
3. Chandrawathani P, Adnan M, Waller PJ (1999) Anthelmintic resistance in sheep and goat farms in Peninsular Malaysia. *Vet Parasitol* 82: 305-310.
4. Chandrawathani P, Adnan M, Jamnah O (1998) The efficacy of moxidectin against trichostrongylid infection in sheep. *Journal of Bioscience* 9: 112-113.
5. Chandrawathani P, Jamnah O, Chaeh TS, Adnan M, Rajamanickam C (1996) Evaluation of Closantel against gastrointestinal nematodes of sheep. *Journal of Bioscience* 7: 83-86.
6. Khadijah S, Rahman WA, Chandrawathani P, Waller PJ, Vasuge M, et al. (2006) Small Ruminants on Private Farms in Peninsular Malaysia: Nematode Resistance to Anthelmintic. *Journal Veterinary Malaysia* 18: 29-32.
7. Khadijah S, Rahman WA, Chandrawathani P, Waller PJ, Vasuge M, et al. (2006) Nematode Anthelmintic Resistance in Government Small Ruminant Farms in Peninsular Malaysia. *Journal Veterinary Malaysia* 18: 1-5.
8. Coles GC, Bauer C, Borgsteede FHM, Geerts S, Klei TR, et al. (1992) World Association for the Advancement of Veterinary Parasitology (W.A.A.V.P.) methods for the detection of anthelmintic resistance in nematodes of veterinary importance. *Veterinary Parasitology* 44: 35-44.
9. Anonymous (1986) Manual of veterinary parasitological laboratory techniques. (3rd edn), Ministry of Agriculture. Fisheries and Food. London.