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

Chandrawathi P, Premaalatha B, Nurulaini R, Erwanas A, Zaini CM, Aizan M, Ramlan M and Khadijah S

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, Bovet Pharmaceutical Ltd.), Macrocyclic 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...
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 crossbreeds 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 A (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* spp. and *Cooperia* sp (1%). Post treatment in Farm A showed resistance of *Haemonchus contortus*, *Trichostrongylus* sp and *Cooperia* sp to Benzimidazoles, Levamisole and Macrocyclic Lactones (Ivermectin, Man./Fab: KELA N.V.) and Salicylanilides (Closantel, Janssen Pharmaceutical N.V.) 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 Macrocyclic 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.

|                  | Bz   | Leva | ML   | Clo  |
|------------------|------|------|------|------|
| Farm A           | 94%  | 33%  | -28% | 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.
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.

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

| Farm | Control | Bz | Leva | ML | Clo |
|------|---------|----|------|----|-----|
| Post-treatment | H. contortus (84%) | Trichostrongylus sp. (11%) | Cooperia sp. (5%) | H. contortus (97%) | Trichostrongylus sp. (3%) | Cooperia sp. (1%) |
| Post-treatment | H. contortus (47%) | Trichostrongylus sp. (22%) | Cooperia sp. (2%) | Oesophagostomum sp. (29%) | H. contortus (6%) | Trichostrongylus sp. (28%) | Cooperia sp. (1%) | Oesophagostomum sp. (0%) |
| Post-treatment | H. contortus (50%) | Trichostrongylus sp. (49%) | Cooperia sp. (1%) | Oesophagostomum sp. (0%) | H. contortus (84%) | Trichostrongylus sp. (16%) | Cooperia sp. (0%) | Oesophagostomum sp. (0%) |
| Post-treatment | H. contortus (33%) | Trichostrongylus sp. (43%) | Cooperia sp. (3%) | Oesophagostomum sp. (21%) | H. contortus (86%) | Trichostrongylus sp. (1%) | Cooperia sp. (13%) |