What does anthelmintic resistance mean for worm treatment in cattle?

Dr Nicholas Wonders  
Field Services Veterinarian, Large Animal Business  
Merial Australia  
Building D, 12-24 Talavera Rd, Macquarie Park, NSW, 2113

Introduction

Reports of Anthelmintic resistance in Australian cattle have grown since the mid 2000’s.\textsuperscript{1,2,3,4} With the aid of producers, veterinarians and independent researchers, from 2012-14, Merial undertook the largest national survey of anthelmintic resistance on Australian cattle properties to date.

Anthelmintic resistance in cattle nematodes

Worm Egg Count Reduction Tests (WECRT) were conducted on 36 properties throughout Australia to get an indication of the prevalence and severity of anthelmintic resistance in naturally acquired nematode infections in cattle.

Cattle were selected on the following criteria; young cattle (preferably weaners) aged 6-12 months, of a consistent line (age, size, weight, breed, sex, condition), with a similar grazing history and able to be maintained on similar paddocks for the duration of the test, and a targeted minimum pre-trial mean worm egg count (WEC) of >200epg, with the majority of animals having WEC’s >100epg.

Where numbers and facilities allowed, cattle were randomly allocated into 5 treatment groups of 15 animals each; 1) abamectin/levamisole PO (abamectin 0.5mg/kg, levamisole 10mg/kg), 2) moxidectin PO (0.5mg/kg), 3) doramectin PO (0.5mg/kg), 4) eprinomectin PO (0.5mg/kg), and 5) untreated control group. Where facility constraints were a concern, injectable doramectin (0.2mg/kg) and injectable moxidectin (0.2mg/kg) could be used in place of PO products.

On day zero (0) cattle were individually weighed and treated according to group. Each pour-on treatment group were then separated for a minimum of 7 days to avoid cross contamination. On day 14 faecal samples were collected for individual WEC’s and larval differentiation by group. Treatment efficacy was based on arithmetic means using Abbott’s formula as follows: Efficacy (%) = 100 x (mean control group – mean treated group/mean control group).

An efficacy of <95% was used to identify the presence of resistance to a given treatment. Where larval differentiation results permitted, efficacy against the following nematode species was calculated; Cooperia spp. (n=32), Ostertagia spp. (n=23), Trichostrongylus spp. (n=9), Haemonchus spp. (n=21), Oesophagostomum spp. (n=10), Bunostomum spp. (n=6) and Nematodirus spp. (n=2).

75.0% (n=32) of properties had resistance in at least one species (Ostertagia spp., Trichostrongylus spp., Haemonchus spp. and Cooperia spp.) to at least one of the single active macrocyclic lactone (ML) treatment groups.

The prevalence of resistance in individual species to any of the single active ML’s was; Cooperia spp. (n=32) 71.9%, Ostertagia spp. (n=23) 34.8%, Haemonchus spp. (n=21) 57.6%, Trichostrongylus spp. (n=9) 22.2% and Oesophagostomum spp. (n=10) 20.0%.

Of the 36 trial sites, 36, 30, 25, 17 and 36 included a treatment group for
abamectin/levamisole PO, moxidectin, doramectin, eprinomectin and an untreated control group, respectively.

For all nematode species:

- 48.0% of properties tested had resistance to the doramectin treatment group (n=25), efficacy range 16.7 - 100%, mean 88.3%.
- 53.3% of properties tested had resistance to the moxidectin treatment group (n=30), efficacy range 30.7 - 100%, mean 88.7%.
- 41.2% of properties tested had resistance to the eprinomectin treatment group (n=17), efficacy range 56.8 - 100%, mean 90.7%, and
- 2.8% of properties tested had resistance to the abamectin/levamisole PO treatment group (n=36), efficacy range 94.7 - 100%, mean 99.5%.

**What does anthelmintic resistance mean for worm treatment in cattle?**

Although not a large data set, the overall findings were consistent with previous work done looking at the prevalence of resistance in Australian cattle nematodes. Cotter *et al* (2015) identified resistance in either *Cooperia oncophora* or *Ostertagia ostertagi* to ivermectin on 89.5% (n=19) of properties tested\(^1\). Cotter *et al* (2015) also looked at the efficacy of fenbendazole and levamisole and identified resistance in *Ostertagia ostertagi* on 50.0% (n=16) and 67.0% (n=15) of properties, respectively\(^1\).

Rendell (2010) identified resistance in either *Cooperia spp.* or *Ostertagia ostertagi* to ivermectin on 53.8% (n=13) of properties tested. Resistance to ivermectin in *Trichostrongylus spp.* was also identified on one property. Resistance to benzimidazole (BZ) was seen in 45.5%, 57.1%, and 9.1% in *Ostertagia ostertagi* (n=11), *Trichostrongylus spp.* (n=7) and *Cooperia spp.* (n=11), respectively. While 100.0% of properties tested had resistance in *Ostertagia ostertagi* (n=3) to levamisole.

Throughout Merial’s study, on properties where ML resistance was identified in *Cooperia spp.* and all three single active ML’s were tested (n=10), eprinomectin maintained a higher arithmetic mean efficacy against *Cooperia spp.* (85.9%) compared to moxidectin (78.9%) and doramectin (69.1%). Although a small data set, the result was suggestive of varying potency between the single active ML’s.

Worsening resistance in cattle nematodes will have several implications for the future treatment of cattle.

As, or ideally before resistance worsens to single active drenches, greater emphasis should be placed on the use of combination products to increase their efficacy and delay the onset of resistance to their individual actives\(^5\). The use of combination broad-spectrum active products is well understood and accepted in the management of sheep nematodes but currently less so in that of cattle.

This is of particular importance where *Ostertagia ostertagi* is found in significant numbers. The innate variable efficacy of benzimidazoles\(^6\) and levamisole\(^7\) against inhibited L4 *Ostertagia ostertagi* should prompt producers to move to combination products prior to the failure of ML’s.

The addition of levamisole, with its superior efficacy against BZ/ML resistant *Cooperia spp.*\(^8\), in combination with a ML, not only increases the resulting efficacy of the drench but will prolong the lifespan of ML’s against *Cooperia spp.*, the recognised dose limiting species for ML’s.
Failure of drench classes on properties will lead to downward pressure on productivity gains. This will place additional pressure on intensive production systems not only in lost production, but also secondary to the necessary adoption of integrated pasture management practise used to success in sheep production systems; resting and rotating paddocks, reduced stocking rates and genetic selection away from productivity traits towards inherited resistance.

References