NSW Agriculture

TURNING THE WORM

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Welcome

to this issue of TTW. The main purpose of this informal newsletter is to share information with those particularly interested in the management of endoparasites of farmed animals, including sheep, goats and cattle.

From 'Ag' to 'DPI'

From 1 July 2004, NSW Agriculture becomes the

NSW DEPARTMENT OF **PRIMARY INDUSTRIES**

as a result of the amalgamation of four existing NSW Government agencies.

- NSW Agriculture
- NSW Department of Mineral Resources
- NSW Fisheries
- State Forests of NSW

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While interim arrangements are in place, the existing agency websites will continue to deliver information and services.

Paraherquamide

The following abstract may be of interest. - Ed.

Marcfortine and paraherquamide class of anthelmintics: discovery of PNU-141962.

Lee BH, Clothier MF, Dutton FE, Nelson SJ, Johnson SS, Thompson DP, Geary TG, Whaley HD, Haber CL, Marshall VP, Kornis GI, McNally PL, Ciadella JI, Martin DG, Bowman JW, Baker CA, Coscarelli EM, Alexander-Bowman SJ, Davis JP, Zinser EW, Wiley V, Lipton MF, Mauragis MA.

Curr Top Med Chem. 2002 Jul;2(7):779-93.

Animal Health Discovery Research, Kalamazoo, MI 49001, USA. byung.h.lee@pharmacia.com

Three distinct chemical classes for the control of gastrointestinal nematodes are available: benzimidazoles, imidazothiazoles *(levamisole etc._ Ed.)*, and macrocyclic lactones. The relentless development of drug resistance has severely limited the usefulness of such drugs and the search for a new class of compounds preferably with a different mode of action is an important endeavour. Marcfortine A (1), a metabolite of *Penicillium roqueforti*, is structurally related to paraherquamide A (2), originally isolated from *Penicillium paraherquei*. Chemically the two compounds differ only in one ring; in marcfortine A, ring G is six-membered and carries no substituents, while in paraherquamide A, ring G is five-membered with methyl and hydroxyl substituents at C14. Paraherquamide A (2) is superior to marcfortine A as a nematocide. 2-Desoxoparaherquamide A (PNU-141962, 53) has excellent nematocidal activity, a superior safely profile, and is the first semi-synthetic member of this totally new class of nematocides that is a legitimate candidate for development. This review describes the chemistry, efficacy and mode of action of PNU-141962.

Resistance widespread in New England

The following article, reprinted with permission, recently appeared in the June issue of the Armidale RLPB[2] News. With respect to Table 1, note that resistance is one *reason why worm eggs might unexpectedly be present soon after a drench. Without diminishing the import of this article, note also that Table 2 summarises results from a relatively small sample (18 faecal egg count reduction tests) a sample which could also be biased (e.g. 'better managers' might be more inclined to get a DrenchTest done). While estimates of prevalence of drench resistance cannot be extrapolated from this data, it does give an idea of the likely extent of the resistance problem. -Ed.*

How big is the problem of drench resistance in the Armidale RLPB?

Dr Michelle Wooster

Formerly of Veterinary Health Research Pty Ltd, Armidale NSW

Worms (such as Barber's Pole, Black Scour and Small Brown Stomach) have been estimated to cost the Australian sheep industries approximately $250 million each year in control costs (drenches and labour to drench), mortalities and production losses due to subclinical infections (reduced fleece weights, body weights etc). This cost is estimated to grow to a cost of $700 million each year over the next 5-10 years, due to the increasing occurrence of worms resistant to the drenches available on the market.

We have all heard these statistics before, but how big is the problem of drench resistance in the Armidale RLPB?

Drench resistance is now a fact of life on all New England properties. The results (Table 1) indicate the percentage of samples (with worm eggs present) that were sent to the laboratory

[2] Rural Lands Protection Board

immediately following a drench when worm eggs should not be present if the drench has been fully effective. They indicate a reduction in efficacy. Conducting a faecal egg count reduction test (FECRT) on farm will give you an actual efficacy for each of the drenches used in the test. This will tell you whether you have resistance to each of the drenches on your property or not. So far this year, the VHR Animal Health Laboratory had conducted 18 FECRTs on properties in the New England area, at the request of owners. The results of these tests, summarized in Table 2, give an idea of the proportion of properties in our region where drench resistance is present.

Table 1. Percentage of samples (from properties in the Armidale RLPB) submitted to the VHR Animal Health Laboratory (between July 2000 and June 2004) showing worm eggs present where worm eggs would not be expected if the drench had been fully effective.

Drench group	Worm Type	% of samples with worm eggs present
Benzimidazoles (BZs or white drenches)	All worm types	97
Levamisole (LEV or clear drenches)	Mainly Black Scour and Small Brown Stomach worms	87
BZ + LEV combination	Mainly Black Scour and Small Brown Stomach worms	85
Naphthalophos (e.g. Rametin)	Only Barber's Pole worm checked	18
Ivermectin	Barber's Pole worm	70
Ivermectin capsules	Barber's Pole worm	65
Moxidectin	Barber's Pole worm	50

Table 2. Summarised results of 18 FECRTs conducted in the New England region of NSW during 2004

Drench group	Worm Type	% of samples with worm eggs present
Benzimidazoles (BZs or white drenches)	All worm types	87
Levamisole (LEV or clear drenches)	Mainly Black Scour and Small Brown Stomach worms	69
Naphthalophos (NAP e.g. Rametin)	Only Barber's Pole worm checked	0
NAP + BZ combination	Mainly Black Scour and Small Brown Stomach worms	13
Closantel	Barber's Pole worm	71
Ivermectin	Barber's Pole worm	60

Both sets of data show that drench resistance is a major problem in the Armidale RLPB, as it is in all sheep producing areas of Australia. What the data doesn't show is that resistance can vary widely from property to property. The only way you can be sure of the resistance status of the worms on your property (and, therefore, which drenches you should be using) is by conducting a drench resistance test on your property.

For further information, contact Justin Bailey or Matthew Friend at Veterinary Health Research on 02 6771 1358.

The importance of *Ostertagia* and its control in cattle

This article also recently appeared in the June 2003 issue of Armidale RLPB News and is reprinted with permission. – Ed.

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Ostertagia ostertagi is regarded as the most important roundworm parasite of cattle throughout Australia and the rest of the world.

- *Ostertagia* is most often associated with disease outbreaks and poor growth rates.
- Cattle develop immunity to *Ostertagia* more slowly than to other roundworms.
- Measures undertaken to control *Ostertagia* will effectively control other roundworm parasites.

Haemonchus placei, or barber's pole, is considered to be the next most important parasite in tropical and sub-tropical zones of Australia being associated with outbreaks of disease in very young dairy calves.

Cooperia oncophera, found in temperate zones is not considered to be a worm which causes serious harmful effects.

Cooperia punctata and *C. pectinata* have a potential to produce disease outbreaks in very young dairy cattle in tropical and sub-tropical zones, but immunity is well developed by 6 months of age.

Acquired immunity and its importance in control programs

By 1 or 2 years of age, well-fed and healthy cattle develop a solid acquired immunity to all roundworm parasites. The initial effect of this is to control the number of eggs the female worms produce, followed by the expulsion of worms, the self-cure phenomena. Consequently, healthy adult cattle maintain worm burdens at low, non-harmful levels and pass very few eggs onto the pasture.

Young cattle excrete between 50 and 1000 eggs per gram of faeces compared to adult cattle, which pass less than 1 to 5 eggs per gram of faeces. This is critical in control programs as immune adults can be used to "clean-up" paddocks in preparation for susceptible calves.

Good nutrition is essential for the development and stability of the immune response.

> The rate of development of immunity is different for each worm and is slowest against *Ostertagia*, which makes its control more difficult. Calves only start to mount an immune response to *Ostertagia* at 12 months, which is usually complete by 15 months of age.

In stark contrast, calves become immune to barber's pole within 2 to 3 months of exposure and by 6 months of age are immune to the effects of *Cooperia*.

Because of the latter development of immunity to *Ostertagia*, choice of treatments for prevention of pasture contamination with *Ostertagia* eggs and protection of calves is critical. The treatment should be chosen which gives the greatest sustained activity against the most important parasite.

Do *Cooperia* dominate egg counts?

The answer to this is a resounding yes! This does not reflect the relevant importance of *Cooperia* but rather the egg laying capacity of the female worms, which varies between species.

Barber's Pole is the most prolific egg-layer at 10,000 eggs per female worm per day with *Cooperia* the next at 400 eggs per day. *Ostertagia* females are not consistent or prolific egg producers at 100 eggs per day.

A study conducted by CSIRO in the Northern Tablelands of NSW between February and September 1980 clearly illustrates this. Naturally infected calves were monitored during this period when *Ostertagia* and *Cooperia* dominated egg counts, the results being summarized in Table 1.

Table 1.

Month	Average Egg Count		Percent of Egg Count	
	Ostertagia	Cooperia	Ostertagia	Cooperia
Feb	25	96	21%	79%
March	45	59	44%	56%
April	25	60	29%	71%
May	25	57	30%	70%
June	15	35	30%	70%
July	12	49	20%	80%
Aug	29	179	14%	86%
Sept	81	398	17%	83%

The inference that *Cooperia* have dominated egg counts only since the introduction of the macrocyclic lactones is just not true.

Control of *Ostertagia*

The timing of preventive treatments to control *Ostertagia* (and *Cooperia* and Barber's Pole) is critical. The highest numbers of eggs are excreted by calves between 6 and 12 months of age.

Average counts as low as 20 eggs per gram from a group of calves are very significant in producing high contamination levels in autumn and winter. This results in an abundance of infective worm larvae in the spring which is the time when outbreaks of disease can occur.

Controlling egg output from susceptible calves, starting in early autumn, is essential to minimise outbreaks of disease in the spring. Monitoring through faecal egg counts will indicate when and if further treatments are required.

The dung pat: a reservoir of infection

The third stage, infective larvae have a limited life span when they move from the dung pat onto the pasture. They live longer in the cooler autumn-winter months (5 months) than in the hot summer period (3 months). The larvae are very susceptible to desiccation.

However, within the dung pat these infective larvae are protected against high temperatures and dry periods. They survive in dried out dung pats a long time and periods of up to 18 months have been recorded.

The drier the conditions, the better the survival of the infective larvae within the dung pats. Heavy rains following drought break up the pats and allows the escape of larvae onto the pasture.

Pastures heavily contaminated with dung pats cannot be assumed clean after a drought, a dry summer or periods of spelling, because of the reservoir of third stage larvae within the pat.

Hungry cattle will graze closer to the dung pats which they would normally avoid. Over 90% of worm larvae are found within one metre of the dung pat from which they emerged.

Many adult cattle will have their immunity compromised due to poor nutrition during the drought and may need treating.

New Agnote on cattle worms

Cattle worm control – the basics. Love S and Hutchinson GW. Agnote DAI 312, February 2004.
Available through NSW Agriculture offices, or on the web at

http://www.agric.nsw.gov.au/reader/cattlehealth

Macrocyclic lactones – guidelines

This first appeared in the June 2003 issue of 'VHR News' and is reprinted with permission. – Ed.

Dr Justin Bailey
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The macrocyclic lactone (ML) group of anthelmintics, as represented by ivermectin, abamectin and moxidectin, remains the last broad spectrum drench group to which internal parasites have not yet developed widespread resistance in Australia. However, this situation is rapidly changing, and with no realistic expectation of a new drench group in the short to medium term, it is critical that we take all necessary steps to preserve this status for as long as possible. In essence, this means taking an integrated approach to parasite control. The use of worm monitoring, an awareness of the current resistance status of your property, nutrition, genetics, livestock and paddock management are all vital tools in this effort. However, chemical control and specifically MLs have a vital role to play as part of a balanced approach to worm control and production issues. VHR has a range of policies which it advocates to slow the development of resistance to the ML group:

- Develop a good understanding of parasite control issues and monitor regularly – drench only when necessary.
- Drench test every 2-3 years – It is important to know the resistance status of all the drenches used on your property.
- Do not use ML drenches for more than 1/3rd of your annual drenches. Ensure that you do not under-dose.
- Use MLs preferentially on your most susceptible stock.
- Rotate to a different (and short acting) drench group following the use of a long acting ML.
- If using a capsule always monitor 30-50 days after administration.
- Use narrow spectrum drenches whenever appropriate.
- 'Quarantine drench' all introductions.

Keeping super-worms at bay

Stephen Love
Veterinarian/State worm control coordinator, NSW Agriculture, Armidale

This topic is perhaps timely given Dr Michelle Wooster's recent article (June issue, Arm. RLPB News; this issue of TTW) on the prevalence of drench resistance in the New England.

There are two ways you will get drench-resistant sheep worms on your property: by breeding your own, or by importing someone else's.

Let's look briefly at the former: 'breeding your own'. Initially genes for different types of drench resistance exist at a very low level in the worms on your farm. These might arise by way of mutation-genetic 'accidents'. Or maybe you are just 'lucky'. Worms with genes conferring resistance to drench X or its close relatives gain a survival advantage over their peers when drench X is used. This is especially so if drench X is used frequently or used unnecessarily in prolonged dry spells or droughts when there are fewer worms around. Eventually the resistant worms become a sizeable proportion of the worm population on your farm, and drench failure (ill thrift, scours, anaemia, deaths) becomes apparent. Resistance is detected a lot earlier if you do regular resistance tests (DrenchTests[3]), or you occasionally do a 'DrenchCheck' – a worm egg count (usually) 10-14 days after drenching a mob of sheep.

The other way to get super-resistant worms is to buy them in. Resistance to drenches is common. There is not a product or drench group on the

[3] Faecal egg count reduction tests

market that is left completely unscathed, although resistance to the older drench groups is more common, as you would expect. (But don't automatically assume that older drenches won't work on *your* property).

We are moving closer to the situation where a small number of properties will develop 'super-resistant worms' against which no drench on the market is completely effective. We may already be there. We at least know there are now some properties where only one drench still works (and it's not always the same drench).

So, now we come to 'quarantine drenching', the treatment you give to imported sheep to keep resistant worms out. What would you use to keep out the more common resistant worms? What about the still rare 'super multi-resistant' sheep worms?

The best bet is to use a combination of unrelated drenches – and the more the better. As a general guide, most experts suggest a combination of at least three unrelated drenches, but preferably four, especially if there is any chance the sheep you have bought are carrying ML (macrocyclic lactone)-resistant worms. Check with your vet or other adviser, (and read product labels!) but one option is to use a BZ (white) + LEV ('clear', levamisole) + macrocyclic lactone (ML, 'mectin') + naphthalophos ('Combat', 'Rametin'). Obviously you cannot make a giant 'drench cocktail' on-farm, but there are options, including some proprietary combination products on the market which might mean giving fewer drenches up and down the race. For more information, see the **NSW Agriculture Agnote DAI 257, "Sheep worms: don't import resistance"**. Available though NSW Agriculture, Rural Lands Protection Boards, or 'the web": www.agric.nsw.gov.au/reader/sheep-internal

Sheep worm info: 'Worms on the Web'

www.agric.nsw.gov.au/reader/sheep-internal

WormBoss is coming!

'WormBoss' is a CD/web-based decision aid tool for farmers. It is a joint project of the Australian Sheep Industry Cooperative Research Centre and Australian Wool Innovation Ltd. Watch this space.