NSW DEPARTMENT OF PRIMARY INDUSTRIES

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.

wormboss launch imminent

The national launch of WormBoss will be on 11 March at Woolorama, Wagin, Western Australia.

Watch this space!

What is WormBoss?

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Here is a recent statement from the Sheep Cooperative Research Centre:

'WormBoss' is a computer-based decision tree, developed by the Sheep CRC with significant assistance from Australian Wool Innovation, to assist with decisions on parasite management. It is likely to be a very valuable product for producers as well as re-sellers and consultants. It will be launched jointly by the CRC and AWI […on 11 March 2005].'

The wormboss Scientific Team with Scott Williams from AWIL. Melbourne 2004.

L-R: Arthur Le Feuvre[1], Scott Williams, Ian Carmichael[2], Rob Woodgate[3] and Brown Besier[4], Noel Campbell[5], Stephen Love[6]. Absent: Andrew Bailey[7].

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Drenches for goats – a thorny issue

Lee Cook and Stephen Love

Dr Lee Cook is Veterinarian Chemical Control, NSW Dept Primary Industries, Orange NSW. *This article began life as a letter I wrote to a goat owner who was trying to do the 'right thing'. The issue of drenches for goats is a thorny one.-Ed.*

Treating goats for worms legally in New South Wales is a big problem for producers and veterinarians because there are few, if any, effective drenches registered for use in goats.

Dr Lee Cook

- The only products registered for goats are certain benzimidazoles (BZ or "white" drenches) or flukicides containing triclabendazole, and morantel. There is also a permit in place which allows the use of Neguvon® which contains an organophosphate (trichlorfon).)

- The BZ drenches are broad-spectrum but resistance to this class is common in both sheep and goats. Neguvon is likely to be highly effective against *Haemonchus* (barber's pole worm). The efficacy of such organophosphate drenches against the major scour worms such as *Ostertagia* (small brown stomach worm) and *Trichostrongylus* (black scour worm) is somewhat less.

…there a few effective drenches registered for use in goats

- None of the levamisole (or "clear") drenches are registered for use in goats.

Legislation controlling the use of all medicines, including drenches, to treat animals in New South Wales prohibits the use of products on species which are not listed on the label (Stock Medicines Act 1989). The Act says it is not legal to use a sheep drench to treat goats except if written instructions to do so have been provided by a veterinarian. At this time this restriction applies because goats are considered to be, and defined as, a food producing species.

Why not just use sheep products to treat goats using the sheep doses and sheep withholding periods?

1 The drenches do not work quite the same

Goats metabolise drenches differently to sheep and as a result the drenches can be less effective in goats and so more likely to produce resistant worms. (Initial detections of worm resistance commonly have been in goats). Appropriate dose information is required.

… goats metabolise drenches differently

2 There are no MRLs for goat meat

A Maximum Residue Limit (MRL) is required by food authorities for every chemical which may be detected in food consumed by humans within Australia. An MRL is set when the chemical is registered for use in the relevant animal species. If the chemical is not registered for use in the animal species then no MRL is set.

Whenever a chemical is used residues will always occur for some time in tissue of the treated animal. The time the residues remain there varies depending on many factors. It is to deal with these residues that an MRL is set. Having an MRL allows the animal to be slaughtered before all the residues are gone on the basis that the low levels (less than the MRL) still present have been assessed to pose no risk to human health.

That is why using drenches not registered for use in goats is a problem – there are no MRLs for those drenches in the tissue or milk of the goats. (For some chemicals, but none of the drenches which goat owners might want to use, there are general MRLs set for meat (mammalian) or for fat (mammalian) and these MRLs do allow off-label use of the relevant chemicals in goats with more confidence).

…there are often no MRLs for goats…residues can be an issue..

Another consideration is that just because there is an MRL in one species does not mean it is suitable to use that chemical in another species. This is because the MRL is allocated as part of an Acceptable Daily Intake (ADI) and the ADI can be used up already with registered uses. (This happened some years ago with diazinon when new registrations were held up because all the ADI had been used up).

If there is no data to support a suitable withholding period then it is likely that violative residues will occur for extended periods after treatment of the goats. This is particularly a problem with long acting or persistent chemicals such as moxidectin or closantel.

3 There are no ESIs for goat meat

Similar requirements for residues apply in importing countries. But they usually require that no residues of any chemical be present at

all. The withholding time period required to allow all residues to disappear, or to reach an internationally-agreed level set by Codex, is called an Export Slaughter Interval (ESI). This is usually a lot longer than an Australian MRL (if one has been set).

What is required to deal with this problem?

1 Under the legislation in New South Wales owners need to seek veterinary advice and a written prescription to use non-goat products off-label.

- Veterinarians can sometimes overcome the problem of no MRL being set by determining an appropriate withholding period which will allow all the residues to disappear.

…vets may be able to prescribe off-label, but determining WHPs can be a problem....

- This can be very difficult, or even impossible, depending on the amount of data available in relation to the residues. This means that even veterinarians may be reluctant to recommend off-label uses for goats.
- Sometimes there are specific label restraint statements (headed "Restraint" and/or beginning "DO NOT…") which prohibit use in goats and then it is illegal even for a veterinarian to do so.

2 The food producing status of goats could be modified. Under amendments to the Stock Medicines Regulation to be proposed this year it will be possible to reclassify goats so that it is no longer illegal to treat them with products not registered for use on them. This will ***NOT*** solve the problems of the goat industry because it will not reduce the need for MRLs or ESIs for export requirements. But it will mean that goat producers are no longer breaking the law to use such products.

3 Owners can lobby their industry bodies in order to encourage them to invest industry funds in obtaining necessary data to set both MRLs and withholding periods for important drenches. In general only the national body holds such funds. The fact is that the manufacturers of the products most commonly being used to treat goats are not interested in registering their products for use in goats.

…data to set WHPs and MRLs is needed....

Note that under no circumstances should goat owners who are collecting milk from goats for human consumption treat their goats with any product that is not registered for use in lactating goats. Triclabendazole is a particular problem in this regard. Residues found in milk could be damaging for the goat milk industry if a problem came to the attention of the public.

Moxidectin-resistant *Haemonchus* and *Trichostrongylus* in Queensland goats

The abstract and introduction of this recent paper are presented below. As always, obtain and read the whole paper for yourself.-Ed.

Characterization of moxidectin resistant *Trichostrongylus colubriformis* and *Haemonchus contortus*

L.F. Le Jambre, J. Geoghegan, M. Lyndal-Murphy

Veterinary Parasitology 128 (2005) 83–90

Senior author, Dr Leo Le Jambre, CSIRO, Armidale NSW

'Abstract
The development of moxidectin resistance (MOX-R) in sheep parasitic gastrointestinal nematodes already carrying multiple resistances to other anthelmintic groups has made control of these strains very difficult. The anthelmintic resistance patterns of MOX-R strains of *Trichostrongylus colubriformis* and *Haemonchus contortus* were characterized to provide an insight into the remaining role of anthelmintics in the control of such strains. Homozygous MOX-R individuals of both genera were unaffected by moxidectin. For MOX-R heterozygotes a dose rate of 200 ug/kg abamectin (ABA) given orally removed 25% of *H. contortus* while 200 ug/kgMOX given orally achieved a 72% reduction. Doubling the dose rate of ABA improved the mean efficacy to 37%. Consequently, in *H. contortus*, the degree of dominance differs markedly between the two anthelmintics. A dose rate of 8mg/kg levamisole and 185 mg/kg naphthalophos[2] achieved >95% reduction in worm count of the MOX-R homozygous *H. contortus* but only 85 and 7%, respectively against the MOX-R homozygous *T. colubriformis*.

Introduction
Until recently, what was known about macrocyclic lactone (ML) resistance was restricted to studies on resistance that had developed against the first generation ML, ivermectin (IVM) (Gill and Lacey, 1998). IVM resistance provided protection against IVM either as a drench or delivered in a sustained release device. In field-selected strains, IVM resistance (IVM-R) was inherited as an autosomal, major effect gene (Le Jambre et al., 2000). IVM-R provided limited side resistance to the more potent second generation ML, moxidectin (MOX) (Barnes et al., 2001). In IVM-R *Haemonchus contortus* MOX was equally effective against both heterozygote and homozygote worms, while in IVM-R *Ostertagia circumcincta* the homozygote resistant worms were more likely to survive MOX than the heterozygotes.
As well as this potency, MOX also has a persistent activity against *Haemonchus* and *Ostertagia*. However, in this case IVM-R worms can re-establish during the period that the persistent activity prevents susceptible worms from establishing. Now, however, MOX resistant strains of *H. contortus* are being reported in Australia (Love et al., 2003) and a MOX resistant strain of *O.circumcincta* has been reported from New Zealand (Sutherland et al., 1999). These strains can survive the initial exposure to MOX as well as the persistent activity. Therefore, during MOX

[2] *This is several times the usually recommended dose rate for naphthalophos. The reference may be to weight of product (powder) rather than weight of active ingredient. I believe NAP was used at the recommended rate (~ 35mg/kg) in this case - Ed*

exposure, MOX resistant (MOX-R) worms in contrast to the IVM-R worms continue to lay eggs through the entire period when MOX treatment is killing MOX susceptible worms. Present drenching recommendations as well as simulation model outputs (e.g. Le Jambre et al., 1999; Barnes et al., 2001) are based on what is known about IVM resistance and not MOX resistance. Consequently, the debate on whether high potency against resident worms is or is not offset by selection during the persistent phase is biased by the lack of knowledge about MOX resistance. If, as it appears, resident MOX-R worms are unaffected by MOX, then the persistency of the drug would leave these worms unaffected by competition for at least 35 days (Shoop et al., 1997). Likewise, it needs to be determined whether MOX is more effective against the heterozygotes carrying the MOX-R gene(s) than against the homozygotes. Abamectin (ABA), a ML more potent than IVM but without the persistency of MOX, should also be tested against MOX-R homozygotes
and heterozygotes. It is urgent that these questions regarding the MOX resistance phenotype be answered so that the information provided to industry by veterinary consultants on parasite control is up-to date and of the highest quality. Consequently, when goat faeces sent to the Department of Primary Industries, Queensland (DPI, Queensland) were found to be positive for trichostrongylid eggs following treatment with MOX we decided to isolate these parasites and characterize their MOX resistance phenotype.'

Drench resistance- Victoria & southern NSW

PI Veale
Para-Site Diagnostic Services
Benalla, Victoria

The following is from the Para-Site Newsletter Jan 05 and is reproduced with permission. – Ed.

Some clients have recently been investigating their sheep Drench Resistance status by sending us a Check-Resistance (FECRT[3]) trial or a Drench Rite (Larval Development Assay).

Our latest sheep drench resistance stats (as at 1 January 05) are:

Worm resistance to the

- benzimidazole, WHITE, (BZ) group of drenches is present on more than 96% of properties.
- The levamisole CLEAR, (LEV) group of drenches on more than 86% of properties.
- The COMBINATION of these drench groups (BZ+LEV) on about 75-80% of properties.

To our knowledge there are currently 79 sheep properties in southern NSW, NE and mid Victoria where **ivermectin resistant Brown Stomach worm**, (*Ostertagia* sp.) have been found.

There are two sheep properties, one in NE Victoria and one in southern NSW where **moxidectin resistant *Ostertagia*** have been detected.

There is one sheep property in NE Victoria and five in southern NSW where **ivermectin**

[3] *Faecal egg count reduction test, commonly known as a 'DrenchTest' in NSW. – Ed.*

resistant Barber's Pole worms, (*Haemonchus contortus*) are evident.

There are also four sheep properties in southern NSW and three in NE Victoria where **abamectin resistant *Ostertagia* and *Haemonchus*** are present.

Finally, there are two sheep properties in southern NSW and 1 in NE Victoria where ***Ostertagia* have been found to be resistant to the combination of BZ and LEV and ivermectin.**

I have 'summarised' the above in the table below-Ed.

Drench group/worms	Resistance – NE Victoria/southern NSW (sheep farms)
BZs	> 96% farms
LEV	>86 % farms
BZ+LEV combination	75-80%
IVM-resistant *Ostertagia*	79 farms
MOX-resistant *Ostertagia*	One in Vic., one in S.NSW
IVM-resistant *Haemonchus*	Six farms(Vic.-1, S.NSW-5)
ABM-resistant *Ostertagia* and *Haemonchus*	Seven farms (Vic.-3, S.NSW-4)
Ostertagia resistant to IVM+BZ+LEV combination	Three farms (Vic.-1, S.NSW-2)

Failure of moxidectin to control benzimidazole-, levamisole- and ivermectin-resistant *Teladorsagia circumcincta*[4] in a sheep flock [5]

ND Sargison, F Jackson, DJ Bartley, ACP Moir.

Veterinary Record (2005) 156, 105-109.

Abstract

Control of a benzimidazole-, levamisole- and ivermectin-resistant population of *Teladorsagia circumcincta* was attempted using moxidectin administered orally at the manufacturer's recommend dose rate of 200 ug/kg bodyweight. Ewes were dosed after lambing with the aim of controlling the periparturient rise in faecal egg output and lambs were dosed at six-week intervals throughout the summer. This regimen failed to suppress the establishment of significant numbers of infective helminth larvae on the pasture, resulting in unsatisfactory lamb production. Oral dosing with moxidectin was effective in removing adult female burdens of ivermectin-resistant *T circumcincta*, but the effect of the drug did not persist against the resistant helminth population.

Other gleanings from this paper:

- *The emergence of anthelmintic resistance threatens economic sheep production in the UK.*
- *BZ resistance has been found in about 80 per cent of low-ground flocks in south-east Scotland*

[4] *Aka* Ostertagia circumcincta *('small brown stomach worm', or 'brown stomach worm'). –Ed.*
[5] *Sheep flock in the United Kingdom.-Ed.*

- *LEV resistance has been found in a smaller number of UK flocks.*
- *Few UK farmers do annual drench checks, so the true extent of resistance is unknown.*
- *ML resistance: T circumcincta resistant to BZ, LEV and ivermectin was found in a SE Scotland flock in 2001; another (similar) case was uncovered in 2004.*
- *Risk factors: in many cases resistance appears by way of introduced animals.*
- *All introduced animals should receive an effective anthelmintic treatment on arrival (in Australia, a 'quarantine drench').*
- *In this case, the reduced persistency of activity against* T circumcincta "may indicate the early expression of resistance *(to MOX)*, and its routine use alone as a quarantine drench could further select for resistance and would be imprudent". *(In Australia, the current recommendation is generally to use four unrelated actives as a quarantine drench). – Ed.*

Drench resistance – some good news!

It's not all bad news. Some farmers actually *do* have a number of viable drench options, but **sadly many don't know this, as relatively few have tested their drenches in recent years.**

A number of District Veterinarians around NSW have been doing DrenchTests (faecal egg count reduction tests), with some assistance from NSW Department of Primary Industries.

David Champness, until recently DV Bombala, is one of these.

Here is one of the results from the Bombala district, and there were others like it:

LABORATORY REPORT MN04/9667/M

Regional Veterinary Laboratory Menangle NSW

Owner [Name/property details suppressed] Bombala RLPB District. Samples received *16.11.2004*.

	Control	White	Clear	Wh/Cl	Ivermectin	0.5x Ivermectin	Q-Drench
1	40	40	0	0	0	0	0
2	1000	80	0	0	0	0	0
3	120	40	0	0	0	0	0
4	200	120	0	0	0	0	0
5	320	0	0	0	0	0	0
6	280	200	0	0	0	0	0
7	680	0	80	0	0	0	0
8	160	200	0	0	0	0	0
9	480	120	0	0	0	0	0
10	520	120	0	0	0	0	0
Average	380	92	8	0	0	0	0
PCT Redn		**76***	**98**	**100**	**100**	**100**	**100**
Range		49-88	82-100	100-100	100-100	100-100	100-100
Nematodirus Average	56	8	4	0	0	0	0

	Control	White	Clear	Ivermectin
DRENCH EFFICIENCY				
Trichostrongylus #		**91%**	**100%**	**99%**
Ostertagia		**74%**	**98%**	**99%**
Cooperia #		**95%**	**100%**	**99%**
Oesophagostomum #		**100%**	**100%**	**99%**

Note: Egg reductions for individual species are unreliable unless the egg count for that species in the control group is greater than 200 epg. ^Note : Egg reductions for individual species are unreliable if that species represents less than 15% of the total egg count of the control group.