NSW DEPARTMENT OF PRIMARY INDUSTRIES

TURNING THE WORM

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NSW Department of Primary Industries, Armidale[1]

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.

Haemonchus and weight gain

Dr Leo Le Jambre

(Well-know parasitologist Dr Leo Lejambre is a Post-retirement Fellow, formerly Senior Principal Research Scientist, with CSIRO, Armidale NSW. –Ed)

Dr Leo Le Jambre

The effect of *H. contortus* infection on productivity of weaner lambs at pasture can best be predicted by haematocrits; for each further 0.01 proportional decrease in haematocrit there is a 0.03 reduction in live-weight gain (Albers et al 1990). Haematocrit decreases can be determined from the daily blood loss of sheep (Albers and Le Jambre, 1983) and blood loss determined from faecal egg counts as demonstrated by Le Jambre, 1995. When this is calculated, the relationship is that shown in the figure below. It is possible therefore to determine the effect that a given faecal egg count will have on liveweight gain. The graph emphasizes the value of diagnosis of parasitism based on faecal blood loss in order to identify and remove the infection before production loss occurs.

The figure (next page) displays the average daily weight gain of uninfected weaner lambs compared to the decrease in weight gain in weaner lambs with the egg counts shown on the x-axis. The blood loss in mls per day for a given egg count is also shown. Uninfected weaners are assumed to gain 100g/day.

References

Albers, G.A.A., Gray, G.D., Le Jambre, L.F., Barger, I.A. and Barker, J.S.F (1990). The effect of Haemonchus contortus infection on haematological parameters in young Merino

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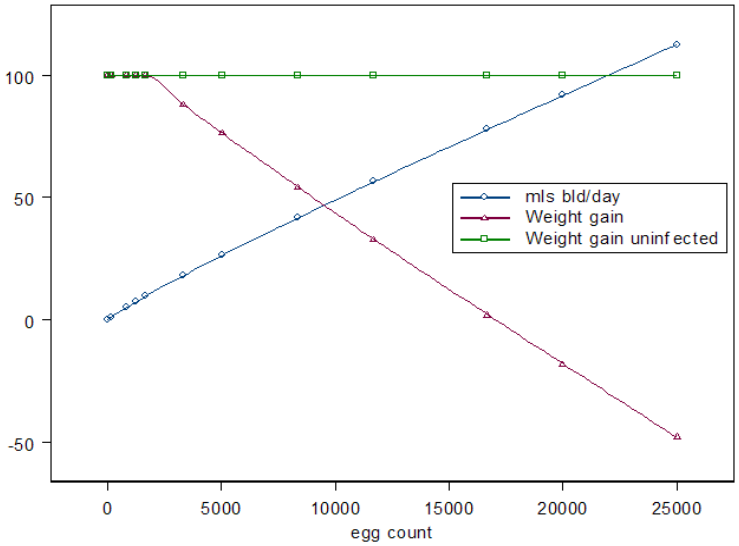
(#19, December 2005)



Subsequently our egg counts have been more the levels that I would associate with 'Trich' than with 'Ost' (individual counts >1000 epg).

The larval cultures/differentiations that we have seen have also had a lot more 'Trichs' than usual, meaning quite a few rather than none.

It is interesting that we should see this when similar moisture levels produced by irrigation do not give the same results.

Cheers,
Dan 30/05/2006'

sheep and its significance for productivity. Animal Production, 50:99-100.

Albers, G.A.A. and Le Jambre, L.F. (1983). Erythrocyte potassium concentration: a simple parameter for erythropoiesis in sheep infected with Haemonchus contortus. Research in Veterinary Science 35, 273-276.

Le Jambre, L.F. (1995). The relationship of blood loss to worm numbers, biomass and worm numbers in infected sheep. International Journal for Parasitology 25, 269-273.

Riverina Reflections

Dr Dan Salmon

Dan Salmon is the District veterinarian for the Riverina Rural Lands Protection Board (RLPB). Following are some observations on worm patterns in his district. In the last issue of TTW, we re-printed an article by Dan (from the Riverina RLPB Animal Health Newsletter Vol XIV Number 4 Spring 2005) which mentioned the results of a recent anthelmintic resistance survey by Harry Suddes and Dan in the Murray and Riverina RLPBs. – Ed.

'Steve,

You may recall some time ago (months if not years) an electronic discussion about the relative importance of *Ostertagia* and *Trichostrongylus* in this area.

Last spring was wet all the way through, producing the conditions that I consider to be conducive to the development of 'Trichs'. We had above median rainfall for Aug, Sep, Oct and Nov.

Parasites at slaughter – abattoir surveillance by NSW DPI

Stephen Love
NSW Dept Primary Industries, ARMIDALE

In addition to OJD surveillance NSW DPI, in cooperation with abattoir operators at Dubbo, Deniliquin and Wallangarra, is also collecting information on other conditions observed at these works.

Below (see table, next page) is initial information which may be of interest. If you do not have (internet) access to the publications mentioned in the notes which I have prepared below, you should be able to get hard copies through the Rural Lands Protection Board or your nearest NSW DPI office.

Notes regarding table (next page):
[1] OJD: Ovine Johnes Disease. The vaccine used is the 'Gudair' vaccine. Further info: http://www.agric.nsw.gov.au/reader/ojd ('The causative organism was first recognised in Germany by Johne and Frothingham in 1895, who saw it in the tissues of diseased cattle.' [Ref: Hagan's Infectious Diseases of Domestic Animals]).

[2] "Pimply gut' (aka 'Knotty gut') is caused by the host reaction to migrating larval 'nodule worm' (*Oesophagostomum columbianum*). *O. columbianum* should not be confused with its somewhat more common but somewhat less pathogenic cousin, 'large bowel worm' (*O. venulosum*). Nodule worm was once second only in importance to *Haemonchus contortus* in the northern tablelands of NSW. Being somewhat less cold and desiccation tolerant than even *H contortus*, nodule worm has entirely or almost entirely disappeared from the Northern Tablelands with the advent of pasture improvement and 'modern' drenches (Thibenzole® and following) around 4 decades ago. Nodule worm is now confined it seems to the northwest

Inspection under the NSW Sheep Health Abattoir Monitoring Program

"Other Conditions" detected in 1229 Lines of Sheep in three major NSW Abattoirs - January to March 2006

	OJD Vacc-ination Lesions[1]	'Pimply Gut'/ *O. columbianum*[2]	Liver Fluke [3]	Hydatids [4]	Sheep Measles (*C. ovis*) [5]	Sarcocyst [6]	CLA [7]	Pleurisy/ Pneumonia [8]	'Cancer'[9]
No. of Lines	6	54	447	17	59	33	31	46	83
Total	1229	1229	1229	1229	1229	1229	1229	1229	1229
% of lines with evidence of condition	0.49%	4.39%	36.37%	1.38%	4.80%	2.69%	2.52%	3.74%	6.75%

Source: Adapted from data from document prepared by Dr. Ian Links, NSW Dept Primary Industries 30 March 2006

slopes and nearby plains of NSW and adjacent areas in Queensland. Its main significance these days appears to be confined to condemnations of affected sheep runners (intestines) at abattoirs. (The cost to an operator can be significant).

[3] Liver fluke. For more information, see http://www.agric.nsw.gov.au/reader/sheep-internal and recent WormMails on the subject. See also Turning the Worm newsletter, Issue 19-December 2005. http://www.agric.nsw.gov.au/reader/6359

[4] Hydatids: the larval/intermediate stage of the tapeworm *Echinococcus granulosus*. A public health hazard. See http://www.agric.nsw.gov.au/reader/sheep-internal

[5] Sheep measles. The larval/intermediate stage (known as *C. ovis*, found in sheep etc) of the tapeworm *Taenia ovis* (found in dogs). See http://www.agric.nsw.gov.au/reader/sheep-internal Losses to individual farmers (carcase condemnations) can be considerable. For example, there have been cases of say 100 ex 400 lambs condemned.

[6] Sarcocyst. Sarcocystis is a genus of parasitic protozoa, part of a predator-prey system. The definitive (final) hosts are domestic carnivores (dogs, cats); the intermediate hosts are food animal species, and cysts form in the muscles of these (commonly oesophagus, heart and tongue).

[7] CLA: caseous lymphadenitis – 'cheesy gland'. Preventable using a vaccine, eg 6-in-1 vaccine. See http://www.agric.nsw.gov.au/reader?MIvalObj=16441&doctype=document&MItypeObj=application/pdf&ext=.pdf

[8] 'Cancer': presumably adenocarcinoma, which may be seen affecting the ileum (part of the small intestine) of sheep. The lesions may be asymptomatic, or cause obstruction.

(Reprinted from NSW DPI occasional e-newsletter, 'WormMail 20060503')

Sheep worm control and drench resistance – an update

Stephen Love

What's the latest on the resistance front?

For an overview of the current resistance situation in NSW and elsewhere, see the NSW DPI publication, 'Sheep worm control and drench resistance'.

Even more recent –and alarming - data has come from Armidale-based veterinarians Justin Bailey and Rad Nielsen, who presented their findings at the World Association for the Advancement of Veterinary Parasitology conference in Christchurch last year. **(Their poster is reprinted at the end of this newsletter)**. They examined the database (approx. 40,000 samples) at Veterinary Health Research (VHR), Armidale for the year 2004. (Strict protocols were followed; client information was not disclosed).

Because relatively few drench resistance tests are done, they looked for cases where there was a positive worm egg count (positive WEC) during a defined period after treatment when you would expect zero egg counts if the drench was 100% effective. This 'defined period' will vary depending on the type of drench (short- vs long-acting) and, to some extent, on the species of roundworm. (*Haemonchus* (barber's pole worm) eggs might

Table 1. Days before *Haemonchus* eggs appear in faeces ('Positive WEC') after a 100% effective drench

	Approx. days
Short-acting drench (eg benzimidazole (BZ), levamisole (LEV), ivermectin, abamectin, naphthalophos)	18-21 (Usually 21)
Moxidectin-oral	32
Capsule (ivermectin or BZ)	121

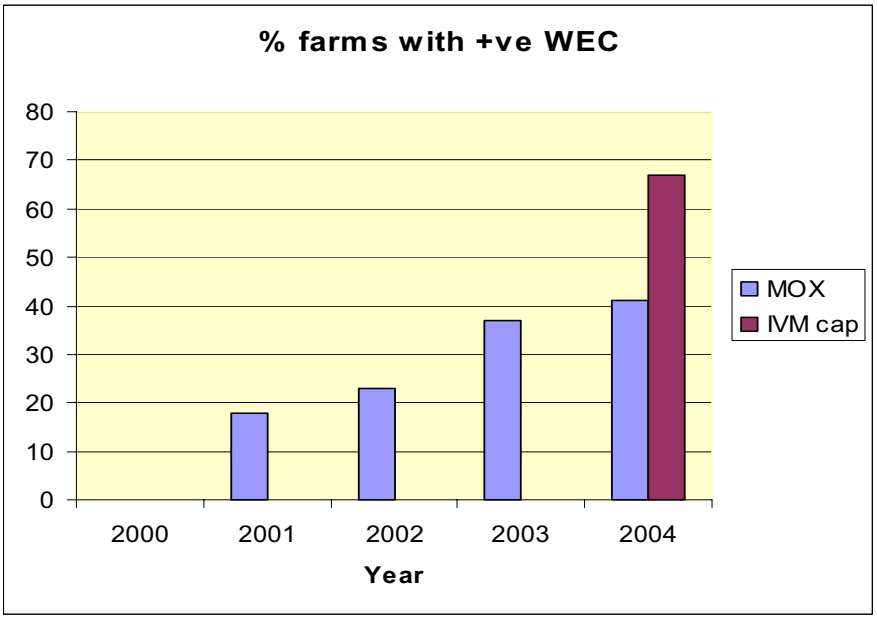
Table 2. Farms with Positive WEC after various drenches (Based on Bailey and Nielsen (2005)	
	Farms with Positive WEC
Short-acting drench [within 21 days; n=87]	> 65%
Moxidectin oral [within 32 days, *Haemonchus* only, n=49]	41% (zero in 2000)
Ivermectin capsule [within 121 days, n=6]	67%
Notes: Analysis: Reasonably good correlation between DrenchTest results and 'Positive WEC' results (but interpret with care. There can be other reasons for an unexpectedly early 'Positive WEC'). 'Positive WEC' a rough guide to resistance prevalence. Database: 40,000 samples (VHR). Region: Australia. Year: 2004. n=number of farms.	

appear a little earlier than eggs of other important sheep worms).

This is not an exact measurement of how much resistance is 'out there', but it is a useful guide.

Table 2 (above) is a summary of some of the findings of Bailey and Nielsen.

Bailey and Nielsen also compared 'positive WECs' results for oral moxidectin with those of previous years. The following is a graphical representation of the data:
Notes: Adapted from Bailey and Nielsen (2005).



Database: 40,000 samples, VHR. Australia-wide.
Mostly *Haemonchus* (BPW) in this graph. N> 30 samples in most cases. 'MOX' = oral moxidectin sheep drench. IVM cap = ivermectin controlled release capsule (100 day pay-out).

As moxidectin is the most potent of the macrocyclic lactone (ML)-based sheep drenches, one would expect the figures to be even higher for the avermectin members of the ML family.

The bottom line

- Resistance to the MLs appears to be developing rapidly
- All MLs –indeed all drenches - are affected to some degree.
- Don't assume any drench will work on your farm, unless you have tested it.
- WormTest regularly to:
  - monitor worm control.
  - monitor drench effectiveness.

More information

- Your vet or other professional adviser
- Rural Lands Protection Boards and NSW DPI < http://www.dpi.nsw.gov.au >
- WormBoss < http://www.wormboss.com.au >

References

Bailey J and Nielsen R (2005). Anthelmintic resistance in Australia – a commercial laboratory's experience. WAAVP, Christchurch, NZ. **(See last page of this newsletter)**

Love S (2005). Sheep worm control and drench resistance – no worries? Agnote DAI/87, fourth edition, revised April 2005. NSW DPI. [http://www.agric.nsw.gov.au/reader/sheep-internal].

(Reprinted from e-newsletter WormMail 20060629).

'Bad *Haemonchus* year' in Northern Tablelands and elsewhere

Stephen Love

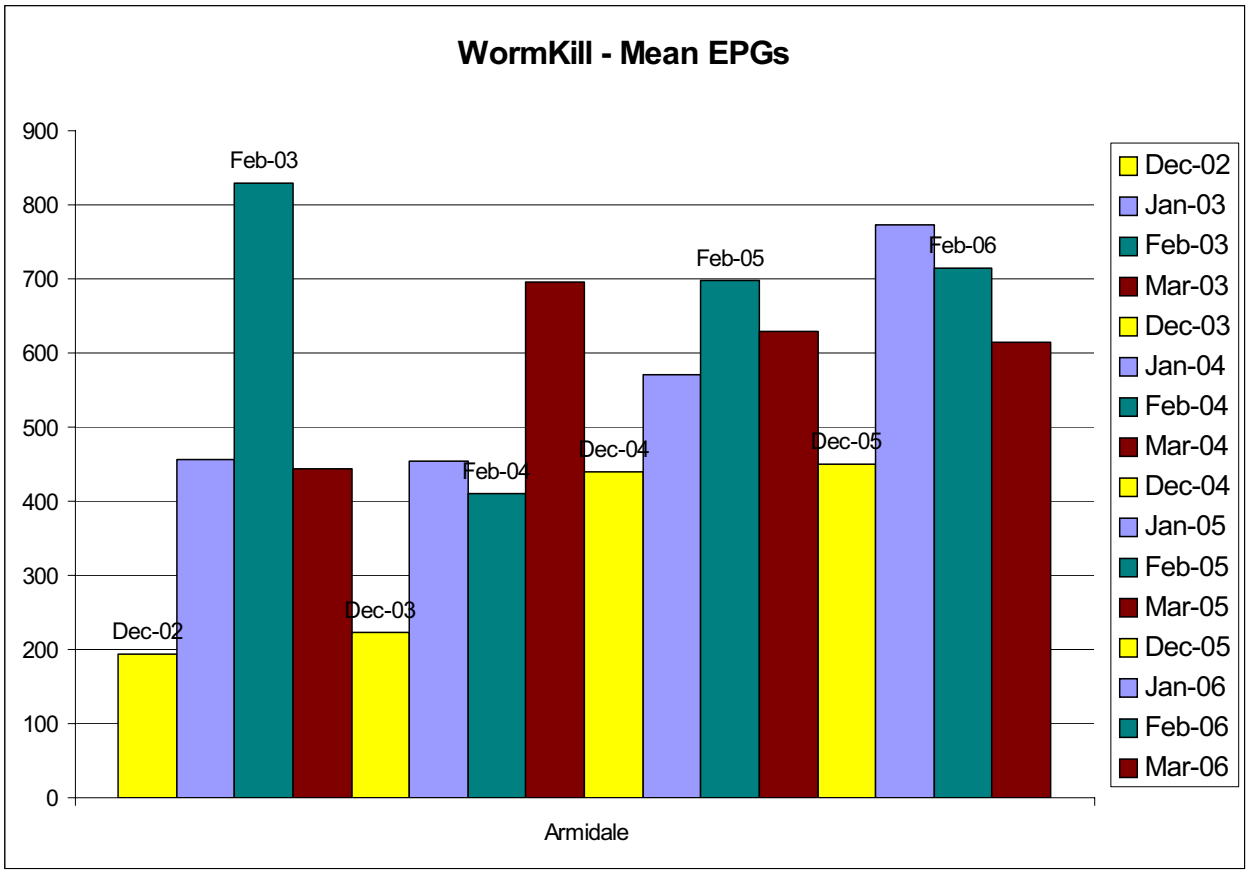
(The following first appeared in the March and April issues of WormFax http://www.agric.nsw.gov.au/reader/wormfax-nsw and is an attempt to make sense of the 'bad barber's pole worm' season in 2006 (summer/autumn)).

Many have observed that *Haemonchus* was 'bad' this year in the Northern Tablelands (where *Haemonchus* is commonly a problem), but also in other parts of NSW (eg Goulburn, central tablelands, parts of the southern tablelands etc). Below is a graph of average worm egg counts (WECs) for the Armidale district (part of the 'WormKill' area) for this and some previous summers. The table shows some recent weather data for Armidale.

Weather - Armidale city: Nov 2005 – March 2006			
Month	**Rain – observed /[average] (mm)**	**Evaporation (mm)**	**Rain days – observed /[average]**
Nov05	161 [80]	120	12 [9]
Dec05	88 [89]	172	9 [10]
Jan06	73 [105]	138	11 [10]
Feb06	67 [87]	126	16 [10]
Mar06	94 [65]	98	13 [9.5]

Some comments:

- This is 'average' data. Some individual WormTests had much, much higher WECs (eg from Armidale/March 2006: one WormTest with average 7828 eggs per gram of faeces (epg) - average of 10 counts; highest individual count in that test was 16920 eggs per gram).
- Rainfall and other conditions varied quite a lot over the tablelands: Guyra for example got a lot more rain than other localities. Likewise, there were more cases of haemonchosis in some areas than others.
- In some cases, sheep were dying of acute haemonchosis i.e clinical signs and even deaths were occurring before WECs rapidly escalated. This indicates a rapid intake of larvae, and significant blood loss from these before reaching breeding/egg-laying stage.
- Management factors were doubtless another factor. Were effective drenches used? Were sheep set-stocked (greater risk of parasitism) or was there some system of grazing management?



- Rainfall for Armidale city was around average or even below average, after a flying start with double the average in November 2005. Once there is a certain minimum amount of monthly rainfall (say, 50mm) to keep *Haemonchus* 'ticking over', other factors such as number of rain days/frequency of rain may well become as or more important than total rain received in a month. Bear in mind that *Haemonchus* eggs freshly deposited on pasture in faeces need adequate moisture within about a week in order for the eggs to develop and hatch. Otherwise the eggs die.

Some take home points:

- Regular WormTesting (WEC monitoring) is one of the best things you can do, even if – very occasionally – you get caught with worm problems when egg counts are still low. (Notably, barber's pole worm in very bad seasons; thin-necked intestinal worm in young sheep in certain situations).

- WormTesting:
  - Gives you information on how worm control is going on your farm
  - Provides DEW: distant early warning
  - Can you save you the cost of unnecessary drenching
  - Can tell you what drenches work on your property

More take home messages: grazing management:

- Set-stocking is bad for worm control. Barber's pole worm in particular loves it.
- Do this for starters: don't move young sheep onto pasture which has had other young sheep on it within the last few months.
- Preparing low worm-risk lambing paddocks for Spring: this should be well underway now.

That other blood sucker – liver fluke

The April/May fluke drench (triclabendazole-based product) to small ruminants and large is the single-most important one on 'flukey' properties.

Have you checked out ..

wormboss

http://www.wormboss.com.au

Recently published NSW DPI Primefacts

http://www.dpi.nsw.gov.au/aboutus/resources/factsheets/primefacts

NSW DPI newsletters

http://www.dpi.nsw.gov.au/aboutus/news/newsletters

A – Z index for entire NSW DPI website

http://www.dpi.nsw.gov.au/aboutus/a-z#n

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Bailey and Nielsen (2005) – the poster

Anthelmintic resistance in Australia – A commercial laboratory's experience

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Introduction

That anthelmintic (drench) resistance is the major animal health issue facing the Australian sheep industry is widely accepted. However, the precise level of resistance to each anthelmintic group is difficult to determine on a regional, state or national scale. This is largely a result of limited uptake by producers of parasite monitoring services, including drench resistance testing. However, analysis of available data presents a clear and disturbing picture.

Methods

Veterinary Health Research Pty Ltd runs a diagnostic laboratory specializing in 'large animal' parasitology. Approximately 40, 000 faecal samples were processed in 2004, with samples submitted from most sheep producing regions of Australia. Data from these samples were collated to give an indication of the reduction in anthelmintic efficacy as seen in the field in 2004. Data from samples were included for analysis if the samples were submitted within 21 days of treatment with a short-acting anthelmintic (n=87), within 32 days of treatment with moxidectin (n=49, *Haemonchus* spp. only) and within 121 days of treatment with an ivermectin capsule (n=6). These submission dates correspond to the periods following treatment when we would not expect to see strongyle eggs in the faecal samples if the treatment had been 100% effective. A positive worm egg count (WEC) was interpreted as an indication of reduction in anthelmintic efficacy (efficacy <100%, actual efficacy unknown). The results were expressed as the percentage of farms with a positive faecal egg count following treatment.

Results

Table 1. Reduction in anthelmintic efficacy.
Percentage of samples collected within 21 days of treatment with a short-acting anthelmintic showing positive WEC as an indication of a reduction of efficacy in the field – 2004 data.

Anthelmintic	No. farms analysed	% farms with positive WEC
BZ	15	93.3[1]
LEV	30	86.6[1]
BZ + NAP	17	70.5[1]
IVM	15	66.6[2]
BZ + LEV	10	80.0[1]

[1] Mixed nematode genera present
[2] Predominantly *Haemonchus* spp. present

Table 2. Anthelmintic resistance (efficacy <95%).
Summary of FECRT data collated from 24 tests undertaken between January and June 2004 using the VHR Drench test Kit®: broad-spectrum treatments (Wooster *et al.*, 2004).

Anthelmintic	No. farms analysed	% farms with efficacy <95%
BZ	23	91%
LEV	24	75%
BZ + NAP	24	8%
IVM	23	61%

Table 3. Reduction in anthelmintic efficacy.
Percentage of samples collected within 32 days of treatment with moxidectin showing positive *Haemonchus* spp. WEC as an indication of a reduction of efficacy in the field: 2000–2004 data by year.

Year	No. farms analysed	% farms with positive WEC
2000	7	0
2001	44	18.2[1]
2002	30	23.3[1]
2003	30	36.7[1]
2004	49	40.8[1]

[1] Predominantly *Haemonchus* spp. present

Table 4. Reduction in anthelmintic efficacy.
Percentage of samples collected within 121 days of treatment with an ivermectin capsule (100 days payout of IVM) showing positive *Haemonchus* spp. WEC as an indication of a reduction of efficacy in the field: 2000-2004 combined data.

No. farms analysed	% farms with positive WEC
108	70.4

[1] Predominantly *Haemonchus* spp. present

Discussion

The reductions in efficacy seen in Tables 1, 3 and 4 do not necessarily signify the presence of resistance according to the WAAVP definition (efficacy <95%). However, it can be seen that the results for reduction in short-acting anthelmintic efficacy (Table1) correlate well with data from 24 faecal egg count reduction tests (Table2), conducted on-farm by Veterinary Health Research Pty Ltd (over four states) from January to June 2004 (Wooster *et al*, 2004). This highlights the potential for industry and extension services to use this type of data to aid in the assessment of anthelmintic efficacy on a regional level.