Update on worm control in sheep

Stephen Love
Veterinarian/State coordinator internal parasites

ASAP/Sheep CRC Seminar, Cowra May 2013

Just to whet your appetite:
barber’s pole worm


Moderate to heavy infection.. Say 5000 worms >>>
~ 250 mls blood per day >>>
i.e. ~ 5% of blood – 60 kg sheep.

What sex is this worm?

‘Haemonchus’ means ‘blood spear’
(source Georgi’s Parasitology...)
Roundworm eggs under the microscope

Parasite eggs commonly found in faecal egg counts

- Coccyx
- Moniezia
- Trichuris
- Strongyle
- Nematodirus


Worms cost lots

Highest cost endemic diseases of sheep and cattle - Australia

- Worms: number one disease in sheep...several dollars or more per sheep?
- Approx 80% of cost is production loss (~invisible), (not drenches, WormTests etc...)
- Also big in cattle (number one or two) and other livestock

Stephen Love NSW DPI May 2013
Worms: quiet achievers, out of sight, out of mind

More or less invisible …
- The worms themselves
- The losses they cause
- Drench resistance

To increase visibility: WormTest!

“If you don’t measure it, you can’t manage it”

Resistance: how long?

<table>
<thead>
<tr>
<th>Sheet drenches - AU</th>
<th>Released</th>
<th>1st report resistance</th>
<th>Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rametin ® [OP]</td>
<td>1960s</td>
<td>1981</td>
<td>~20?</td>
</tr>
<tr>
<td>Levamisole [LEV]</td>
<td>1968</td>
<td>1979</td>
<td>11</td>
</tr>
<tr>
<td>Closantel</td>
<td>1982</td>
<td>1988</td>
<td>6</td>
</tr>
<tr>
<td>Ivomec® [ML]</td>
<td>1988</td>
<td>1993</td>
<td>5</td>
</tr>
<tr>
<td>Cydectin® [ML]</td>
<td>1995</td>
<td>2001</td>
<td>6</td>
</tr>
<tr>
<td>Combinations - triples and 4-way (ML+BZ+LEV+/-closantel)</td>
<td>[Resistance? Yes!]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zolvix® [AADs]</td>
<td>2009 (NZ), 2010 (AU)</td>
<td>2013 (NZ, goats)</td>
<td>(4)</td>
</tr>
</tbody>
</table>
Resistance overview - Australia ~ 2009-2012

% of farms with efficacy (WECRT %) < 95% in any of *Haemonchus*, *Trichostrongylus* or *Teladorsagia* spp.

![Graph showing percent of farms with WECRT < 95% for different drench groups]

Percent of (sheep) farms with efficacy (WECRT %) less than 95% in any of *Haemonchus*, *Trichostrongylus* or *Teladorsagia* spp. (Australia wide, 2009-2012) (Bailey et al. 2013)

BZ = benzimidazole group. LEV = levamisole group. ML = macrocyclic lactone group. IVM = ivermectin, which, like MOX and ABM, is an ML. AAD = aminoacetonitrile derivatives group. MPL = monopantel, which is an AAD. MOX = moxidectin. ABM = abamectin. WECRT% = efficacy%, reduction in worm egg count after treatment. *Haemonchus* = barber’s pole worm. *Trichostrongylus* = black scour worm (and stomach hair worm). *Teladorsagia* (Ostertagia) circumcincta = small brown stomach worm.

Stephen Love NSW DPI Armidale May 2013

Average efficacy - sheep drenches, Australia, 2009-2012

Average efficacy for different drenches and worms on sheep farms, Australia, 2009-2012 (Bailey et al. 2013)

For every drench tested, efficacies against the various worm species range from zero % (severe resistance) to 100% (fully effective). Numbers of farms for each test result ranged from 40 - 27. BZ = benzimidazole group. LEV = levamisole group. ML = moxidectin. AAD = abamectin. MOX = moxidectin. NAP = napthalophos. *Haemonchus* = barber’s pole worm. *Trichostrongylus* = black scour worm. *Teladorsagia* (Ostertagia) circumcincta = small brown stomach worm.

Stephen Love NSW DPI Armidale May 2013
Resistance in your backyard?
Recent work in Central West, Lachlan and Hume LHPAs

Resistance – Central West LHPA, NSW
% of tests showing <95 WECR%

Percent of (sheep) farms (n=10) with efficacy (WECRT %) less than 95% in Haemonchus, Teladorsagia or Teladorsagia spp. in the Central West LHPA (Walker et al. 2013)

BZ=benzimidazole group. LEV=levamisole group. ABA=abamectin. CLOS=closporin (no claim for efficacy against Trich or Tel). NAP=naphthalophos (no claim for high efficacy against Trich or Tel). DERQ=derquantel. All drenches used at recommended dose rates. WECRT= % reduction in worm egg count after treatment. Haem(onchus)=barber’s pole worm. Trich(ostrongylus)=black scour worm. Tel(adorsagia (Ostertagia)=small brown stomach worm.

Stephen Love NSW DPI Armidale May 2013
Resistance – Lachlan LHPA, NSW

% of tests showing <95 WECR%

Percent of (sheep) farms (n=58) with efficacy (WECRT %) less than 95% in Haemonchus, Teladorsagia and Trichostrongylus spp. in the Lachlan LHPA (Braddon 2013)

NAP=naphthalophos. ABA=abamectin. BZ=benzimidazole group. LEV=levamisole group.

WECRT%=efficacy=% reduction in worm egg count after treatment.

Haemonchus = barber’s pole worm.

Teladorsagia = black scour worm (and stomach hair worm).

Trichostrongylus = small brown stomach worm.

Stephen Love NSW DPI Armidale May 2013

Resistance – Hume LHPA, NSW

- Shergold and Morton (2013)
- Drench resistance trials done in Hume LHPA in 2012.
- Poor drench efficacy common
- E.g. less than 95% efficacy for ivermectin on each of eight properties tested.
- Efficacy for a levamisole-benzimidazole combination drench was also commonly below 95%.
tests and tools, old and new

‘Old’
- Worm egg counting + larval culture (WormTest)
- WormBoss ver 1 (2005)
- Copper oxide wire particles
- Nematophagous fungi

‘New’
- WormBoss ver 2 (21.11.12)
- Lectin-binding assay
- Haemonchus dipstick test
- Barbervax
- ‘High tech’ diagnostic tests

NEW drenches !! 😊

- ZOLVIX®, Novartis
  - Active: monepantel
  - Family/action group: AADs (new)
  - Short acting; broad-spectrum
  - Released (sheep):
    - NZ, autumn 2009, AUS Sept 2010
  - Cattle, goats? Probably.

(As usual, goat dose rate much higher than for sheep)
NEW drenches!! 😊

- **STARTECT®, Pfizer**
  - Active: Derquantel (‘new’, a spiroindole) + abamectin (‘old’, an ML)
  - Family/action group: spiroindole (NEW)
  - Short-acting; broad-spectrum
  - Released (sheep) NZ, July 2010
  - Australia… 2013?
  - (Horses? NO! (toxicity)

Stephen Love NSW NSW Primary Industries May 2013

WormBoss - new / revamped

WormBoss was developed by the Australian Sheep Industry CIC and Australian Wool Innovation with the support of Animal Health NSW.
WormBoss

your two best friends

Regular **WormTesting**

- Before drenching (do I need to drench)
- After drenching (did the drench work?)

**WormBoss**

all you need to know; tasty and digestible

- Sometimes you need to spend to save
- Don’t guess, WormTest!
- The most expensive drench is the one that doesn’t work
thank you for your attention
and/or not snoring

Appendixes..
So, what quarantine drench?? (sheep)

- **Best:** four unrelated actives including Zolvix
  Eg a triple active, followed immediately by ‘Zolvix’

- **Good:** ‘Zolvix’ plus at least one other unrelated drench

- **OK (possibly):** 3-4 unrelated actives

Plus time in quarantine paddock (at least 3 days)

Get good, up-to-date advice!

---

Integrated parasite management (IPM)

- **Control exposure**
  Low-worm risk paddocks for vulnerable animals
  (grazing management)

- **Reduce vulnerability**
  Genetics + nutrition e.g. buy rams with good
  ASBV for WEC; meet growth rate and conditions
  score targets

- **Measure so you can manage**
  Monitor worm burdens and drench efficacy (using
  WECs (worm egg counts))

- **Smart treatments** right drench at the right time
New drenches- how to use them

- Use with older drenches *known to be effective*
- Best - use in combination*
- Next best – use in rotation, within season*

Eg triple ML-based combination then NAP-based combination then Zolvix (in no particular order)

- Drenching on/to very clean pasture (eg dry years, stubbles)
  - Don’t drench unless you have to
  - Consider leaving 1-4% untreated (if using effective drench) (get advice/assess risk)


---

(almost finished!)

Managing worms - and resistance

- Right drench, right time
  - What is effective? ‘DrenchCheck Day 10’ (WormTest)
  - When do you drench? (WormTest + local plan)
- Right dose (incl. goats)
- Keep resistant worms out (quarantine drench)
- Rotate **effective** drench families within season (incl Zolvix)
- Consider combinations
- Avoid unnecessary drenching (WormTest), especially
  - Adults
  - In droughts, dry spells; onto cereal stubbles (refugia)
- Non-chemical options – genetics, nutrition, grazing management

Stephen Love NSW DPI November 2011

Stephen Love NSW DPI March 2012
If nothing else….

- Do **regular WormTests** (worm egg counts)
- Do **regular ‘DrenchChecks’**
  - WormTest 10-14 days after drenching
  - Best if a WormTest just before drenching as well
- Low worm risk lambing and weaning paddocks

More info

**Worm-savvy advisors** from DPI, LHPA and private vets, resellers, etc

- **WormBoss**
  - Website (being re-vamped…)
  - Regional programs/training days from early 2012 (Australia-wide)
### Sheep worms: who’s who?

<table>
<thead>
<tr>
<th>Species</th>
<th>Common Name</th>
<th>Length of Worm</th>
<th>Appearance, Nematodes</th>
<th>Appearance, Capreole (in parentheses)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Heterakis gondotitis</em></td>
<td>Chicken proventricular worm</td>
<td>10-20 mm</td>
<td>White, slender, straight, yellow</td>
<td></td>
</tr>
<tr>
<td><em>Heterakis spathulata</em></td>
<td>Whiteworm</td>
<td>10-20 mm</td>
<td>White, slender, straight, yellow</td>
<td></td>
</tr>
<tr>
<td><em>Nematodirus battus</em></td>
<td>Nematodirus</td>
<td>10-20 mm</td>
<td>White, slender, straight, yellow</td>
<td></td>
</tr>
<tr>
<td><em>Trichostrongylus colubriformis</em></td>
<td>Roundworm</td>
<td>1-5 mm</td>
<td>White, slender, straight, yellow</td>
<td></td>
</tr>
</tbody>
</table>

**Drenches and goats**

- Few registered
- BZs, morantel, triclabendazole; Neguvon (no longer a permit?), Caprimec® (abamectin)
- Naphthalophos – narrower safety margin
- Using cattle pour-ons??!! %#$@! Not good!
- Off-label usage with vet script?
- Issue of residues (Cook & Love. Turning the Worm. #18 March 2005)
- Metabolise drenches faster than sheep
  - Efficacy
  - Dose rates
  - Selection for resistance

Stephen Love NSW DPI November 2011 e&oe
## Drench half-lives – sheep & goats

<table>
<thead>
<tr>
<th></th>
<th>Sheep</th>
<th>Goat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ivermectin</td>
<td>~60-100</td>
<td>28 (~ 1 day)</td>
</tr>
<tr>
<td></td>
<td>(~2.5- 4 days)</td>
<td></td>
</tr>
<tr>
<td>Abamectin</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>Doramectin</td>
<td>156 (~ 6.5 days)</td>
<td>?</td>
</tr>
<tr>
<td>Moxidectin</td>
<td>385-500 (16-21 days)</td>
<td>288 (12 days)</td>
</tr>
</tbody>
</table>

Source: Macrocyclic lactones in antiparasitic therapy. Ed: Vercruysse, Rew

---

## Cost of WormTests

**State Vet Lab, NSW DPI** (Nov.2011)

### Parasitology

WormTest Packages - Kits are provided free of charge for on farm sample collection

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>WormTest Basic</td>
<td>2 pooled worm egg counts from 10 samples</td>
<td>30.00</td>
</tr>
<tr>
<td>WormTest Basic + type</td>
<td>2 pooled worm egg counts + bulked larval differentiation</td>
<td>56.00</td>
</tr>
<tr>
<td>WormTest Gold</td>
<td>10 individual worm egg counts</td>
<td>58.25</td>
</tr>
<tr>
<td>WormTest Gold + type</td>
<td>10 individual worm egg counts + bulked larval differentiation</td>
<td>78.45</td>
</tr>
<tr>
<td>Sheep Fluke egg count</td>
<td>2 pooled fluke egg counts from 10 samples (sedimentation test)</td>
<td>51.00</td>
</tr>
<tr>
<td>Cattle Fluke egg count</td>
<td>5 bulk fluke egg counts from 10 samples (sedimentation test)</td>
<td>84.90</td>
</tr>
</tbody>
</table>

The value of WormTests

“We might think it is expensive (because the cost is up front and obvious). Say you went for GOLD+type ($56.65+19.65=$76.30) when testing a mob of 500 sheep. That is **15 cents per sheep**. If the WormTest result was applicable to another 1000 sheep that were similar (age/class, drenching and grazing history etc) then the cost comes down to **5 cents per sheep**.

It would be pretty hard to drench sheep for 15 cents, even if you don’t include the cost/value of labour. (You might do it for under 15 cents using an older drench that is very likely ineffective (Resistance is VERY VERY common). So, all you would achieve in the sheep is a very modest degree of rehydration at great expense. But there are the benefits to the operator of recreational drenching :-).”

Now compare the cost of drenching or WormTesting with what sheep worms cost in Australia. Roughly, depending on where you are (and commodity prices etc), the estimated annual cost is between **$5-10 per sheep**, possibly more. (Sackett and others (2006; Australia-wide), see MLA website; Kelly and others (more recently, and in the New England region of NSW).

Generally about **80-90% of the cost of worms is from production losses** (as opposed to the cost of drenching and/or WormTesting).

WormTesting stacks up pretty well when you do a cost-benefit exercise”, – S Love March 2012

http://wormmailinthecloud.wordpress.com/2012/02/23/wrm-increased-lab-charges-diy-worm-egg-counting-course-farm-safety-course/