WormKill - the basics

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Introduction
WormKill is a sheep worm management program for the summer rainfall area of north eastern NSW with annual rainfall approximately 650mm or above and north of a line from Sydney to Mudgee. (See map).
The program was first launched in 1984 but has evolved since then, particularly because drench resistance has become worse.
This Primefact is an overview. For more detail on worm control in the summer rainfall zone (north-eastern NSW and south-eastern Queensland), go to the WormBoss website.

The main worms
The main sheep roundworms in the ‘WormKill’ zone are barber’s pole worm (*Haemonchus contortus*), black scour worm (*Trichostrongylus* spp including *T. colubriformis*) and small brown stomach worm (*Teladorsagia (Ostertagia) circumcincta*), with barber’s pole worm and black scour worm being most important.
Liver fluke (*Fasciola hepatica*) is not as uniformly distributed as the roundworms mentioned above, but can be very important in the localities where it occurs.
Other worms can also be important at times, especially thin-necked intestinal worm (*Nematodirus* sp) in young sheep.

Goats and alpaca
The worms mentioned above are also important in goats. Alpaca can carry both sheep and cattle worms. For more information on worms in alpaca, see Primefact 991.

Right drench, right time
Timing is based on WormTest results, as well as condition of sheep, nutrition and the weather. Worm egg count benchmarks (see table 1) help with assessing these factors.
There are few fixed drenches, apart from a drench for lambs at weaning, and liver fluke drenches (1-3 per year) that may be required on fluke affected properties. A pre-lambing drench for ewes is often necessary in the northern tablelands. (WormTest first).
The right drench is an effective drench that targets the worms of interest. This will usually be a broad-spectrum drench, but may be a narrow spectrum product, notably for liver fluke control.
An effective drench is generally defined as those that are over 95% effective.

Resistance testing
Test for resistance every three years using DrenchTest (faecal worm egg count reduction test). Additionally, use DrenchCheck from time to time (a WormTest at the time of drenching followed by another test 10-14 days later). Entirely lab-based tests such as DrenchRite® or the Closantel Resistance Assay are no longer available.

Drench rotation and combinations
Rotate from one drench group to another. Consider using combinations if possible. One option is to rotate from one combination type to another, e.g. from a combination containing a macrocyclic lactone (‘ML’ or ‘mectin’) to a non-ML based combination. Details of recommendations will vary as new drench groups become available. Sensible strategies are only possible if you know which drenches are effective on your property.
**WormTesting**

This is faecal worm egg count (WEC) monitoring. Larval cultures will be required from time-to-time as well as egg counts in order to determine the type of worms present.

The Haemonchus Dipstick Test may be used as well as WECs to provide earlier warning of problems when conditions are good (warm + moist) for barber’s pole worm.

Weaners are WormTested just before weaning (12-14 weeks after lambing) then every 6-8 weeks.

Ewes are WormTested pre-lambing, just before lamb marking and weaning, and then every 6-8 weeks.

Wethers and rams are WormTested every 6-8 weeks.

When conditions are good for worms, more frequent testing may be required.

Less worm testing may be required in drier seasons and areas.

**Benchmark Worm Egg Counts**

Most of the eggs in a worm egg count will be ‘strongyle’ type, and most of these will come from barber’s pole worm and the main scour worms, namely small brown stomach worm and black scour worm.

The species of ‘strongyle’ type worms cannot be reliably determined from examination of the eggs so a larval culture (worm type) will be necessary in order to determine the WECs attributed to barber’s pole worm and the scour worms.

<table>
<thead>
<tr>
<th>Table 1. Benchmark worm egg counts (eggs per gram of faeces (EPG))</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Barber’s pole worm</strong></td>
</tr>
<tr>
<td>800</td>
</tr>
<tr>
<td>(600-1000)</td>
</tr>
</tbody>
</table>

The benchmarks of 800 and 300 EPG are for sheep in average condition (fat score (FS) = 2.5) and average pasture quality and quantity.

Err towards the lower ends of the WEC ranges (600 for barber’s pole worm, and 200 for the scour worms) if one or more of these apply: sheep in poor condition (FS less than 2.5), poor feed; sheep less than one year old.

Work towards the upper end of the WEC ranges (1000 for barber’s pole worm; 400 for the scour worms) if these apply: sheep in good condition (FS greater than 2.5); feed is very good; adult dry sheep.

Producers who are risk averse or WormTest infrequently may err towards the lower end of the WEC ranges.

If a larval culture has not been done, a rough benchmark of 500 strongyle EPG may serve as a guide, bearing in mind that this is a low egg count if the eggs are all from barber’s pole worm, or a high egg count if the eggs are from black scour worm and the sheep are young and in poor condition.

Thin-necked intestinal worm can cause scouring and ill thrift in young sheep in particular. They have an egg quite different from strongyle eggs and are counted separately.

Drench with an effective drench when WECs exceed the benchmarks.

**Liver fluke**

On properties where liver fluke is a problem, one to three drenches may be required each year.

In order of importance, these drenches are:

- April/May. Use a highly efficient flukicide (i.e. triclabendazole-based)
- August. Consider rotation to a non-triclabendazole based flukicide
- February

Use WormTest to monitor fluke as well as round worm egg counts from time to time.

**Grazing Management**

The aim is to reduce numbers of worm larvae on pasture.

Begin preparing paddocks for spring lambing (around September) by keeping them free of sheep in March and April. In the northern tablelands, sheep can be grazed on these paddocks in the colder months (May - August). This is because for the most important worm species – barbers pole worm and black scour worm - there is very little development of worm eggs to infective larvae on pasture at this time.

Prepare paddocks for summer weaning (January) by keeping them free of sheep during October-December.

Paddocks can be grazed with cattle, or spelled, during 'sheep-free' periods. Sheep that are not shedding worm eggs because they have been treated with a known effective drench within the last 3 weeks can also be used.

To get a substantial reduction in numbers of infective larvae on pasture, paddocks in the northern tablelands need to be kept sheep-free for
about 2-3 months in summer and double that in the colder months.

If it fits your enterprise, intensive rotational grazing may produce good results, especially for barber’s pole worm control.

Set-stocking is to be avoided, as is weaning into the lambing paddock.

**Condition and nutrition**

Sheep in good condition manage worms better because of improved resistance (resulting in lower worm egg counts) and resilience (maintaining productivity despite the presence of worms).

Supplementary feeding may be necessary for weaners and pregnant ewes in winter if pasture is inadequate.

Targets:
- Ewes: Fat score (FS) 3.0 at joining and at lambing
- Weaners: 24 kg bodyweight by the end of May.

**Breed resistant and productive sheep**

Use rams with a favourable Australian Sheep Breeding Value for worm egg count (ASBV-WEC) as well as favourable breeding values for production traits.

**Keep resistance worms out (Quarantine)**

Treat introduced sheep with a combination of unrelated drench actives, generally four or more.

This can be done by using proprietary combination drenches, on-farm mixes following label directions, or concurrently drenching with different products. Note that not all drenches can be mixed together in the same drum. Check the label.

Some possible combinations:
- Moxidectin used concurrently with a combination containing naphthalophos (an organophosphate (OP)) + ‘white’ drench (benzimidazole (BZ)) + ‘clear’ drench (levamisole (LEV)).
- An OP drench used concurrently with a proprietary combination product containing abamectin plus 2-3 other actives.
- Zolvix® (monepantel) used concurrently with a naphthalophos or ML-based combination.
- Startec® (derquantel+abamectin) used concurrently with an OP-based combination

Follow product labels. Avoid treating stressed or dehydrated sheep, especially with OPs.

Hold sheep in yards (small mobs) or a secure paddock (larger mobs) for at least 4 days after treatment to allow for passage of worm eggs out of the gut. Provide adequate feed and water. Allow no grazing of this paddock by sheep or goats for at least 3 months.

Then release sheep onto a paddock that is likely to be ‘wormy’. This is to dilute resistant worms surviving treatment with sheep worm larvae already on the paddock.

For added confidence, WormTest the imported sheep 10-14 days after treatment (i.e., ‘DrenchCheck’).

Get local advice on the most up-to-date recommendations. These will evolve as the drench resistance picture changes.

**Managing resistance**

- Use effective drenches. Consider using combinations of unrelated drenches.
- Use the correct dose using equipment known to be accurate. Calculate dose based on the heaviest animals in the mob.
- Follow the label.
- Avoid unnecessary drenching
  » especially of adults.
  » during droughts or prolonged dry spells.
  » immediately before moving onto very clean paddocks, for example ungrazed cereal stubbles.
  » WormTest before drenching.
- Rotate between effective drenches or drench combinations from different drench families
- Avoid use long-acting drenches pre-lambing. If you do, have a management plan to deal with resistant worms that accumulate on the lambing paddock.

**Further developments**

Industry and Investment NSW (DII), the Queensland Department of Employment, Economic Development and Innovation (DEEDI), and the Australian Sheep Industry Cooperative Research Centre are working together to develop an updated sheep worm control program for the summer rainfall zone of northern NSW and south east Queensland. This updated program, of which this Primefact is a summary, should be available on the WormBoss website by the second quarter of 2011.

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1 Monepantel and derquantel each represent new drench groups. In Australia, monepantel was released in September 2010 and derquantel is expected to be released 12-18 months after that.
Table 2. WormKill calendar - example

<table>
<thead>
<tr>
<th>Month</th>
<th>Management</th>
<th>WormTest (and drench, if necessary)</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>mid Jan</td>
<td>Weaning</td>
<td>Ewes, weaners, wethers, rams.</td>
<td>Drench weaners.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Drench ewes depending on WormTest.</td>
</tr>
<tr>
<td>late Feb</td>
<td>Crutching</td>
<td>Ewes, weaners, wethers, rams.</td>
<td>Liver fluke drench if necessary.</td>
</tr>
<tr>
<td>March</td>
<td>Start lambing paddock</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>preparation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>mid April</td>
<td>Joining.</td>
<td>Ewes, weaners, wethers, rams.</td>
<td>Ewes are fat score 3.0.</td>
</tr>
<tr>
<td></td>
<td>Lambing paddock preparation.</td>
<td></td>
<td>Liver fluke drench if necessary.</td>
</tr>
<tr>
<td>May</td>
<td>Lambing paddock preparation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>June</td>
<td>Lambing paddock preparation.</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>mid Aug</td>
<td>Shearing</td>
<td>Ewes, weaners, wethers, rams.</td>
<td>Liver fluke drench if necessary.</td>
</tr>
<tr>
<td></td>
<td>Lambing paddock preparation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>mid Sept</td>
<td>Lambing</td>
<td></td>
<td>Ewes are fat score 3.0.</td>
</tr>
<tr>
<td>late Sept</td>
<td>Start weaning paddock</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>preparation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>mid Nov</td>
<td>Marking</td>
<td>Ewes, weaners, wethers, rams.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Weaning paddock prep.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For the purposes of this table, hoggets (approx. 1-2 years old) are classed as adults.
New elements, based on work by PhD students and others\textsuperscript{2} at the University of England, include:

- **IPM.** Although integrated parasite management has been a part of sheep worm control programs for well over 10 years, Gareth Kelly and others (UNE) have examined IPM on various New England properties compared to ‘typical’ worm programs. IPM was found to somewhat superior in terms of health and productivity, the difference in one study equating to about $4 net per ewe per year.

- **Lambing paddock preparation.** Work by Justin Bailey and others showed that the eggs of important worm species – *Haemonchus contortus* and *Trichostrongylus colubriformis* – do not develop in the months June – August on the northern tablelands. This means that lambing paddocks do not need to be kept sheep-free in these months, making lambing paddock preparation easier. Bailey also developed and successfully tested a summer rainfall zone variation of ‘Smart Grazing’, a system of creating low worm risk paddocks by short periods of intensive grazing by recently drenched sheep.

- **Drench decision aid (DDA).** A DDA has been developed and field tested by Associate Professor Lewis Kahn and others. Users enter worm egg count, sheep condition and pasture information into the aid, which is available as computer- or paper-based versions. The DDA then gives guidance as to whether a drench is required or not.

**More information**

- **WormBoss**
  
  \url{www.wormboss.com.au} or
  \url{www.wool.com/WormBoss}

- **WormBuster** – DEEDI, Queensland (formerly Primary Industries)

  \url{http://www2.dpi.qld.gov.au/sheep/4720.html}

- **Integrated Parasite Management – Sheep (IPM-S) project (summer rainfall)**

  (Search in web browser for “AWI IPM-S”).

- **Industry and Investment NSW website- internal parasites section**

  \url{http://www.dpi.nsw.gov.au/agriculture/livestock/sheep/health#Internal-parasites}

\textsuperscript{2} Supported by Australian Wool Innovation and the Australian Sheep Industry Centre for Cooperative Research.