Startect®: a new sheep drench from Zoetis. The drench is a combination of abamectin, and the novel (brand new) active, derquantel, from the spiroindole(SI) group.

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WormBoss regional worm control programs

Sheep and paddock management
- Create low worm-risk paddocks
- Breed and feed for worm-resistant sheep

Drenching
- WormTest for tactical drenches
- Strategic drenches
- Manage drench resistance

Wormboss.com.au has sheep worm control programs for each region in Australia.

These take an integrated approach broadly comprising sheep and paddock management on the one hand, and drenching on the other.
Managing drench resistance

- Conduct drench tests every 2-3 years
- Use effective drenches
- Use multi-active combinations where possible
- Rotate among all effective drench groups
- Careful use of long-acting products
- Avoid unnecessary treatments
- Basics of good drench practice

Effective broad-spectrum drench: the official benchmark in Australia is >95% for roundworms.

WormBoss prefers >98% (i.e. killing more resistant worms).

Multi-active combinations: combinations of unrelated drench actives.

Rotation: rotate within season between effective single- and/or, preferably, multi-active drenches.


Unnecessary treatments: base treatments on worm egg count (WEC) monitoring apart from the routine strategic drenches (e.g., pre-lambing) for your region.

Good drench practice: right dose rate / follow the label, drench to heaviest in the group, drench gun is accurate.
Managing drench resistance

• Conduct drench tests every 2-3 years.
• Use effective drenches.
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• Basics of good drench practice

The first four steps in managing resistance can’t be done properly if you don’t know your drench resistance status.

DrenchTest every 2-3 years; regularly do DrenchChecks in between times – see http://www.wormboss.com.au/tests-tools/tests.php
Drench resistance (DR): defined as occurring when a drench reduces the WEC by <95%.

Results of a telephone survey (compiled by R. Woodgate as part of WormBoss activity) of producers on whether resistance was perceived to be a problem, and also whether they did a Drench Test – even if not to best practice standard - in the period 2007-2011 (I Reeve and S W Walkden-Brown (2014) National Benchmark Survey).

Most said DR was an issue for the industry, but not for their farm. About 30% of producers had conducted a drench test in the five-year period (dotted line), of which only a quarter used the gold standard DrenchTest. Most producers had not done a recent drench test.
Results from the national survey of sheep producers.

BZ=benzimidazole (‘white’) drench group, e.g. Valbazen®; LEV=levamisole (‘clear’) group, eg ‘Nilverm’®; IVM=ivermectin, e.g. Ivomec®, which is in the macrocyclic lactone (ML, ‘mectin’) group; ABA=abamectin, e.g. Virbamec®, an ML; MOX=moxidectin, e.g. Cydectin®, also an ML; MPL=monepantel, i.e. Zolvix®, which represents the AAD (amino-acetonitrile derivatives) or ‘Orange’ group.

About 55% of producers thought they had resistance to BZ and LEV groups on their farm.
Perceptions (grey columns) vs reality (green columns). The ‘reality’ is from a national survey of drench resistance (Playford and others, Aust Vet J., in press) which analysed 390 drench tests from around Australia. The results here are for any worm (not divided up into the different worm species/genera). Worms represented here are mostly Haemonchus (barber’s pole worm) Teladorsagia (brown stomach worm) and Trichostrongylus (mostly black scour worm). Whereas, for example, only 55% of producers thought they had resistance to BZ or LEV groups, the survey suggested resistance to these groups would be present on 95% of farms.
New effective drench actives help slow drench resistance

• Conduct drench tests every 2-3 years
• Use effective drenches
• Use multi-active combinations where possible
• Rotate among all effective drench groups
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• Basics of good drench practice

New effective drench actives kill more worms, leave few resistant worms and provide options for multi-active combinations and drench rotation.
Value of using combinations of drench actives

- Slow the development of drench resistance
  - Actives have independent modes of action
    - Little evidence for cross-resistance
    - Best when all actives have good efficacy
- Generally more effective than single active drenches where resistance has already developed

<table>
<thead>
<tr>
<th>Drench A</th>
<th>Drench B</th>
<th>Drench AB</th>
</tr>
</thead>
<tbody>
<tr>
<td>80% effective</td>
<td>70% effective</td>
<td>94% effective</td>
</tr>
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</table>

Using combinations of unrelated drench actives slows development of resistance because they kill more worms and each active has a different (independent) mode of action.

They are most effective when integrated with other good worm control practices. See [wormboss.com.au](http://wormboss.com.au)
In this modelling by D. Leathwick (Vet Parasitol, 2012, 186, pp 93-100), drench administered to lambs 6 times at 28d intervals starting at weaning in a clean paddock.

The dotted line is for a new single active (e.g. derquantel); the next 3 lines across are the new active in combination with abamectin when abamectin is 50%, 80% or 95% effective.

R gene frequency: how common resistance genes are in the worm population.

The message from this: addition of even a 50% effective active to a new highly effective active (to form a dual-active drench) will slow development of resistance.
Drench administered to lambs 6 times at 28d intervals starting at weaning in a clean paddock.

Dotted line is for a new single active (e.g. derquantel); the next 3 lines across are the new active in combination with abamectin when abamectin is 50%, 80% or 95% effective.

The red dotted lines overlaid here show, in this scenario, the years of useful life from the drenches, and also indicates that when about 28% of genes are resistance genes, the measured drench efficacy is about 95%. (Efficacies > 98% are preferred by WormBoss).

Approximate relationship between R gene frequency and drench efficacy.
How to get the most out of combinations of drench actives

• Best with higher efficacy to protect all actives
• Declining benefit with lower efficacy
  – Need to know efficacy of individual actives
  – When is a combination no longer an effective combination?
• This relates to Startect and the efficacy of abamectin
  – National survey reported 83% of properties had barber’s pole worm resistant to abamectin
  – Resistance in the New England is common and can be severe <20% efficacy

The ‘perfect’ combination: a combination of unrelated actives (different modes of action); the more actives, the better; all actives have similar spectra of activity (target the same worm species) and similar persistency, and all actives have high efficacy.

In the real world, combinations are usually a compromise.

Important to know the efficacy on each farm of each active so one can make sensible choices about the best combination.
How to get the most out of combinations of drench actives

Modelling indicates benefit from second active, in a dual-active drench, when its efficacy was 50%

- Need to know the efficacy of abamectin
  - Drench Test or Drench Check day
- When abamectin is greater than 50% effective
  - likely to significantly slow development of resistance to derquantel
  - AND derquantel will protect abamectin from worsening efficacy
- When abamectin is largely ineffective
  - Startect resembles an effective single-active drench
  - Resistance will likely develop more rapidly
  - Consider co-treatment with an unrelated effective active
  - Consider timing of treatment to cold periods of the year

The principles above apply to all combinations, not just Startect®.

Co-treatment: this might involve going up the race, drenching with Startect, and going up the race again with another drench that contains a different active (i.e. not an ML in this scenario, given that Startect contains an ML).

Cold periods: worm eggs produced by survivors of treatment (i.e. resistant worms) will not develop and hatch. This particularly applies to Haemonchus, the eggs of which are particularly cold-sensitive.

More information in WormBoss (e.g. in Appendices of ‘Your Program’).
Other strategies to slow resistance

- **Within year rotation among effective drench actives**
  - Slows development of resistance to other drench actives
  - Especially after low worm-risk paddocks
- **Worm tests and WEC thresholds**
  - Remove unnecessary treatments
  - Maintain refugia (generally >80% on NE pasture)
- **Careful use of long-acting products**
  - Primer, exit, time of year, class of animal

Within-year rotation: changing often within a season e.g. from drench to drench, from one effective single- or multi-active drench to another, which is unrelated or mostly unrelated.

Often rotation of all actives may not be possible: e.g. using an abamectin+BZ+LEV ‘triple’ as the next drench after Startect, for example, means that some but not all actives are getting a rest. In this example, abamectin was used both times.

If a naphthalophos+BZ+LEV ‘triple’ was used after Startect®, BZ and LEV would have got a rest.

Rotating from monepantel (MPL, Zolvix®) to a naphthalophos+abamectin+BZ combination gives all actives a rest, as does rotating from MPL to Startect®, or vice versa.


Also see WormBoss for information on refugia, unnecessary treatments and long-acting products etc.
Effective combination drenches such as Startect tick all four boxes above.

But the efficacy of abamectin should be determined separately to know if Startect® is acting as an effective dual-action combination.
Thank you for your attention