New Zealand Parasite resistance facts
By John McEwan (AgResearch Limited) in collaboration with Techion Group Ltd

The internal parasite issue: Young sheep are very susceptible to internal parasites, this has a major impact on production on-farm through sub-clinical infection if not treated. Parasites reduce growth, milk production and reproduction, and affect fleece and carcass quality. The cost is huge – parasites are the largest influencing factor on animal performance after nutrition.

The true cost: Internal parasite costs affect farmers in two ways – in lost production and through animal health costs. It is estimated that internal parasites cost New Zealand’s sheep industry approximately $300 million annually in lost production and drench use; while the cattle industries spend approximately $50 million annually on drench alone1. The time required for drenching is often also a forgotten cost. It is estimated the industry would benefit by $68.7 million a year with a 10% reduction in the effects of parasites2.

What is parasite resistance? Sheep develop a degree of natural immunity to parasite infection when they are young, but as parasite levels differ, some demonstrate more resistance and others prove more susceptible. The rate of resistance is genetic; meaning it is permanent and heritable. Selecting and breeding from the most parasite-resistant rams is an effective long term way of both reducing parasite numbers across the flock, and reducing drench reliance. This resistance affects all New Zealand internal parasite types.

How genetic selection works: Parasite resistance is not visual; the resistance trait is identified through measuring faecal egg counts (FEC). The best way to predict resistance in New Zealand sheep is to challenge the ram lamb flock with parasite infection, take faecal samples when levels are high enough, and use a FEC process to indicate parasite numbers. This is best measured in lambs in their first summer/autumn. SIL Breeding Values for parasite resistance can then rank sheep according to their genetic merit on the number of eggs measured. Selecting for parasite resistance when included in an economic index that includes production traits becomes cumulative with less eggs shed on pasture and will decrease by an estimated 4% per year. Combined with breeding from the most resistant animals, this constantly decreases overall parasite numbers, to the point where the drenching required is minimal.

How does genetic selection for internal parasites affect production?
- Parasite resistance in sheep is independent, and doesn’t interfere with production. There is effectively no relationship between sheep size and the number of parasite eggs on New Zealand farms; a large-scale study in 2012 has verified that selecting on low Faecal Egg Counts has little effect on sheep growth, wool production, dagginess or number of lambs born3. This backs up many years of AgResearch trials. However, selection for parasite resistance should only be considered as a component of an overall selection index as with any other trait.

1 Rattray, 2003
2 McCorkindale et al. 2014
3 Pickering et al. 2010
Commercial farmers and breeders testify that parasite-resistant stock are more robust and less fussy. Environmental differences within New Zealand do not affect this performance.

It should be noted that one daggy sheep does not indicate the flock is infected with parasites. Considerable research over time has shown there is no genetic link between the number of eggs shed and the level of dags in individuals. The most efficient way to identify parasite resistance is to measure FEC and production traits, then by using a Selection Index, choose the best animals for individual farm systems.

There is a continual cost to the farm when animals shed eggs, leaving larvae on pasture for the rest of the flock to ingest. Breeding for resilience rather than resistance continues this larvae contamination; the best way to reduce larval challenge is by grazing the more resistant animals.

The advantages of testing for internal parasites:
- Testing will add to the production gains made by selecting for meat, growth and twinning, giving valuable payback on investment. Selecting for parasite resistance is profitable and permanent. It is also now considerably easier.
- 92% of farms have parasite resistance to at least one commercially available anthelmintic treatment (Figure 1); farmers solely relying on new anthelmintics will inevitably face drench failure in the future. Parasite resistant animals will require less drenching which will minimise the possible production consequences of subsequent drench failure, contributing to a lower cost of production.
- The return on investment for parasite resistance is proven. Farmers will pay more for efficient and profitable parasite-resistant sheep; they see there is value in reducing drench costs and minimising the risk of future drench resistance problems. This is now providing progressive breeders with a competitive edge.
- Pasture contamination is substantially reduced, which improves productivity. It is estimated that approximately 10% of a flock can contribute 50% of larvae on pasture - identifying that 10% that are polluting pastures, can cut contamination by up to half.
- The New Zealand sheep meat industry will benefit by increased overall sheep productivity and profitability, the ability to stay ahead of global competition, and to meet increasing demand from consumers wanting less chemicals in their meat.

New Zealand Drench Resistance: It’s time to face the facts
A survey of nearly 200 DrenchSmart reports revealed that only 8% of New Zealand farms have complete drench efficacy to all single active and combination drenches which were tested (Figure 1). While the remaining 92% of farms tested have developed drench resistance to one or more actives.
Figure 1. The percentage of New Zealand farms with resistance to commercially available varieties of single active and combination drenches. Resistance is defined as a Faecal Egg Count Reduction (FECR) of <95%. Total percentages of resistance are shown. Data was extracted from DrenchSmart Reduction tests across New Zealand (n=196). Not all drench varieties were assessed on all farms.

Table 1. Drench actives and combination actives assessed by DrenchSmart Faecal Egg Count Reduction Tests (FECRT) on 196 New Zealand farms.

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<tr>
<th>Drench Actives and Combination Actives Commercially Available in New Zealand Assessed Using DrenchSmart Tests.</th>
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<tr>
<td>Benzimidazole</td>
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<td>Levamisole</td>
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<td>Ivermectin</td>
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<td>Abamectin</td>
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<td>Moxidectin</td>
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<td>Combination (BZ &amp; LEV)</td>
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<td>Combination (LEV &amp; ABA)</td>
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<td>Combination (BZ, LEV &amp; ABA)</td>
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Of the 196 farms surveyed, 77%, 32%, and 34% of farms demonstrated resistance to Benzimidazole, Levamisole and Ivermectin (Full), respectively (Figure 2). While, 10% of farms demonstrated resistance to a Combination Benzimidazole & Levamisole (BZ & Lev) drench. No cases of drench resistance to Combination Levamisole & Abamectin (Lev & Aba) or Combination Benzimidazole, Levamisole & Abamectin (BZ, Lev, & Aba) were detected.
How to test
WormFEC provides sheep breeders with tools and advice to select sheep resistant to internal parasites in their own breeding flocks. The service is provided in association with Sheep Improvement Limited (SIL). Commercial farmers should be asking for WormFEC tested rams from their breeders. BSR is a service provided to breeders for them to select parasite resistant animals to improve the genetic value of their flock. BSR is the only certified 'one test' WormFEC provider enabling breeding values to be entered onto SIL.

Further reading
2 McCorkindale B et al. 2014 Sheep industry trait valuations, Report prepared for Beef + Lamb Genetics 26pp