

Resilience to internal parasites

Part 1. Rationale

SIL Technical Note

Relates to: Selection to reduce the impact of internal parasites on sheep performance

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Summary

- Resilient sheep may carry worms in their gut, but their performance is not noticeably affected. These worms are a source of contamination for other sheep who may suffer reduced performance because they are not resilient.
- Resilience to worms is less heritable (c.15%) than resistance to worms (c.30%).
- Genetic assessment of resilience requires a specific protocol to be followed for worm challenge and data collection.
- Genetic improvement through selection offers one of the best long-term solutions to the increasing problem of drench resistance by worms.

Background

Control measures for internal parasites, or worms, have a very significant effect on farm profit and on farm management. Susceptibility to worms leads to loss of production and to the maintenance of a large population of worm larvae on pasture that can reinfect stock later. Increasing incidence of worm resistance to drench is looming as a critical limiting factor to productivity on many farms.

One strategy to reduce the impact of worms on animal performance is to select sheep that “tolerate” an infection with no noticeable drop in performance due to susceptibility or to mounting a resistance response, to the worms. Such sheep are “resilient”. The main criterion defining this is productive performance in the face of a challenge. Some of these sheep may carry large worm burdens and be a significant source of infection for other sheep.

An alternate strategy is to select for “resistance” whereby the host, the sheep, “fights” the worm infection. This has been shown to incur a cost to the sheep and can lead to a reduction in performance as the sheep diverts nutrients (energy & protein) to this task.

There is some controversy with regard to selecting for “resistance” or for “resilience”. However the two strategies share some common features. Those wanting to consider and compare the two strategies are directed to the documents under “Related information” below.

Definition of resilience

In practice, resilience in the face of a challenge from worms is measured as no noticeable drop in production. Parasite loads are not relevant, so some resilient animals may carry large worm burdens. The important thing is that they are performing as well as animals without parasites.

Responses to challenge can be dependent on the level of challenge. Animals that appear to be resilient at low levels of challenge may be susceptible or exhibit resistance at higher levels of challenge. We do not know enough about the ways animals cope with or fight worms.

However, we can use existing knowledge to enhance genetic merit for resilience through selection. Some of the genes selected for may be involved in both resistance and resilience.

Biology and genetics of resilience

As animals grow from birth to adulthood their ability to cope with disease typically increases as the immune system matures and is challenged. Since farmers market many animals before maturity, the impact of parasites on performance during early life is critical.

Prior to weaning, the impact of parasites on young lambs is reduced due to passive immunity the ewe passes through her milk and by the dominance of milk in the diet reducing the rate of infection from parasite larvae on pasture. Later, the lamb is challenged more and must rely on its own physiological processes to reduce the impact of worm infections.

Assessment of resilience should take place at times similar to those when worms impact on commercial animal production.

Resilience is heritable (c.15%) but at a lower level than resistance (c.30%). Higher figures can be obtained when consistent challenges are obtained from year to year. Since resilience is measured in terms of productivity, it is positively related to other important traits under selection. It has a weak association with dag score (more resilient = tend to have fewer dags).

Measuring resilience in practice

It is more complicated to assess resilience than resistance. Breeders should be aware of this when contemplating selection to increase resilience. Like selection for resistance, breeders wishing to select for resilience must be registered before genetic evaluations can be carried out by SIL. This is to ensure data collected meet minimum standards. SIL uses a protocol developed by AgResearch.

Measuring performance under challenge is the key to selection for resilience. The best time to do this is after weaning and the most practical criterion is liveweight gain. Resilient animals continue to grow well when other sheep show reductions in growth rate due to worms.

Animals are assessed for two critical measures. Firstly their gain from the beginning of the challenge period until the first sub-group require drenching because their growth rate has dropped below that of unaffected animals. Secondly, for the time after the start of the challenge before they need to be drenched. This time is longer for those animals that show signs of a drop in performance later.

A separate SIL document describes in detail the protocol for assessing the resilience of sheep. It is titled "[Resilience to internal parasites – Part 2. Protocol for measurement](#)".

Related information

"[Internal parasites – Selection to reduce drench requirements of sheep](#)" considers the different ways to reduce the impact of worms on sheep performance. "[Selection to increase resistance of sheep to internal parasites](#)" and "[Internal parasites – WormFEC protocol](#)" consider selection for resistance to worms. "[Dag Score](#)" describes how to reduce dags through selection. All documents mentioned are on the SIL website (www.sil.co.nz) under Technical Information.

Need more information?

- Contact your SIL bureau, local SIL adviser or call 0800-745-435 (0800-SIL-HELP) or email to silhelp@sheepimprovement.co.nz
- Queries related to collecting data, the genetic evaluation of resilience and registration for this service can be obtained from Neville Amyes at AgResearch (07-838-5421) or by email to neville.amyes@agresearch.co.nz