Selection for improved immunity to roundworm parasites in livestock - CARLA Saliva test

SIL Technical Note

Relates to: Selection for protective immunity to larval stages of roundworm parasites
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Summary

- The CARLA® Saliva test measures an antibody response to roundworm parasites in sheep and other livestock.
- The test provides a method to select livestock for natural resistance to parasite infections.
- Genetic selection for high CARLA® antibody can reduce the impact of roundworm parasites in a flock.

Background

For the last 40 plus years the use of broad-spectrum drenches has markedly reduced the effects of roundworm (nematode) parasites on animal production. However the widespread use of a limited number of drench families has led to the development of drench resistance in roundworms on many farms in New Zealand. Studies have shown that using an ineffective drench can result in a marked reduction in productivity in young stock.

Attempts to develop sustainable control strategies less reliant on the regular drenching have largely concentrated on breeding livestock for natural resistance. SIL has been using the WormFEC protocol for assessing faecal egg counts (FEC) as an option for breeders to identify and select sheep with host resistance to roundworm parasites.

Studies at AgResearch have identified a component of the immune response to parasites that prevents their establishment at the infective larval (L3) stage. This antibody response, measured using the CARLA® Saliva test, limits the ability of L3s to establish in the gastro-intestinal tract. Fewer larvae establishing means fewer adult worms and therefore reduced FEC and reduced pasture contamination. Fewer L3s establishing also means less energy is required to fight the adult worm population, so as a result animals with high levels of CARLA® antibody tend to be more productive.

L3 stages of all types of roundworm parasites infecting livestock in NZ have a protective surface coat of a material called CarLA. CarLA is extremely resistant to chemical degradation and is thought to be important to survival of the larvae in the environment and during their transit of the rumen in the host. However, it is progressively lost from the surface of the L3s, 3 to 5 days after being swallowed by their host, and is not present on the later stages of the life-cycle stage. Sheep exposed to worm larvae on pasture can produce a protective antibody response to CarLA in the gastro-intestinal tract. This antibody response prevents the establishment of L3s and results in their rapid rejection from the animal. CarLA antibody can be detected in saliva and high levels are associated with reduced FEC. Individual animals vary in their ability

to produce CarLA antibody, in respect to both the rapidity and intensity of the response.

Genetics of the CARLA® antibody response

The CARLA® antibody response is moderately heritable (30%) in young stock. Unlike FEC testing, generally sheep need to be sampled only once. The genetic correlation between CARLA® and FEC is quite high at around 0.5. However, using CARLA® as a selection tool for reduced FEC will be a little slower than the genetic gain made by using FEC directly.

Selecting for CARLA® antibody

SIL uses the CARLA® saliva sampling system developed by AgResearch & Ovita. Animals need to be exposed to a parasite challenge for the protective CARLA® antibody response to develop and is dependent on the size and/or duration of the challenge. The CARLA® antibody response is relatively slow to develop, with the highest levels occurring late in the growing season. This is consistent with parasite ecology, as lower numbers of L3 are generally present on pasture in spring. L3s are ingested by naïve stock, resulting in the multiplication of parasite numbers towards late summer and autumn.

It is recommended that saliva samples are collected from lambs when at least 25% of the animals to be tested are expressing 2 units/ml of CARLA® antibody in saliva. Monitor testing, where 20 randomly selected animals are saliva tested, is used to determine when a suitable level of flock reactivity is achieved.

Unlike FEC testing, drenching your animals with short acting anthelmintics will have little direct effect on the CARLA® antibody response. This is because, regardless of drenching, sheep are continuously ingesting varying levels of L3 as they graze pasture in NZ. To ensure good larval challenge and thus maximise CARLA® responses, grazing paddocks that have been previously grazed by young stock at least 3 weeks after a drench treatment, 5-7 days before testing is a useful practice.

Recording CARLA® data

The CARLA® testing unit measures CARLA® antibody levels in saliva and provides results of testing to the breeder and straight to their SIL bureau. SIL does require the following information to perform a genetic evaluation for the CARLA® response

Contemporary Group – animals grazing in separate groups since weaning or with different drenching histories could be exposed to different levels of larval challenge and should be identified as such (mob codes). This is to ensure that variation between mobs due to differences in management can be corrected for to avoid biasing estimates of genetic merit for the CARLA® response.

Sampling dates – if animals are saliva sampled on different dates these should be recorded.

Genetic evaluation

SIL bureaus can run genetic evaluations for CARLA® antibodies along with other traits as part of the service they offer their breeder clients.

SIL predicts the breeding value (BV) for CARLA® using the antibody levels measured in saliva samples. High levels of CARLA® antibody are best so best BVs are high positive ones.

Need more information?
Contact your SIL bureau, send an e-mail to silhelp@sheepimprovement.co.nz or telephone 0800-745-435 (0800-SIL-HELP). Alternatively you can contact the CARLA® Saliva Test unit directly, E-mail: carlasalivatest@agresearch.co.nz Phone: 0800 422752 (0800 4CARLA) Website: https://www.agresearch.co.nz/doing-business/products-and-services/carla-saliva-test/