

Facial Eczema Tolerance

SIL Technical Note

Relates to: Selection to increase tolerance to facial eczema

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Summary

Facial Eczema (FE) is a disease that can cause severe losses of production and death in sheep. It is possible to select for sheep that are more tolerant to the effects of the disease. This genetic improvement is possible without adverse effects on production and can have major, positive impacts on animal production and welfare.

Breeders wishing to select for FE tolerance must be registered users of the RamGuard™ service. Animals are challenged with the facial eczema toxin and their tolerance measured in terms of the level of an enzyme in a blood sample. SIL treats FE tolerance as a separate sub-index (Goal Trait Group) that can be integrated into standard SIL indexes.

An explanation of the FE star ratings can be found at the end of this document

Background

FE is a significant disease for sheep, mainly particularly in the northern North Island of New Zealand. A toxin, sporidesmin, is produced by a fungus that lives in the base of pasture. This toxin has a serious effect on animal metabolism and causes liver damage. It reduces productivity and in severe cases leads to death. There is no known treatment.

Severity of disease outbreaks vary both between and within years and this has been related to environmental conditions (temperature, humidity, condition of pasture). Most importantly, sheep vary in their response suggesting that there is genetic variation for tolerance. This has proven to be true in several pioneering selection programmes run by breeders and in experiments undertaken by scientists.

Genetics of FE tolerance

It's almost all good news. FE tolerance is strongly inherited (c.40%) and is genetically independent of important production traits. So selection to improve tolerance will not directly reduce the response to selection for productive traits.

However, it is one more trait to select for which makes it harder for a sheep to be good at everything. So there will be some sheep that are good all round sheep but with low FE tolerance and others with high FE tolerance but weak on one or more other traits. Fortunately there will also be sheep that are highly productive AND strongly FE tolerant. Successful, commercial breeding programmes have found these sheep.

Selecting for FE tolerance

Animals need to be challenged with FE toxin and a blood sample taken to measure how they have responded. Variations in the challenge sheep are exposed to can compromise an effective selection programme for tolerance.

SIL uses the RamGuard system developed by AgResearch. Tolerance is measured in terms of the level of an enzyme, gamma glutamyltransferase (GGT), produced by the liver. For an artificial challenge, sheep are dosed with sporidesmin at a level where about 50% of sheep show levels of GGT above 55 international units per litre of blood 21 days later. RamGuard provides feedback to allow breeders to achieve optimal challenge conditions. This target of near 50% will give the best discrimination between degrees of tolerance (or susceptibility) to FE. Alternatively, a natural challenge can be used and blood samples collected when a monitor group (sub-sample of animals) exhibits a high average level of GGT. Advice on what method is best for you can be obtained from SIL advisers or the RamGuard service. It is recommended that the youngest animals to be tested are at least 3 months of age.

Recording FE data

SIL uses the RamGuard testing regime and genetic evaluation system developed by AgResearch scientists at Ruakura working in collaboration with breeders actively selecting for FE tolerance. Tolerance is assessed on the basis of levels of an enzyme in a blood sample collected a certain time after a disease challenge. SIL requires the following information to perform a genetic evaluation for FE tolerance.

Contemporary group – animals grazing in separate groups since the start of the FE season and during the challenge period should be identified as such (mob codes).

Slaughter/ cull animals – if animals are culled due to severe FE symptoms, or sent for slaughter for other reasons, PRIOR to the 21 day blood sampling of the main mob(s), blood samples should be collected from them at the time of culling or before they are sent for slaughter. This is to avoid possible bias in the data collected. It is better to have some data than no data on these sheep.

Genetic evaluation

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

SIL predicts the breeding value (BV) for FE Tolerance using information collected for GGT 21 days after challenge. Low levels of GGT are best so better BV values are more negative.

SIL uses the performance of relatives in genetic evaluations. So genetic merit for FE tolerance can be predicted for sheep that have not been tested themselves AND an animal's BV is influenced by the performance of it's relatives.

Reporting on FE tolerance

SIL recommends the use of the Facial Eczema sub-index, rather than BVs, on reports. The index is simply the GGT21 BV multiplied by its economic weight. It has the advantage of showing how much impact Facial Eczema has on the overall index of economic merit. The units for these indexes are the same – cents per ewe lambing – and in all cases, larger, positive values are better. This recommendation is made to help make reports easier to understand for ram buyers.

The economic weight that SIL uses for Facial Eczema is based on the effects Facial Eczema has on the survival and performance of breeding ewes and young ewe replacements over a 10 year cycle containing 2 severe and 3 moderate outbreaks.

The facial eczema sub-index is included in the DPO index as DPX. It is not included in the DPP index (Dual Purpose Production index) as this index does not include disease traits. There is no Facial Eczema sub-index for terminal sire sheep as their lambs are normally away before facing a natural facial eczema challenge. However, Facial Eczema breeding values can be produced for use by Terminal Sire ram breeders and included on reports.

FE Star ratings are explained further on the following pages.

FE Star Ratings

Rating individual animals for Facial Eczema Tolerance

SIL Technical Note

Relates to: Evaluating individuals for Facial Eczema Tolerance

Written by: Sally Lee and Neville Amyes

Date: 28 September 2009

Summary

- Flocks on SIL that are registered for the Ramguard service are given a Flock Status Rating depending on dose rates used in the flock.
- Individual animals can get a FE Star Rating for FE tolerance based on the dose rate they or their progeny were challenged with. Together with the GGT21 BV or the FE Tolerance sub-index (DPX) this is the best way to genetically rate animals from different backgrounds for FE Tolerance.
- Ramguard is the programme which co-ordinates the dose rates given to animals and provides a certificate to breeders each year verifying their part in the programme. Buyers are encouraged to ask for this information.

Background

Due to demand from both breeders and buyers, SIL has developed tools to better identify flocks and individual animals with FE tolerance. This document outlines these tools.

SIL characterizes genetic merit within flock with a breeding value, GGT21, or a sub-index (DPX) based on this. Comparison of animals from different flocks has previously been problematic. Test results are measured as levels of GGT 21 days after an animal is challenged with but the SIL genetic evaluation does not take account of the dose level of this challenge.

The new tools described here, together with the GGT21 BV or DPX index, allow more robust comparisons of animals from different flocks or backgrounds.

RamGuard Flock Status Rating

Each flock on RamGuard is assigned a Flock Status Rating based on the dose rate they currently test at. Dose rate is affected by number of years a flock has been testing and the extent to which sheep tested each year react. Flock Status Ratings are shown in Table 1. They were derived in consultation with Ramguard and breeders using the service. A list of flocks with Flock Status ratings can be found at www.sil.co.nz under "Buying rams".

NB: Flock Status Rating is related to, but not the same as, the FE Star ratings described below.

Individual animal FE Star ratings

SIL has two attributes to help report on genetic merit for FE Tolerance for individual animals – ratings for themselves (FE Star) or their progeny (FE Star progeny).

The FE Star rating is based on individual trait data for 'DOSE', the challenge the animal was given (see Table 1). If an animal was not artificially challenged, but a GGT21 value exists, it is called a field challenge (FC). Only animals with a GGT21 value get a FE Star rating.

If an individual reacts to a dose rate, this is shown as ‘-’ instead of ‘*’ after the dose level e.g. ‘4-’.

A reactor has a GGT21 value 1.5 times greater than GGTB (GGT before dosing). A field challenge reactor result is defined as a GGT21 value greater than 100.

FE Star Progeny can be used on a Sire Summary to show reactor status of a sire’s progeny. The sire itself may not have been tested. For FE Star Progeny, ‘-’ means more than half his progeny reacted to that level of challenge. No result for FE Star Progeny will be shown if no progeny have GGT21 data. Progeny in different years or flocks may have different dose rates. SIL shows all variations e.g. 2*3*4- (see Table 2).

Genetic merit for FE Tolerance

SIL predicts breeding value (BV) for FE Tolerance using information collected for GGT in the blood before challenge and 21 days after challenge. Low levels of GGT21 are best so better BV values are more negative.

SIL uses the performance of relatives in genetic evaluations. So genetic merit for FE tolerance can be predicted for sheep not tested themselves AND an animal’s GGT21 BV is influenced by challenge data from its relatives. SIL has a Facial Eczema sub-index, DPX. This is simply the GGT21 BV multiplied by its economic weighting. It shows the impact Facial Eczema Tolerance has on overall economic merit. Units for the index are “cents per ewe lambing” with larger, positive values better.

The facial eczema sub-index is included in the DPO index as DPX. It is not included in the DPP index (Dual Purpose Production index) which does not include health traits.

Table 1. Links for Flock Status Rating and individual animal Star Rating with Ramguard challenge dose rates.

Ramguard Dose rate mg/kg LW	FLOCK	INDIVIDUAL ANIMAL	
	Status Rating	Star rating	Reactor Status
<0.20	*	1*	1-
0.20-0.29	**	2*	2-
0.30-0.49	***	3*	3-
0.50-0.60	****	4*	4-
>0.60	*****	5*	5-
Field or natural challenge	N/A	FC	fc-

Table 2. FE Star Progeny result examples

3*4*	less than half of progeny reacted at dose levels 3 & 4
2-3-	more than half of progeny reacted at the dose levels 2 & 3
4-FC	more than half of progeny reacted at dose level 4 but less than half reacted with a Field Challenge
2*3*4-	less than half of progeny reacted at dose levels 2 & 3 but more than half reacted at dose level 4

SIL recommendations

- Rate flocks for general FE Tolerance using the Flock Status Rating. Lists of flocks rated for this are available on the SIL website (www.sil.co.nz) under “Buying Rams”
- Individual animals be rated using FE Star or FE Star Progeny ratings together with either the FE Tolerance sub-index, DPX or GGT21 BV.
- Number of progeny with GGT21 data (nGGT21) be used with FE Star Progeny, BV and index figures to assess how much information is behind these figures

Flock Status Rating for Facial Eczema Tolerance

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Ramguard Status Rating

Flocks are assigned a Ramguard flock status rating based on the dose rate they test at. The dose rate is affected by the number of years the flock has been testing and the degree to which the sheep tested each year react. Ramguard scientists determine the dose rates that flocks use each year and produce status ratings for flocks based on the table below.

The dose rate a flock is tested at is not used in the SIL genetic evaluation of Facial Eczema tolerance. So GGT21 breeding values may be similar for sheep tested different dose rates. Using the flock status rating along with the estimates of genetic merit for individual animals (GGT21BV or DPX index) provides the means to rate animals for FE tolerance.

When animals have similar values for GGT21BV or DPX, those from a flock with a higher status rating are likely to be more tolerant to FE.

Dose rate and resultant flock status rating table:

Dose rate mg/kg LW	Flock Status Rating
<0.20	*
0.20-0.29	**
0.30-0.49	***
0.50-0.59	****
>.60	*****

This Ramguard rating for each flock will be updated annually.

Finding rams that are FE tolerant

If you want to purchase rams to kick-start FE tolerance in your ewe flock, you need to purchase from ram sellers who are actively selecting to improve FE tolerance using the Ramguard system. You can then do one or both of two things.

- Target flocks that are highly rated for FE tolerance (more stars = more tolerant) and which are also genetically rating their rams for the other traits that are important to you. Remember that while a high status rating is good for FE, it is only part of the genetic package you are purchasing.
- Once you have selected a flock, make sure the rams you buy are highly rated for FE tolerance (higher DPX index or lower GGT21 BV) along with good merit in other traits of importance to you.

Need more information?

If you have any queries about the ideas and terms in this document, please send them by email to silhelp@sil.co.nz

Alternatively you can contact the Ramguard Service directly,
C/o **Neville Amyes**, AgResearch Ruakura, phone 07-838-5421 or 029-838-5259.