

Breeding for Footrot Tolerance cont.

In breeding for increased tolerance to footrot the following must also be remembered:

- 1) It doesn't matter how good a sheep's genetics are regarding tolerance to footrot, if it is not in good condition, then it is less able to fight infection. Poorly fed sheep are more susceptible to diseases, and this would include footrot.
- 2) This gene test is based upon the analysis of populations of sheep and the footrot scores reflect variation from the average in a population. In any given population there are always individuals who do not reflect that population as a whole (called outliers). These sheep may get footrot despite having a good footrot score. There is no absolute guarantee of the extent of the flock response to the recommendations made based on this gene marker test, other than that "on average", sheep with '1' or '2' scores are considered less likely to get footrot than sheep with '4' and '5' scores.

Getting Your Sheep Tested

If breeders and farmers contact the testing laboratory at the numbers below then we will send out special cards for collecting small blood samples, along with instructions on how to easily and safely collect blood from sheep. Only when these cards are returned to us will typing be undertaken.

Testing Cost

A separate schedule of prices is available on request. Discounts apply for multiple tests carried out in a calendar year (Jan 1 – Dec 31) and for testing done in concert with other gene tests provided by the Lincoln University Gene-Marker Laboratory.

Disclaimer

Lincoln University and the Lincoln University Gene-Marker Laboratory cannot be held responsible for the outcome of any decisions made by breeders in the breeding of sheep using this DNA-typing technology. The genetic information supplied to breeders may only be used by them on the assumption that they assume responsibility for any loss, damage or consequence resulting directly or indirectly from the use of that information. The liability of Lincoln University and the Lincoln University Gene-Marker Laboratory is limited to the re-testing of individual sheep where an error has been made at some stage of the DNA testing process.



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Footrot Gene-Marker Test

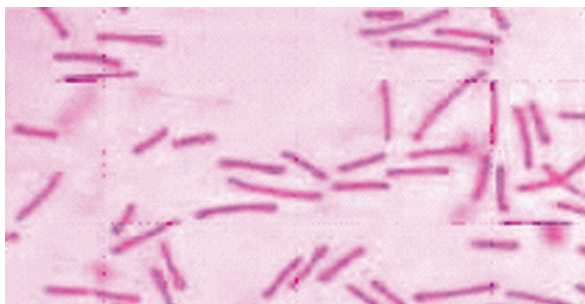


Want to find out more?

www.lincoln.ac.nz/gene-marker-lab
0508 FOOTROT (0508 366 8768 - within NZ)

New Zealand's specialist
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The Lincoln University Footrot Gene-Marker Test

Footrot is a contagious and debilitating hoof disease of sheep (but will infect any cloven hoof animal). It is caused by the bacterium *Dichelobacter nodosus*. Footrot impacts on sheep production both through the need for expenditure on control measures (e.g. foot-bathing, vaccination and antibiotics), and through losses attributable to such things as decreased weight gain, reduced wool quality, reduced lambing percentages and in severe cases death.

The ability of sheep to tolerate a footrot challenge is partly a heritable trait and a number of sheep breeders around the world have deliberately bred sheep to be more tolerant to the disease. This way of breeding has been proven to be successful, but is slow and sheep must be subject to a footrot challenge to be able to ascertain their level of tolerance. The breeding approach has therefore not been used extensively in the sheep industry.

In the last two decades research has linked a group of genes called the Major Histocompatibility Complex (MHC) to the ability of sheep to tolerate footrot. These genes regulate specific immune responses and therefore are believed to control the immune response to *Dichelobacter nodosus*. Sheep with certain forms of the MHC genes (different alleles) have been shown to both have varying degrees of tolerance to footrot under challenge and also produce more or less antibody when vaccinated with the bacterium.

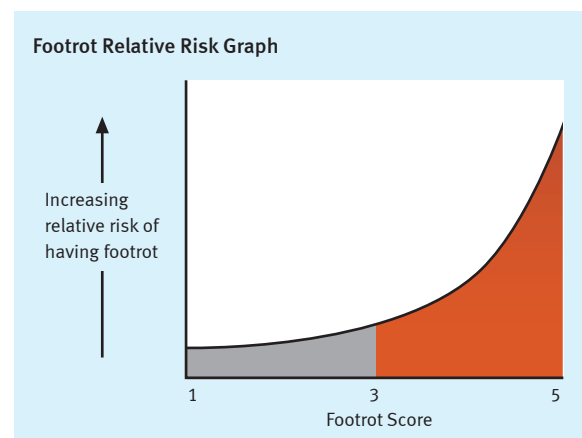
Research over the last 15 years at Lincoln University has revealed that one particular MHC gene called *DQA2* is associated with sheep having a greater or lesser likelihood of getting footrot. This research has become the basis of a gene-marker test that enables sheep breeders to identify sheep that are considered less likely to get footrot.

The Test

Blood samples collected from sheep can be “typed” to reveal which alleles of the *DQA2* gene the sheep has. Sheep have two alleles, reflecting that they inherit one allele from each parent and thus can pass each allele on to their progeny in approximately a 50:50 ratio. The “flow” of alleles can thus be followed through extended pedigrees of sheep.

Rather than reveal the exact alleles sheep possess, the alleles have been codified into a ‘1’ (least likely to get footrot) to ‘5’ (most likely to get footrot) scale. The individual alleles are placed on this scale based on the “relative risk” of getting footrot. In our research, sheep with a ‘1’ or ‘2’ score are considered less likely to get footrot than average and sheep with a ‘4’ or ‘5’ score are considered more likely to get footrot than average. Sheep with a ‘3’ score are average (i.e. considered more likely to get footrot than those with a ‘1’ or ‘2’ and less likely to get footrot than those with a ‘4’ or a ‘5’ score).

The graph below shows how the footrot ratings correspond to the relative risk scale, with sheep scoring less than ‘3’ being considered fractionally less likely to get footrot, while those greater than ‘3’ are a number of times more likely to get footrot.



The test allows you to identify rams of a particular relative risk before you purchase them. This means that even if the sheep has never been challenged with footrot, you can predict its likelihood of contracting the disease should it be subsequently exposed.

Breeding for Footrot Tolerance

The footrot gene marker test results can be used to breed sheep that are considered less likely to get footrot. It should be noted that the effectiveness of the test in defining the percentage of footrot in progeny from a single sire will vary depending on numerous factors including the severity of the challenge and the genetics of the ewes that any given tested ram is mated to.

In breeding, the test will improve both the accuracy of selecting sheep that are considered less likely to get footrot and speed up the rate of genetic gain, as sheep can be DNA typed at birth and therefore preferentially selected at an earlier age.

A number of breeding strategies can be employed, but we recommend:

- That current footrot infections, especially those that are virulent, are treated immediately by recognised methods and with veterinary assistance if necessary. This will limit the impact of the disease on both animal welfare and animal production. Those sheep that have severe footrot should be identified clearly for isolation and/or treatment.
- That the test is used conservatively in the context of the “golden rule” of genetics, whereby selection for multiple traits limits genetic gain for any given trait. In this context, we recommend that breeders focus on removing sheep with ‘4’ or ‘5’ scores from breeding programmes. We DO NOT recommend breeders focus solely on breeding for sheep with ‘1’ scores as there is little difference between a ‘1’ or ‘2’ score and therefore little advantage in going to this extreme when trying to increase footrot tolerance. Additionally, breeders should always be very cautious about overly narrowing their genetic base, as this will reduce diversity and may reduce their ability to make genetic gain in other traits.
- That the test is used predominantly on sires and rams as these have greater genetic influence on flocks than ewes.
- That sheep that have footrot are removed from breeding programmes at the first practical opportunity regardless of their footrot rating. There are some animals that may have good footrot scores but still get footrot because of other inherent faults (e.g. poor hoof conformation). We recommend that these sheep are removed from breeding programmes at the first opportunity. Breeders should use discretion when selecting replacement ewes and ideally not select those ewes that have had footrot.