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HOW FAST AND WHAT AR

How fast can genetic improvement build high levels of resistance to breech flystrike while still making productivity gains?

What are the consequences for overall productivity of Merino sheep when breeding for increased resistance?

These are questions addressed in a recent AWI-funded project 'Rate of genetic gain in reducing breech flystrike' carried out by Associate Professor Dr Forbes Brien of the University of Adelaide and Dr Sam Walkom of the Animal Genetics and Breeding Unit at Armidale.

Motivation for the project comes from a general acceptance in the Australian wool industry that many woolgrowers have the choice to embark on breeding more resistant sheep as a critical component of programs to control breech and tail strike in non-mulesed flocks as well as reducing the risk of strike in mulesed sheep or sheep with a smaller mules.

Using all the information generated from AWI's flystrike prevention program since 2005 (representing a WA medium wool Merino type in a Mediterranean environment and a superfine wool type in a NSW summer rainfall environment), the researchers predicted the genetic gains that could be made in reducing the risk of breech strike while also improving overall productivity. Note, the gains predicted are for breech flystrike rather than gains in the indicator traits of wrinkle, cover and dags.

"When designing the study, following consultation with AWI we decided to predict genetic gains for these two different environments, at Mt Barker in WA and Armidale in NSW due to the actual data gathered on these flock over the 10 years. Dags are a lot more prevalent in the Mediterranean environment, but at Armidale the fly risk season lasts longer," stated Dr Brien. Both these factors influence the rate of genetic gain that can be made for increasing resistance to breech flystrike.

In the prediction study, after removal of 35% of the sheep based on visual assessments, the remaining animals were selected on modified MERINOSELECT indexes (especially created for the prediction study) that included breech flystrike incidence (FSI), with the amount of emphasis on the FSI trait varying from zero to very high. Three different sheep types were modelled:

1. For fine and superfine Merinos, selection was based on a modified Fibre Production plus (FP+) index option, which targets significant reductions in fibre diameter and modest gains in fleece weight and staple strength as well as reducing flystrike incidence.
2. For fine to medium Merinos, selection was based on a modified Merino Production plus index option (MP+) which targets significant gains in fleece weight, modest reductions in fibre diameter and modest gains in reproductive rate, as well as reducing in flystrike incidence.
3. For dual purpose Merinos, selection was based on a modified Dual Purpose Plus index option, which targets significant gains in reproductive rate, modest gains in fleece weight whilst maintaining the level of fibre diameter as well as reducing flystrike incidence.

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The scenarios have limitations as they are modelled from data (but the best we have) from a superfine wool summer rainfall and a medium wool Mediterranean rainfall production system.

"We assumed all sheep had pedigree information available and were recorded for breech traits (wrinkle, breech cover and dag), the key productivity traits and were visually recorded for constitution and conformation traits," Dr Brien said. For a ram breeding flock that has recorded none of this information, it could add 2-6 years to the timelines predicted in the scenarios below.

In any particular breeding program, the length of time it takes to reduce breech flystrike incidence to low enough levels to make mulesing unnecessary will depend on the starting sheep type, including the initial level of wrinkle, breech cover and dag, the environment (amount of dags, length and intensity of the strike risk period) and the amount of emphasis given to the trait relative to others being selected for. Where the initial breech traits are high, the expression of dags is high and the sheep type has less variability in the breech traits, then the time taken will again be longer.

The calculations also work with average rates of strike and not the impact of high strike seasons.

Where a ram breeders' long-term average breech flystrike expectation is less than one per 100 ewes, the time to move to a non-mules enterprise, (without increased use of chemicals and risk of strike), will again take longer than quoted in the prediction scenarios below.

It is important to note that the study only took account of selection within a particular flock. The use of outside sires in particular may help breeders achieve results more quickly than suggested below, and needs to be considered on a case-by-case basis.

Breeders wishing to utilise (breech and/or welfare) modified MERINOSELECT indexes to assist in breeding for reduced flystrike incidence should make inquiries to Sheep Genetics, as they are not currently available as standard options.

Genetic gains in commercial flocks follow the gains made in the studs that supply them with rams, but the average genetic merit 'lags' behind, typically it adds an additional 7-9 years to the time. **An article for the gains in commercial flocks will appear in the next edition of *Beyond the Bale*.**

PREDICTION STUDY RESULTS

SCENARIO 1

A superfine ram breeder in a summer rainfall environment decides to include breeding for reduced breech flystrike incidence in the stud flock, with the aim of moving in the future to a non-mules enterprise without increased reliance on chemical protection or crutching. Flystrike incidence is routinely suppressed in the flock by crutching, mulesing and strategic chemical treatment.

At the start of the breeding program if the sheep were unmulesed and crutched but not given routine preventative treatment, we would expect the long term average flystrike incidence to be around 10% or 10 strikes per 100 ewes per year, similar to those recorded by CSIRO in the breech strike experimental sheep at Chiswick, near Armidale in NSW. It is assumed that the flock starts off with typical risk levels for flystrike, with average wrinkle, dag and breech cover scores for the superfine sheep type for the area.

The ram breeder has been using a Fibre Production Plus index to aid in sheep selection, but now wishes to put considerable

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selection emphasis on reducing breech flystrike incidence with a modified index, by adding breech wrinkle, breech cover and dag score records to assess animals for the breeding program.

Our results suggest that the breeder could reduce breech flystrike incidence to low levels (less than one strike per 100 ewes per year in unmulesed sheep) after 13-14 years of selection, enough to consider ceasing mulesing. This genetic improvement could also slightly reduce the need and use of flystrike prevention chemicals. Use of strategic chemical treatments may still be required. Although fleece weight is still being genetically improved in the breeding program, the rate of increasing fleece weight is reduced by about one-quarter (27%). There is however no sacrifice in genetic gains for fibre diameter and reproductive rate.

SCENARIO 2

A medium wool ram breeder in a winter rainfall high dag area in Western Australia's south-west decides to breed medium wool Merinos as fast as possible to reduce breech flystrike incidence, using a modified Merino Production Plus index.

The average breech flystrike incidence in unmulesed but crutched sheep (with no preventative chemical treatment) in the local area has been recorded as six strikes per 100 ewes per year at Mt Barker. The breeder's flock starts off with typical levels of risk for flystrike, with average wrinkle, dag and breech cover scores for medium wool sheep in the area, noting that wrinkle scores are a little lower but dags are higher than for the superfine sheep in Scenario 1.

Our results suggest that after 11-12 years of selection, the stud flock can reduce incidence to below one strike per 100 ewes per year in the average year (in unmulesed sheep), without affecting genetic gains in reducing fibre diameter and improving reproductive rate, although there would be a reduction in genetic gains for fleece weight (gains down by 30%). Again, this would put the breeder's flock in a strong position to consider ceasing mulesing.

SCENARIO 3

A fine wool ram breeder in a high rainfall part of Victoria's Western District, with high levels of dag with a high potential incidence of breech flystrike (10 strikes per 100 ewes per year in unmulesed sheep) decides to breed sheep that have a much lower flystrike risk, again with the aim of moving in time to a non-mules enterprise without increased reliance on chemical protection or crutching.

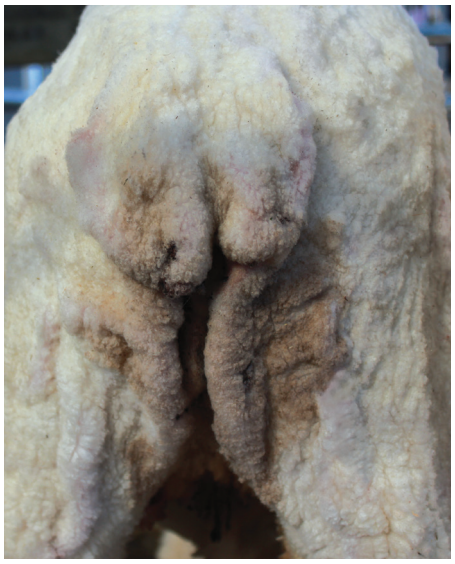
The breeder uses a modified Merino Production Plus index. Unlike in summer rainfall areas, the main flystrike risk period, although challenging, is shorter and concentrated in the mid to late spring period, prior to shearing. In this case, the genetic gains in reducing flystrike incidence are slower than can be achieved in summer rainfall areas due to the lower heritability of flystrike. Again, the breeder's stud flock starts off with average wrinkle, dag and breech cover scores for the area and the sheep type.

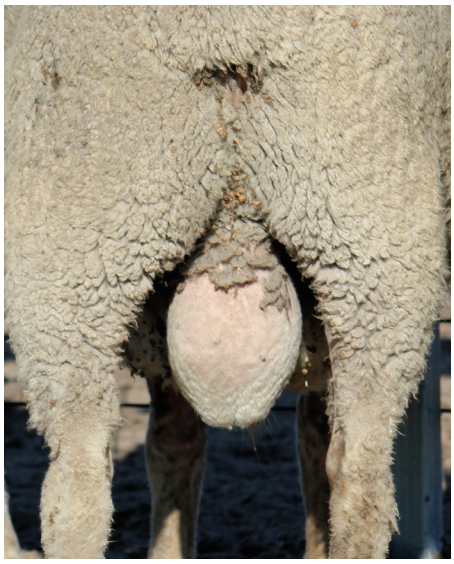
Our results suggest that it will take 19-20 years of selection (considerably longer), in the stud flock to reduce incidence to below one strike per 100 ewes per year in the average year (in unmulesed sheep). Genetic gains in fleece weight, although still positive, are 30% less than what they would be if no selection emphasis was being given to reducing flystrike incidence. As in Scenario 1 and 2, genetic gains in reducing fibre diameter and improving reproductive rate are unaffected.

FAST FACTS

- Recently completed work has predicted how long it takes to breed Merino sheep for low breech flystrike risk to a point where mulesing could be ceased without increased use of chemicals or risk of strike. The predictive study was based on flystrike research on Merinos run in Mediterranean and summer rainfall areas.
- In ram breeding flocks of average flystrike risk, with efficient well recorded programs aided by modified MERINOSELECT indexes, it may take between 11 to 20 years to reduce the incidence of flystrike to less than one strike per 100 ewes per year. This is low enough to cease mulesing without increased reliance on chemical protection or crutching.
- Although selection for reduced flystrike incidence can reduce genetic gains for fleece weight by up to 30% in the scenarios modelled, the gains remain positive. Genetic gains in reducing fibre diameter and reproductive rate are unaffected.
- The time taken to reduce breech flystrike incidence to low enough levels to make mulesing unnecessary will depend on the starting sheep type, including the initial level of wrinkle, breech cover and dag, the environment (amount of dags, length and intensity of the strike risk period) and the amount of emphasis given to the trait relative to others being selected for.

MORE INFORMATION
View the full project report at
www.wool.com/flystrikelatest





Breech wrinkle, urine stain, breech cover and **dags** are the key indicator traits that lead to **increased risk of flystrike.**