

Breech Strike Genetics

This Project is a collaborative research effort of CSIRO Livestock Industries, Armidale, NSW and Department of Agriculture and Food WA supported by AWI

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Welcome back

The original Breeding for breech strike resistance project that was run at Armidale and Mt Barker finished in June 2010. I am please to report that AWI is supporting continuation of the flystrike resistance genetic resource flocks and a further two-year project to investigate some of the issues that arose during the life of the original project. There will be more on that in a later issue.

Since last June, there has been ongoing activity to collect fleece, wrinkle and breech trait records on the 2009 drop yearlings and the breeding flock and that has been incorporated into Sheep Genetics. Flystrike records have continued to be collected and a selection procedure for an ongoing breech flystrike genetic resource flock was undertaken.

In this newsletter we summarise the main results arising from the Armidale flock over the period 2005–2010.

Jen Smith
Leader, Breeding For Breech Strike Resistance Project,
CSIRO Armidale

The 'Best' versus the 'Rest'

Much of the activity in this Project centred around assessed scores on a 1-5 scale of a range of breech traits. It has become clear that score 2 is a 'threshold' as breech strike rates rise markedly when the breech wrinkle, breech cover and dag scores are greater than 2. While there was clear progress and differences between the 3 selection lines, we also focussed on the differences between animals classified as the 'Best' (breech wrinkle and dag scores 2 or less) and the 'Rest' (breech wrinkle and/or dag greater than 2). Breech cover was not included in this definition in the Armidale flock as there were too few animals with breech cover ≤ 2 , but breech cover was used in the classification of the Best and Rest in the WA flock. Results reported on pg 4 and 5 demonstrate differences between these groups.



(Above) The US National Retail Federation's (NRF) Erik Autor was updated on research into flystrike resistance by CSIRO's Jen Smith when he visited Australia in April 2010

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An extract from the

Executive Summary of the Final Report

Design

- This Project aimed to evaluate the effectiveness of breeding for breech flystrike resistance using indirect selection criteria (including breech and crutch cover, body and breech wrinkle, dags, urine stain and wool traits) as an alternative to the practice of mulesing.
- A sheep breeding experiment comprising 3 selection lines, was replicated at two sites and ran over a 5 year period from 2005-2010 (approx. 2 generations);
 - Armidale NSW, summer rainfall (reported here)
 - Mt Barker WA, winter rainfall (DAFWA Newsletter No 4).
- Half of the animals within each selection line were mulesed and the other half remained unmulesed and the sheep were managed under flystrike challenge conditions (no preventative chemical application).

Key results and conclusions

- Consistent differences between Selected and Control lines were achieved in indicator traits and more importantly, breech strike itself.
- Mulesing at lamb marking reduced yearling breech wrinkle by approximately 0.8 of a score. Selection on breech traits achieved approximately 65% of the change in yearling breech wrinkle achieved by mulesing (0.5 of a score).
- Mulesing reduced yearling breech cover by approximately 0.4 of a score and selection on breech traits resulted in a similar change (0.4 of a score).
- Mulesing reduced post-weaning dag score by approximately 0.2 of a score. Selection on breech traits resulted in approximately double that effect on dags (0.4 of a score).
- Proportional changes observed in breech cover and dag with selection were similar to, and better respectively than the effect achieved by mulesing. However, the absolute change as a result of selection was higher for breech wrinkle than breech cover and dag.
- Unmulesed Selected animals exhibited breech strike rates higher than mulesed Controls. However, the differences were often not significant and were dependent upon year (severity of challenge) and the class of sheep.
- Allowing the short time-frame (in sheep breeding terms), the results suggest that selective breeding for breech strike resistance is a viable means of breech flystrike control in Merino sheep in Armidale region.
- In the Armidale temperate, high summer rainfall environment, breech wrinkle was the trait identified as being most useful as an indirect selection

criterion. Breech wrinkle was variable, heritable and correlated with breech strike - key requirements for a high rate of response to selection.

- Dag was correlated with breech strike, but had low scores, variability and heritability, making that trait less effective and less important when wrinkle is still high as a potential selection criterion.
- Use of the other indicator traits in this study, including breech and crutch cover, as additional selection criteria did not provide any further advantage over and above wrinkle and dag.

Outputs

- Genetic parameters arising from this Project have been used in the development of **Sheep Genetics ASBVs for wrinkle, dag and breech cover**—tools that ram breeders and ram buyers can use to accelerate genetic gain in flystrike resistance.

<http://www.sheepgenetics.org.au/MERINOSELECT/>

- **Best practice guidelines** have been developed for incorporation of breech strike resistance into sheep breeding programs and that information was, and continues to be, disseminated to industry via Project newsletters, field days and seminars; the State Sheep and Wool Networks, and through the media (print, radio and television).
- **Correlations** have been established between the breech indicators traits and a whole range of other traits such as fleece weight, fertility, staple strength, fibre diameter etc.
- Data collected and knowledge gained in this Project has been used in the development of **Flyboss** modelling tools.

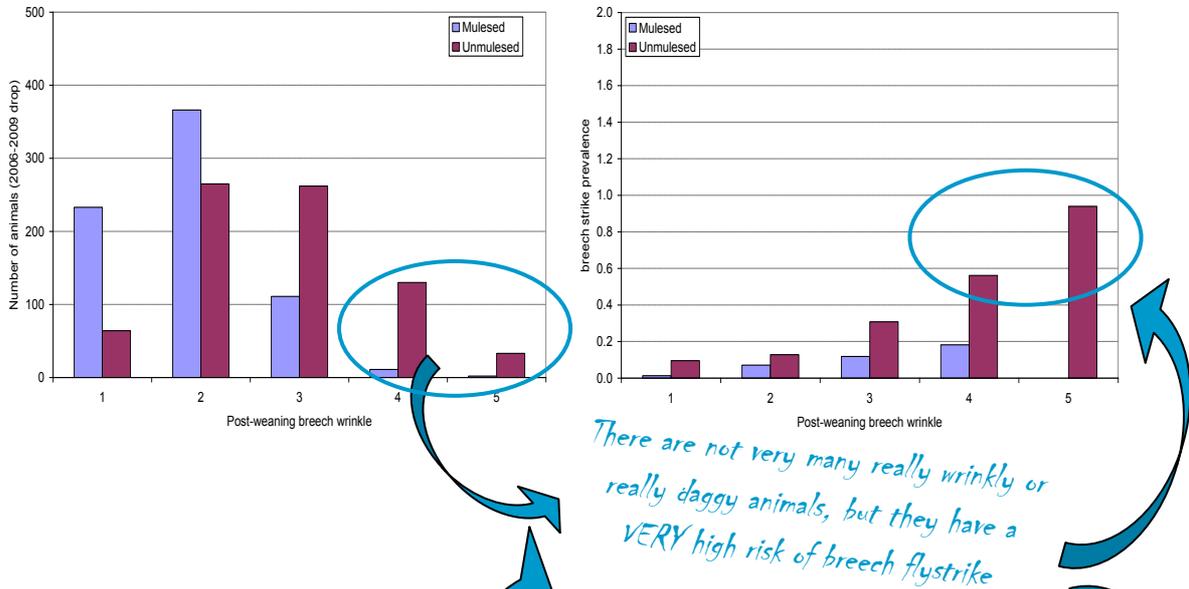
<http://www.flyboss.org.au/>

Where to next

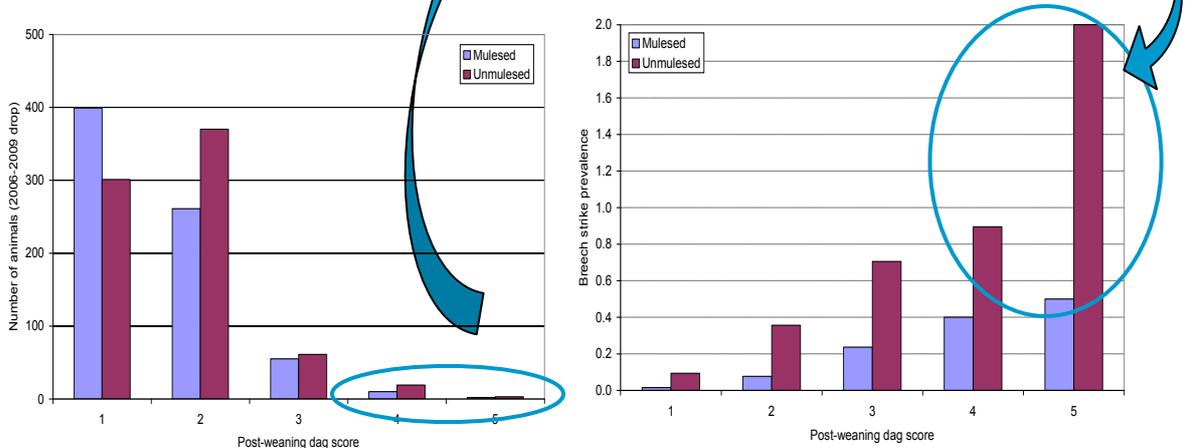
- There are indications that there are other characteristics of the sheep which influence resistance or susceptibility to breech strike that should be investigated in more detailed phenotyping studies using the Resource flocks developed in this Project.
- This Project provides sufficient evidence that selective breeding for breech flystrike resistance is a practical reality.
- Both stud breeders and commercial wool growers should be encouraged to implement practices around measuring and selecting on indicator traits to improve breech strike resistance as a means of reducing the risk of breech flystrike in sheep.

Key results—indicator traits

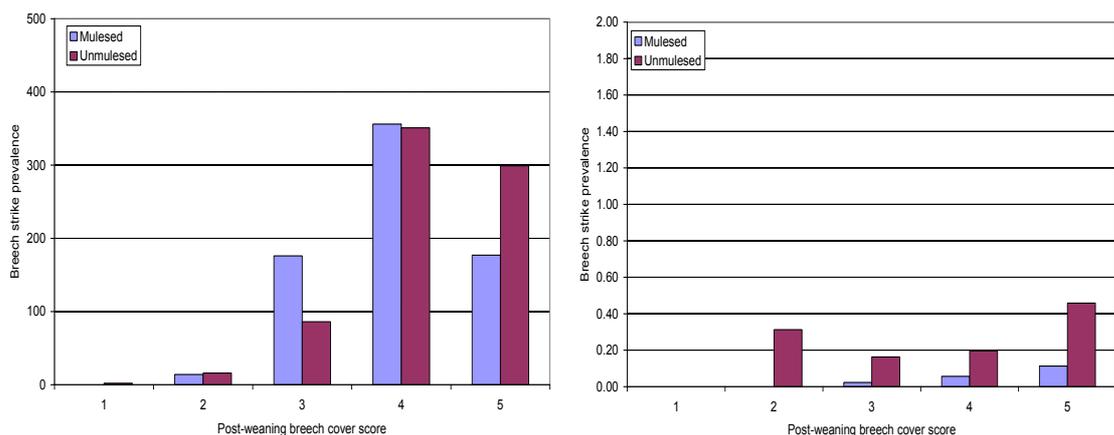
Frequency distribution of **breech wrinkle** in the Armidale research flock (left); breech flystrike rate at different **breech wrinkle** scores (right)



Frequency distribution of **dag** in the Armidale research flock (left); breech flystrike rate at different **dag** scores (right)

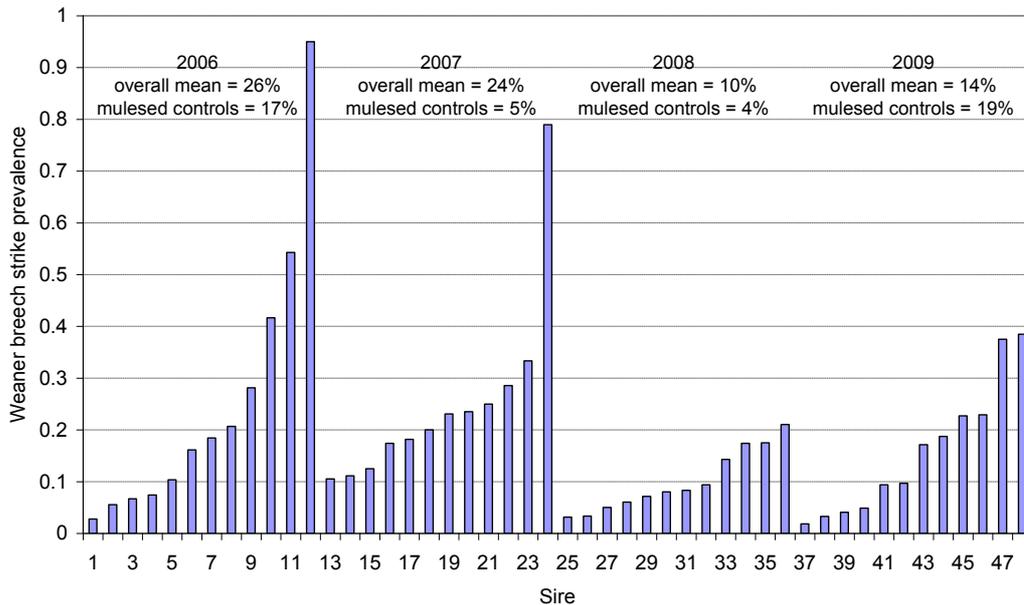


Frequency distribution of **breech cover** in the Armidale research flock (left); breech flystrike rate at different **breech cover** scores (right)



Sire progeny group differences

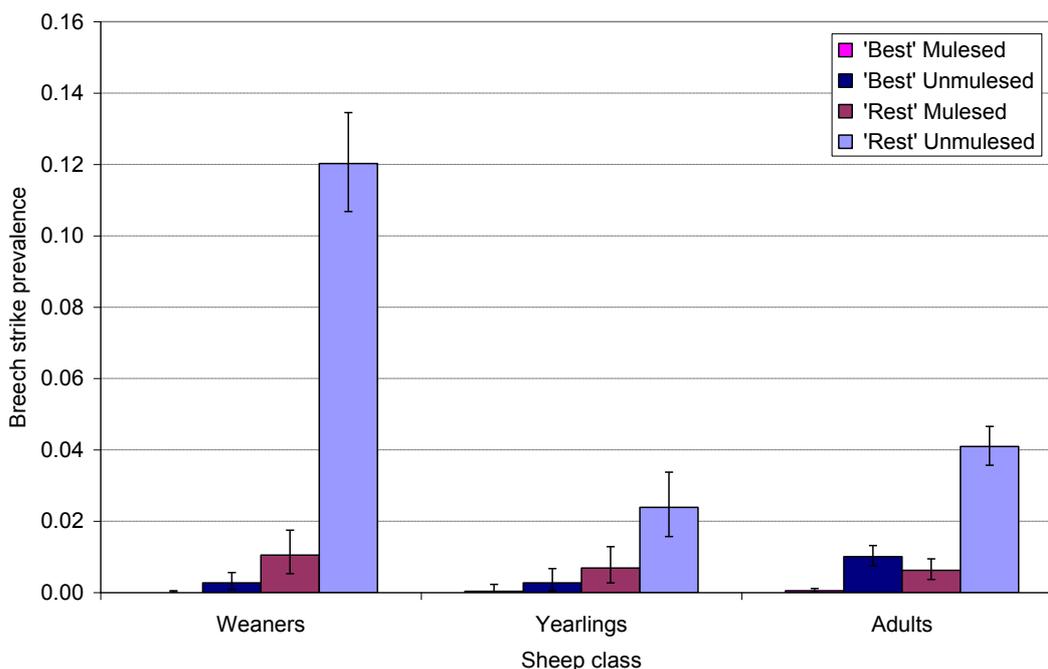
The figure below demonstrates variation in breech strike rates among sire progeny groups. There is variation across years associated with prevailing environmental conditions, but there is also wide variation between sires within years. This suggests good potential for change in breech strike rates using selection of the right sires.



Weaner breech strike prevalence by year and sire progeny group at Armidale (average progeny group size = 32, range 14-61).

Breech strike rates among the Best and the Rest

The figure below shows breech strike rates in mulesed and unmulesed weaners, yearlings and adults classified as Best (resistant) or Rest (susceptible). The trend is consistent across age classes and shows that unmulesed animals with low wrinkle and dag experience breech flystrike rates similar to mulesed animals with high wrinkle and/or dag.



Breech strike prevalence in weaners (2006–2009 drop), yearlings (2006-2008 drop) and adults (2006-2007 drop) classified as Best (post-weaning breech wrinkle and dag ≤ 2) and Rest (post-weaning breech wrinkle and/or dag ≥ 3)

Production comparison of the Best and the Rest

As mentioned on the front page, toward the end of the Project we classified animals as the Best and the Rest based on breech wrinkle and dag thresholds. The Best were ≤ 2 score for both breech wrinkle and dag, and the Rest were those with either or both breech wrinkle and dag ≥ 3 . The figures to the right show the differences between UNMULESED animals in the Best and Rest groups for several traits—yearling bodyweight, fleece weight, fibre diameter, fibre curvature and lambs weaned.

There were different sheep/wool types represented in this flock and they were not equally represented in the selection lines. However, the statistical analysis conducted accommodates those effects and the results shown here are differences between the Best and the Rest over and above any sheep/wool type differences.

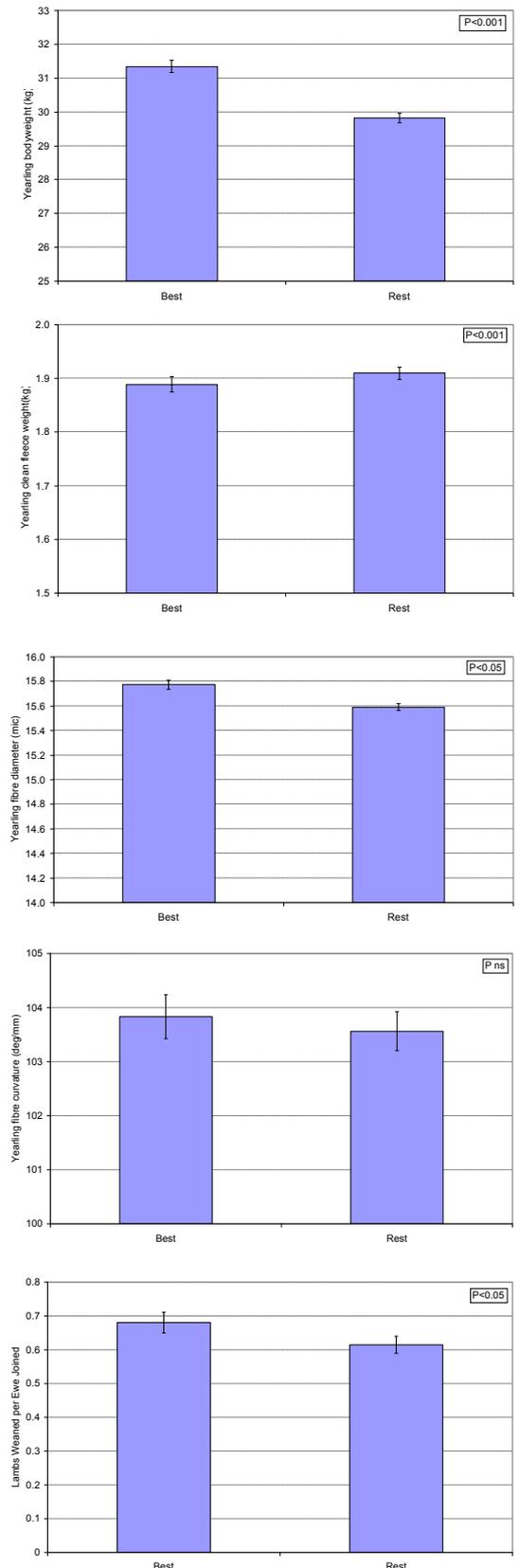
It is important to note that selection was only based on the risk of flystrike. No notice was taken on the production traits of potential sires.

The Best animals for breech strike resistance were heavier (by approx. 1.5kg) than the Rest, but they also had lower fleece weight (by approx. 1% or 20g) and broader fibre diameter (by approx. 0.2 μ m) than the Rest. The Best animals also exhibited lower coefficient of variation of fibre diameter (CVD, by approx. 0.7% and longer staple length (approx. 2.5mm) than the Rest. Yield, fibre curvature and staple strength were not different between the Best and Rest groups.

Ewes in the Best group weaned approximately 6% more lambs than those in the Rest group. However, reproduction results for this flock should be regarded with caution as the matings were conducted almost entirely by artificial insemination and all ewes were programmed the same (regardless of bodyweight) which may have introduced some biases not otherwise accommodated in the analysis.

Sheep in this study were not selected for production traits, but the sheep in the Best and Rest categories are similar in terms of the Sheep Genetics 10%SS and 14%SS production indexes and are also within a few index points of the Ultrafine/Superfine and Fine/Fine Medium flock averages in Sheep Genetics, indicating these sheep are similar to industry flocks.

These results support the earlier evidence that there are some undesirable relationships among breech strike resistance traits and important production traits. But, these are not strong and can be accommodated in a balanced breeding program. There are also some favourable relationships with production traits, particularly bodyweight, and possibly reproduction rate, that can be exploited.



(Above, top to bottom) Yearling bodyweight, clean fleece weight, fibre diameter, fibre curvature, and number of lambs weaned for unmulshed animals classified as the Best and the Rest (2005-2009 drop).

Where to now?

AWI has agreed to support continuation of the genetic resource flocks for breech flystrike resistance and a further 2 year study is in progress to pursue some of the issues arising from the original Project. The sheep genetic resource flocks have been scaled-back from 600 to 400 ewes, representing resistant and susceptible lines. Areas of interest to be pursued in the next 2 years include;

- Phenotyping additional breech characteristics that came to light during the original Project
- Skin follicle histology of the breech region of resistant and susceptible animals
- Better quantification of the impacts and persistence of breech and crutch bareness associated with pregnancy and lactation



(Above) CSIRO technical staff collecting blood samples from ewes in the Breeding for Breech Strike Resistance flock for DNA.

(Left) Hogget ewes at Armidale

Earlier issues of this newsletter outlined the project background, objectives and design, along with progress reports and interim results. If you didn't receive a copy and would like one, please contact Heather Brewer using details below or go to:

http://www.wool.com/Grow_Animal-Health_Flystrike-prevention_Genetic-and-breeding.htm

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Your feedback and thoughts are welcome.

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