

BREEDING FOR BREECH STRIKE RESISTANCE PROJECT

WA ISSUE 3

SEPTEMBER 2009



This project is a collaborative effort with research performed by the Department of Agriculture and Food Western Australia and CSIRO with funding provided by AWI

Editorial

The year 2008 will go down as the year of the fly in WA. It was one of the worst fly seasons that people could remember. Farmers should be vigilant and take all necessary steps to protect their sheep, should we experience another year of the fly. Remember that dags are one of the major predisposing factors. It is therefore critically important to crutch your sheep to keep them free of dags. Dags are mostly caused by worms so a good worm control management program should be followed (for more detail see separate article). Other management options are jetting and changing the time of shearing.

Breeding offers the best long term solution to breech flystrike prevention. We now know that wet dags, breech wrinkles, yellow wool, urine stain, and high wool coverage in the breech and crutch are the key indicator traits that make sheep more susceptible to breech strike. As most of these traits are heritable, breeders can select against these traits in their breeding programs.

To assist breeders to make faster genetic progress, the first Australian Sheep Breeding Values (ASBV) for wrinkles have recently been published by Sheep Genetics. This will make a huge contribution to identify productive but plain-bodied Merino sheep that are more resistant to flystrike for breeding purposes. Breeders are encouraged to score their sheep for wrinkles and also for the other indicator traits by using the Visual Scoring traits booklet published by Australian Wool Innovation (Ltd). This information is critical to generate ASBV for the other indicator traits in future

Project Update

General Project Outline

This project aims to breed Merino sheep that are resistant to breech strike and to demonstrate to industry the genetic changes that can be achieved by

selecting sheep on indicator traits in a Mediterranean or winter rainfall environment.

The summer rainfall component of the overall project is conducted at CSIRO's Chiswick Research Station in Armidale, NSW. The rationale behind this is that the research project will cover the two major Australian sheep environments. The final results should therefore be more robust and may identify significant differences for some traits linked with the local environment.

The flock consists of three lines of 200 breeding ewes per line and the structure of the flock is summarised in Table 1.

Table 1. The three breeding lines

Line	Description	Ewes	Rams
A	Intensive selection	Selected	Selected
B	Commercial	Random	Selected
C	Control	Random	Random

Each of the three lines consists of four 50 ewe single sire mating groups.

Half of the 600 ewe progeny from the original intake in each line were unmulesed and the other half mulesed, while half of the progeny of each sire were mulesed in 2006 and 2007. In 2008 the following major changes were made:

1. All progeny were left unmulesed.
2. The Rylington Merino flock was included in the trial.

These changes were made to increase the size of the flock of unmulesed sheep to generate more reliable genetic parameters of the indicator traits as soon as possible. These requests were approved by AWI.

Apart from the above changes the procedure are unchanged. Selection of future breeding sheep is based on a dual purpose selection index that combines the traditional objectively measured production traits (CFW, etc.), worm resistance breech

strike and key indicator traits. The process is as follows:-

1. Identify sheep for breech strike resistance
2. Estimate breeding values for the known indicator traits for breech strike resistance
3. Estimate breeding values for faecal worm egg count and dag scores
4. Rank sheep on Sheep Genetics 7% 'dual purpose' index

5. This information is combined in an overall Index.

This will be the second year of the project in which we have been able to select rams from amongst our own progeny in the project to breed from. This will give us more information on the response to selection for resistance to breech strike.

Worms, scouring and dags: a major problem for the high winter rainfall regions

In the normal grazing environment the majority of scouring is due to worms with two sub-types (i) **high worm egg count scouring** and (ii) **low worm egg count scouring**. The type of forage may influence the expression of scouring.

The high worm egg count (WEC) scouring is due to individuals having a low immune capacity, thus allowing incoming worm larvae to establish in the gut and mature into adults. The mature female worms produce eggs that allow us to indirectly measure their presence. The adult worms cause damage to the gut lining which result in both reduced absorption as well as leakage of fluid into the gut and therefore fluid faeces.

In the higher winter rainfall regions a second sub-type is associated with a low WEC. In this case it is a localised gut reaction to the intake of worm larvae from the pasture that evokes a gut inflammatory response resulting in reduced fluid retention. Most of the ingested larvae are expelled in this process and therefore not progressed to adults that produce eggs. This reaction is considered to be akin to an individual specific allergy reaction. Thus, the ideal situation for the immune system is a regular but low worm challenge. It is assumed that the lack of worm larvae on the ground during the long dry summers in the winter rainfall regions stops stimulating the immune system to worms. Following the break of the season in winter rainfall regions, the sudden appearance of large amounts of worm larvae in early winter, over-stimulates the immune response and the sheep starts to scour.

The optimum management of scouring therefore requires that we attempt to establish which type of scouring predominates in a mob. The first step is to

monitor the WEC of each mob of sheep that scours. If Barbers Pole worms are present then farmers are advised to drench the mob with a narrow drench such as Closantel which only removes the Barber Pole worms. Thus, in a non-Barbers Pole situation where the WEC's are higher than 800 eggs per gram, this will imply that some sheep will have counts over 1,000. This benchmark figure needs to be interpreted by considering the general condition and robustness of the sheep. For example, in light weight weaners this benchmark threshold would be lower.

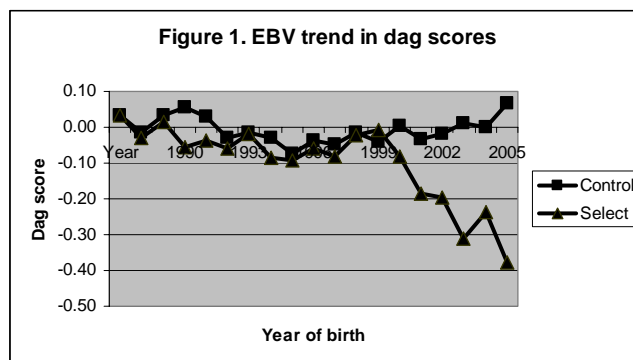
The **high WEC scouring** is more common in young sheep, weaners and yearlings. In the case of hoggets it will vary between flocks. This situation should respond to an effective drench. The scouring will continue for 1 or 2 weeks to allow for gut repair.

The **low WEC scouring** is generally unresponsive to drenching, because when the effect of the active drench has weakened over 2 to 3 days after drenching, the next lot of ingested larvae will continue to evoke the inflammatory gut response. This overreaction of the immune system typically starts to settle down after a few weeks. Some people will claim a drench response in these cases, but this apparent response would most likely be a natural healing process.

Monitoring WEC should not be seen as a burden because it should pay for itself by saving time and drench cost on unresponsive cases. Research is currently being carried out in other areas to determine whether pastures species that contain natural tannins, can be used to manage scouring.

From a genetic point of view, the high WEC scouring will respond to selection for low WEC. However, the

low WEC scouring won't respond to selection for low WEC. This form of scouring must therefore be treated as an independent trait by also selecting for low dag scores. As it is a heritable trait, rapid response is possible as had been demonstrated in the Rylington Merino flock where we have selected for both low WEC and low scouring. An excellent response has been achieved against scouring as shown by the genetic trend in Figure 1



Finally, note that the low WEC scouring is a much bigger problem in the highly seasonal winter rainfall environment compared to the more constant worm challenge experienced in the summer rainfall areas. The ideal situation for the immune system is a regular but low worm challenge. The problem in the winter rainfall environment is that we have about half a year with no challenge and half a year with challenge.

- KEY Points:**
- High WEC scouring is more common in young sheep – weaners and hoggets - and can respond to drenching
 - Low WEC scouring is usually unresponsive to drenching.

Difference between sire progeny groups for breech strike resistance

So far we have progeny tested 46 sires that we have sourced from industry and experimental flocks for breech strike resistance. Figure 2 shows the incidence of breech strike for each progeny group over three years. Large differences exist between sires. The most resistant sire had only about 3% of its progeny struck while 55% of the least resistant sire's progeny

were struck in the breech. This clearly shows how effective breeding could be. The two most resistant sires are shown in Figure 3. These large differences provide ample opportunity to demonstrate which key indicator traits were the most important at different times of the year.

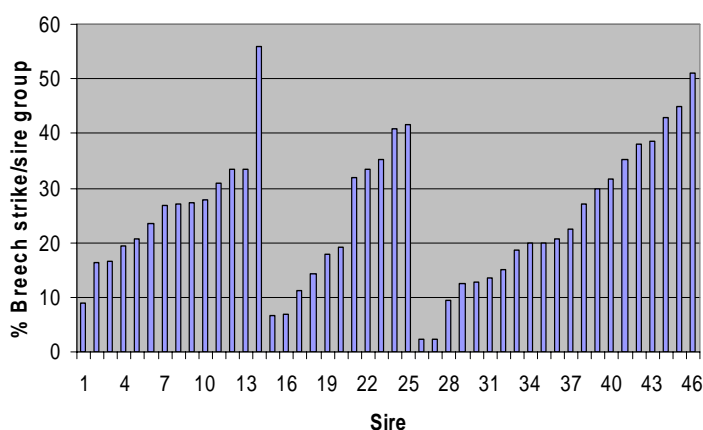


Figure 2. Sire progeny group differences in breech strike



Figure 3. The two Merino rams whose progeny were the most resistant to breech strike.

Relationship between Breech Strike and the Indicator traits

The results to date clearly show that wrinkles, dags, wool colour, breech cover and urine stain play a role in making sheep more or less susceptible to breech strike. Their relationship with breech strike differs and is not always the same at different times of the year, and also

differs between flocks. Figure 4 shows the relationship between breech strike and weaner wrinkles scored, post-shearing in autumn at the Mt Barker research station in WA.

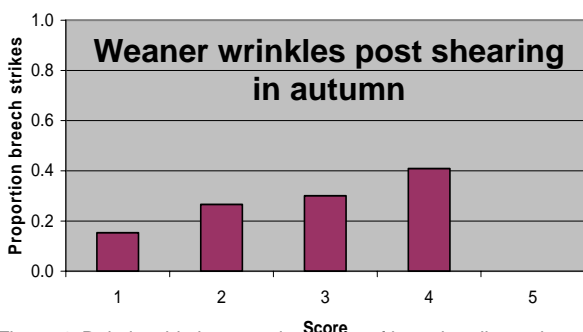


Figure 4. Relationship between incidence of breech strike and weaner wrinkles in unmulesed sheep at post shearing in autumn in WA

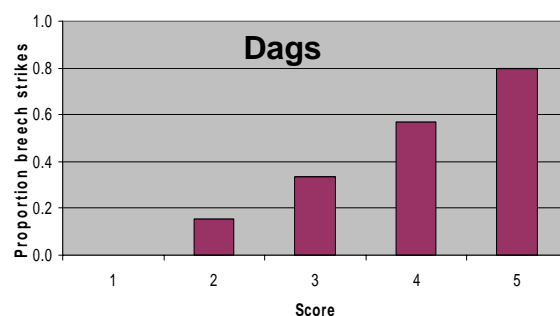


Figure 5. Relationship between incidence of breech strike and dag score at weaning for unmulesed sheep in at Mt Barker WA



Figure 6. Relationship between incidence of breech strike and wool colour at weaning for unmulesed sheep in at Mt Barker WA. A high score indicates more yellow wool.

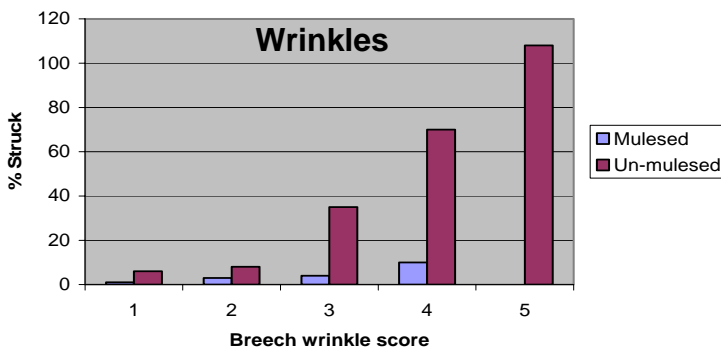


Figure 7. Relationship between incidence of breech strike and wrinkles at weaning for mulesed and unmulesed sheep in a summer rainfall region (courtesy CSIRO)

Incidence of breech strike within breech wrinkle score = 1

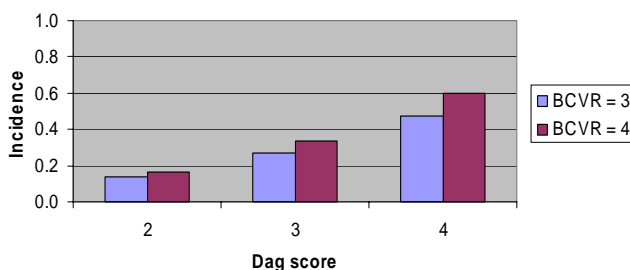


Figure 8. Relationship between incidence of breech strike in unmulesed sheep and dagscore and breech cover in sheep with wrinkles score =1 in a winter rainfall region (courtesy CSIRO)

This relationship is generally not as strong as that found in the CSIRO flock (Figure 7). The reason for this is that the WA breech strike flock is generally less wrinkly than the CSIRO flock in Armidale NSW. However, dags (Figure 5) and wool colour (Figure 6) that were scored at weaning had a stronger linear relationship with breech strike, indicating the importance of these

traits in WA. It is clear that for each unit of increase in dags, the incidence of breech strike increases much more than for one unit increase in breech cover (Figure 8)

In Western Australia, the graphs show that dags is the most important trait followed by wrinkles, wool colour and then breech cover.

Genetic relationships between the key indicator traits and breech strike

To be able to design good breeding programs for breech strike resistance without actually challenging the animals, we need to know which traits can be used as indicator traits. Table 1 shows the genetic parameters that we have estimated so far.

These results show that breech strike and the key indicator traits are heritable and that the genetic correlations are all positive and in the right direction.

This implies that we would be able to select for breech strike resistance using all the indicator traits. However, the accuracies as indicated by the standard errors shown in brackets are very high which indicated that these parameters are not that accurate. We are currently generating more progeny to obtain more precise parameters that the industry can use for their breeding programs with confidence.

Table 1. Inheritance of breech strike and the indicator traits (on diagonal) and the genetic (below diagonal) and phenotypic (above diagonal) correlations between the traits in Western Australia.

Trait	Breech wrinkle	Breech cover	Dag score	Wool colour	Urine stain	Breech strike
Variation	0.67	0.35	0.49	0.23	0.85	0.25
Breech wrinkle	0.45 (0.28)	0.18	0.18	0.35	0.35	0.22
Breech cover	0.19 (0.51)	0.42 (0.32)	0.06	0.15	0.25	0.17
Dag score	0.07 (0.53)	0.27 (0.65)	0.55 (0.30)	0.15	-0.35	0.23
Wool colour	0.31 (0.18)	0.66 (0.25)	0.09 (0.55)	0.49 (0.32)	0.10	0.26
Urine stain	0.44 (0.22)	0.23 (0.23)	0.33 (0.18)	0.00 (0.10)	0.49 (0.32)	0.19
Breech strike	0.23 (0.63)	0.17 (0.19)	0.86 (0.17)	0.25 (0.24)	0.53 (0.22)	0.57 (0.28)

Differences between breech strike selection lines in productivity

The established breeding flock provides both genetic and production data as part of the breech strike project. The breeding ewe lines described above were first mated in 2006 with 2008 being the first year that maiden ewes from the first mating were mated within their respective lines. The results for a range of production traits of the mature ewes from these lines are shown in the Table 2.

These sheep were managed in one large group. Drenching was determined by monitoring faecal worm egg counts and the ewes were crutched in winter to eliminate dags prior to the normally expected fly wave in late winter and spring.

The intensively selected line had a lower rate of fly strike and they compare favourably with fly strike rates for the mulesed ewes in 2008 (3.0% were fly struck and 2.5% were breech strike).

Trait	Intensive selection	Commercial	Control
Ewes fly struck (%)	4.1	9.2	15.8
Breech struck (%)	3.8	8.1	14.6
Tail wrinkle score	1.1	1.2	1.2
Breech cover score	3.3	3.5	3.6
Wool colour score	2.1	2.2	2.3
Clean fleece weight (kg)	2.96	3.48	3.45
Fibre diameter (μm)	19.4	19.8	19.7
Post-shearing weight (kg)	47.2	50.2	50.7
Pregnancy rate (%)	87.8	77.3	79.9
Litter size for ewes lambed	1.23	1.20	1.19
Birth weight (kg)	4.4	4.6	4.5
Lambs weaned (%)	109.0	96.7	96.3
Weaning weight (kg)	25.5	26.4	23.9

Table 2. Means for breech strike, indicator traits, fleece and reproductive traits of mature Merino ewes in the intensive, commercial and control breech strike flock phenotypic (above diagonal) correlations between the traits in Western Australia. Pregnancy rate and weaning rate calculated on the basis of ewes mated.

The indicator traits were all lower in the intensively selected line when compared with the commercial and control lines.

The selected lines weaned heavier lambs than the control line. The higher fertility and weaning rate of the intensively selected line affected the ewes performance as indicated by their reduced body weight post shearing.

The intensively selected line had a lower clean fleece weight and fibre diameter but this may largely be attributed to their higher fertility (ewes lambed/ewes joined) and higher survival rate and growth rate of their lambs than the commercial and control lines.



Figure 9. Weaners from the selection and control lines that have been bioclipped.

In the coming months we will use economic modelling to evaluate all of the factors including the value of 'Easy Care' and off-farm benefits of 'Clean and Green'.

Staff Changes in WA

The past year has seen a number of changes in personnel with Lysandra Slocombe leaving the Department. Technical Officers Nicola Stanwyck and Owen Coppen joined us at the start of 2009. Then in the middle of 2009 Dr Tony Schlink previously from CSIRO joined us as a Scientist. Some of you will know that Tony has extensive experience in sheep research.

Mt Barker Field Day

The WA results will be on display at the Mount Barker Research Station Field Day on the 20th of October, starting at 9.00am. We will present the latest results and demonstrate the changes that have been generated within the flock. You are invited to come along and talk to us about this topical subject.

Acknowledgment

We would like to acknowledge the immense support given to this project by the staff at the Mount Barker Research Station

CONTACT DETAILS

DAFWA

<http://www.agric.wa.gov.au/mulesing>

Johan Greeff 08 9368 3624

jgreeff@agric.wa.gov.au

John Karlsson 08 9821 3221

jkarlsson@agric.wa.gov.au

Tony Schlink 08 98511427

acschlink@agric.wa.gov.au

AWI

<http://www.wool.com.au>

Geoff Lindon (Head Sheep Technologies)

geoff.lindon@wool.com

CSIRO

<http://www.csiro.au>

Jen Smith 02 6776 1381

Jen.Smith@csiro.au

Tim Dyall 02 6776 1463

Tim.Dyall@csiro.au

Sheep Genetics

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

Bronwyn Clark (WA representative)

br@azurecapital.com.au