BREEDING FOR BREECH STRIKE RESISTANCE PROJECT

WA ISSUE 2 **JULY 2007**

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

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Project Update

John Karlsson, DAFWA Katanning
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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 animals 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 this research will cover the two major Australian sheep environments. The final results should therefore be more robust and may find significant differences for some traits linked with the local environment.

Total flock size on each site consists of 600 breeding ewes and followers. The flock is divided into three lines of 200 breeding ewes each with breech strike resistance evaluated against the so called indicator traits. The structure of the flock is summarised in Table 1.

Table 1. The 3 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.

Selection is based on an index that combines the traditional objectively measured production traits (CFW etc.), worm resistance and the flystrike resistance traits. In the research flock we need to keep all the progeny until the hogget selection in order to evaluate all the interactions between traits. However, for most breeders this is not practical and you can use the so called 'Independent Culling Levels' (see later article). For us the main traits and process is as follows:-

1. Breech strike
2. Indicator traits for breech strike resistance
3. Estimated breeding values for faecal worm egg count and dag scores
4. Sheep Genetics 7% 'dual purpose' index

At the time of writing this newsletter we are into the 2008 lambing season. This will be the first year of the project in which we have been able to use our own progeny from the project to breed from. This will give us more information on the response to selection for resistance to breech strike.

2006 Progeny

The 2006 born progeny represent the first animals born in the project. The following graphs show the results of the first drop of mulesed and unmulesed lambs born in 2006 for the three lines.

Flystrike

The incidence of breech strike only across the three lines can be seen in Figure 1 and was reduced in the mulesed sheep by about half in this season (it will vary in different years). It is clear that there is a higher incidence of breech strike in the unselected control line. The first blowfly challenge of these 2006 lambs was in the spring and was predominately breech strike.

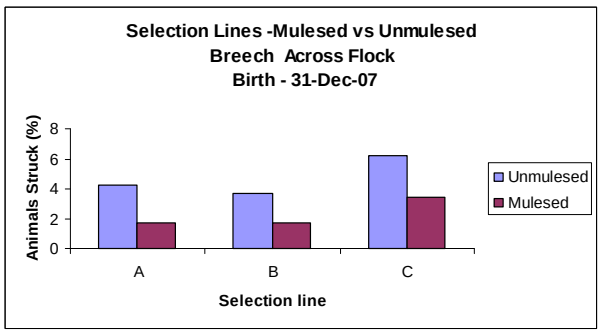

Figure 1. Percentage of mulesed and unmulesed lambs struck from birth in August 2006 to 31 December 2007 for the selection and control lines. Also refer to Table 1 for the line definition.

Comparing breech strike to total strikes after the initial lamb spring fly challenge in Figure 2, it can be seen that in this period, breech strike accounts for approximately one third of the total number of strikes.

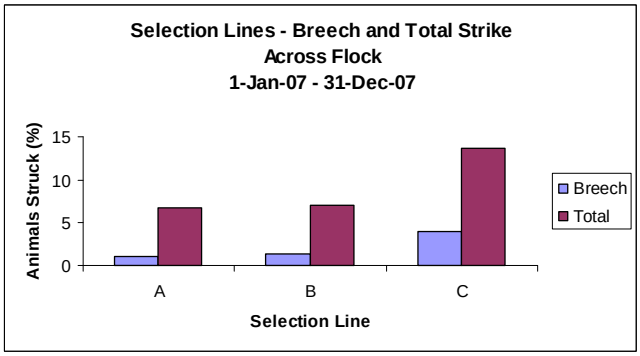

Figure 2. Percentage of total strikes and breech strike of the selection and control lines over a 12 months period from 1 January to 31 December 2007

The remaining strikes consist of body strike and poll strike in the rams. Most of the poll strike occurred after the November hogget shearing following a late rain in the 3rd week of December. Most of these were horned rams.

Overall the trend comparing the lines is in the right direction with the highest incidence of fly strike in the control line.

Combining the previous two periods, breech strike accounted for approximately half of the total strikes during the first 18 months of life. The highest incidence of flystrike (breech and total) was in the control line (Figure 3).

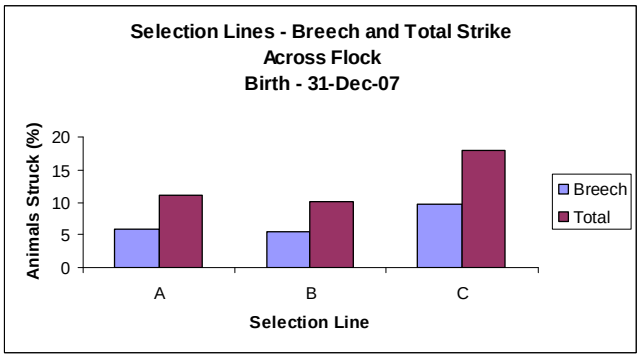

Figure 3. Total number of strike and number of breech strike from birth to 31 December 2007 for the selection and control lines

Wrinkles

Figure 4 shows the relationship between wrinkle score sites (neck, side and breech) and breech strike during the first 6 months. When breech wrinkle scores reach 3 and above, there appears to be a very high probability of breech strike.

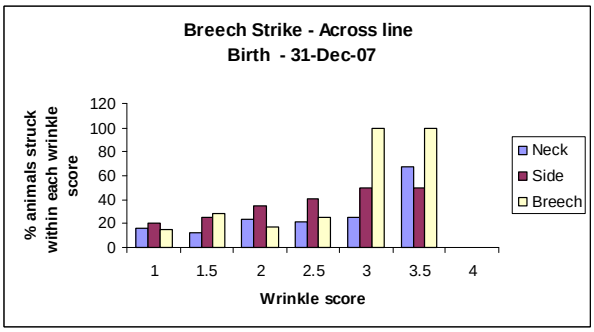

Figure 4. Relationship between the incidence of flystrike and wrinkle score measured on the neck, side and breech.

When total strikes are compared with wrinkle scores across the body, again a high wrinkle score increases the likelihood of strike (Figure 5).

These results confirm previous findings that wrinkly sheep are more prone to being struck than plain bodied sheep. Although, not shown here the same overall trend applies when comparing mulsed versus unmulesed sheep.

Wrinkle scores at lamb marking were higher in singles than in multiples presumably reflecting a difference in body condition. The control line had higher wrinkle scores than selection lines which show that selection for plainer bodies was effective.

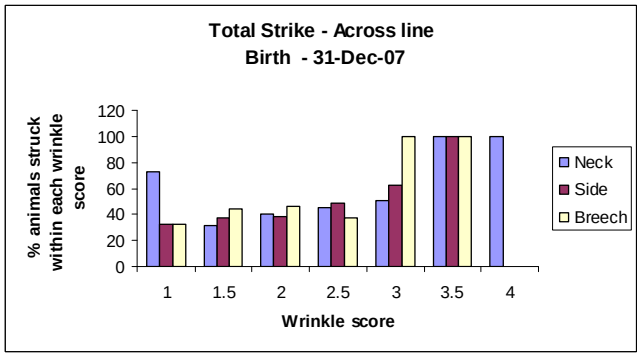

Figure 5. Incidence of total blowfly strikes and wrinkle scores measured on the neck, side and breech.

The optimum time for scoring on wrinkles is generally in short wool that is at lamb marking or off shears (Figure 6).

Figure 6. Weaners following Bioclip® have visible wrinkles, making scoring easy.

General Industry Advice

John Karlsson, DAFWA Katanning

Breeding for breech strike resistance is the logical alternative to surgical mulesing, and it is encouraging from a research perspective that it is gaining more general support in recent years. There are a wide range of beliefs on this topic and I will address several of these in the light of our research:-

1. THAT BREEDING IS A LONG TERM SOLUTION.
   To date our results have shown an encouragingly rapid response through appropriate selection.
2. HOW LONG WILL IT TAKE?
   Basically it depends on how much selection is applied and the heritability of the trait.
3. THAT PLAIN BODIED SHEEP ARE LOW WOOL CUTTERS.
   Although generally true, there are plain bodied sheep in all flocks that cut as much wool as their more wrinkled counterparts. For further information see the following article.

This project will generate the genetic relationships between normal production traits and the indicator traits, which will be used to construct more effective breeding programs and selection indices.

In the final analyses we believe that we have a good news story because:-

1. Plain bodied sheep are more robust, easy care and also more fertile than wrinkly sheep
2. When all of the attributes of plain bodied sheep are accounted for such as fertility, flystrike, do ability, turn off weights, grass seed and the associated VM we believe that the overall benefit will be favourable.

In terms of how to select for breech strike resistance most of the media publicity has focused on the Bare Breech trait. Our results to date indicate that most of the response appears to be due to difference in wrinkle scores. This also fits with the generally greater industry variability of wrinkles compared to the bare breech trait. We would therefore advise breeders to make a start by selecting initially against wrinkly sheep as well as daggs, and when this has been achieved select for bare area. Over time sheep with bare breech will most likely become more available for flock ram buyers.

We hope to obtain the genetic parameters for breech strike and its indicator traits. This information will then become available through service providers like Sheep Genetics. The Sheep CRC Information Nucleus Flock will also provide estimated breeding values for breech strike resistance. These tools can then be used in breeding programs. However, until this stage is reached our advice to the industry is to use so called Independent Culling Levels as described in the following articles.

Decrease wrinkles do not necessarily imply a reduced wool production.

Johan Greeff DAFWA South Perth

There is a general perception that increased skin wrinkles or folds are associated with increase **greasy** wool production. Bob Dunn and his colleagues carried out a lot of research on skin wrinkles and wool production in the sixties. The results have shown that more wrinkled sheep have generally **lower clean yield** and **shorter staples** which means that the effect is reduced and that **clean fleece weight** is not so strongly associated with an increase in wrinkles.

Research in Katanning has confirmed the relationship between wool production and wrinkles. Figure 7 shows the relationship between a combined score for neck, body and breech wrinkle, with clean fleece weight (CFW). Although there is a positive

relationship it is clear that the more wrinkly types actually had lower clean fleece weight and the reason for this was that these more wrinkly types were generally smaller and had shorter staples.
Figure 7 also shows that in this flock there are plainer sheep (LH red circle) that cut as much wool as the more wrinkly (RH green circle) types which shows that one can have plainer sheep with high wool production.

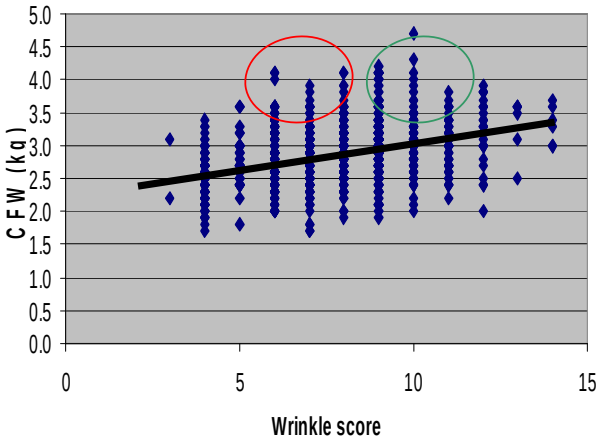

Figure 7. Relationship between clean fleece weight and wrinkle score in the Katanning Merino resource flocks.

The research in the early sixties has also shown that plainer sheep have higher reproduction and survival rate. In addition, plainer sheep were hardier and performed better than wrinkled sheep under harsh dry conditions. With the further benefit of easier shearing, less skin wounds and reduced susceptibility for fly strike, it is surprising that plainer bodied sheep is not the norm.

Breeding for Breech Strike Resistance

John Karlsson, DAFWA Katanning

Since the adoption of mulesing in the 1930's (later in WA) and the availability of chemical protection over the same timeframe there has been a 'masking' of susceptibility to flystrike. In that environment, very little progress can be expected for an increase in resistance to flystrike.

Initially to determine the genetic parameters of resistance to flystrike, animals need to be challenged to show their susceptibility to breech strike and the correlation with this and the indicator traits. On the industry's behalf this is conducted on the two research flocks based at Mt Barker Research Station in WA and at Chiswick CSIRO in Armidale NSW.

The following management protocol is followed to record all the relevant traits. However, there will be subtle differences at the sites due to differences in the local environments. Therefore, the following refers specifically to the Mt. Barker site.

A. Protocol for Research Flocks

Full pedigrees are recorded.
Traits measured include:-

1. Flystrike;

Maximising expression is achieved by minimising any masking by:-

- no mulesing
- avoiding preventative fly treatments
- delaying crutching & shearing until after spring fly challenge period

2. Indicator traits;

- wrinkles and bare area (best recorded in short wool)
- daggs and urine stain (best recorded in long wool after worm challenge)
- Any fleece problems (Colour, Dermo etc.). Measured in winter/spring preferably with long wool

3. Objective measurements (Preferably expressed as estimated breeding values)

- Worm Egg Counts
- Body weight at different ages
- Wool Traits (fleece weight, fibre diameter, coefficient of variation of fibre diameter, staple strength, staple length etc).

For the Mt Barker research flock these traits are combined with a 7% Dual Purpose selection index which is used to select animals for increased production.

B. Industry Flocks

Breeders do not need to use a challenge based method to identify potentially resistant animals as this project will provide the necessary genetic parameters to obtain breeding values for resistance traits. The other good news is that in the initial stages you can therefore use some of the masking tactics such as time of crutching and preventative chemicals to protect your sheep without compromising your breeding program.

The only additional thing you need to do is to record and score your sheep for the indicator traits. They are

described in the Visual Sheep Scores booklet distributed by AWI.

Independent Culling Levels and Indicator Traits

Johan Greeff, DAFWA South Perth
John Karlsson, DAFWA Katanning

Research to date has shown that the important indicator traits for breech strike resistance/susceptibility are;

- wrinkles,
- wet daggs (especially in the winter rainfall regions of southern Australia),
- breech cover and
- urine stain.

Of these, wrinkles because of its high general prevalence in most industry flocks represent a good starting point for culling.

When selecting animals for these traits there are two main issues to consider in that the selection can't be done for each of the traits at the same time and the proportion to be culled for each trait needs to be estimated in advance, based on how many replacement ewes are needed.

The problem is how to determine how many animals should be culled on each indicator trait at each stage of the selection process. A solution is to follow an independent culling level approach. This means that animals above a specific value are culled at the time of measurement, independently from measurement of the other traits.

Using this method requires knowledge of your flock's fertility and some experience with trait expression in your flock. The breeding objectives you have set for your flock will also influence the number and proportion of animals to be culled for each trait.

An example:
If ~65% of ewes need to be retained to maintain flock size and you have 1000 older ewes and 400 ewe hoggets, you will need to retain 250 ewe replacements (a diagrammatic representation of selection can be seen in Figure 8). This means you have (400 - 250 =) 150 hogget ewes that can be culled. Assuming that 50 older ewes and 50 maidens will be culled for other traits such as udders, mouths, wool etc, it leaves 200 older ewes and 100 maiden ewes that can be culled on the new traits such as wrinkles and daggs.

Decide how much emphasis to place on each trait i.e. how many animals should be culled on each trait so that 65% is selected in the final stage. To determine the proportion available to be culled on each trait, the equation below can be used where a = proportion culled on trait one, b = proportion culled on trait two, c = proportion culled on trait three, etc..

Proportion selected = [(1-a)*(1-b)*(1-c)....]

A possible option is to cull 20% on wrinkles, 10% on daggs and 10% on breech cover. This would result in

> [(1-0.2 for wrinkles) * (1-0.1 for daggs) * (1-0.1 for breech cover)] = 0.65

The same result will be obtained if 20% is culled for breech cover and 10% for wrinkles and dags. Alternatively cull 15% on each trait which will result in about 0.62. Many other options can be followed.

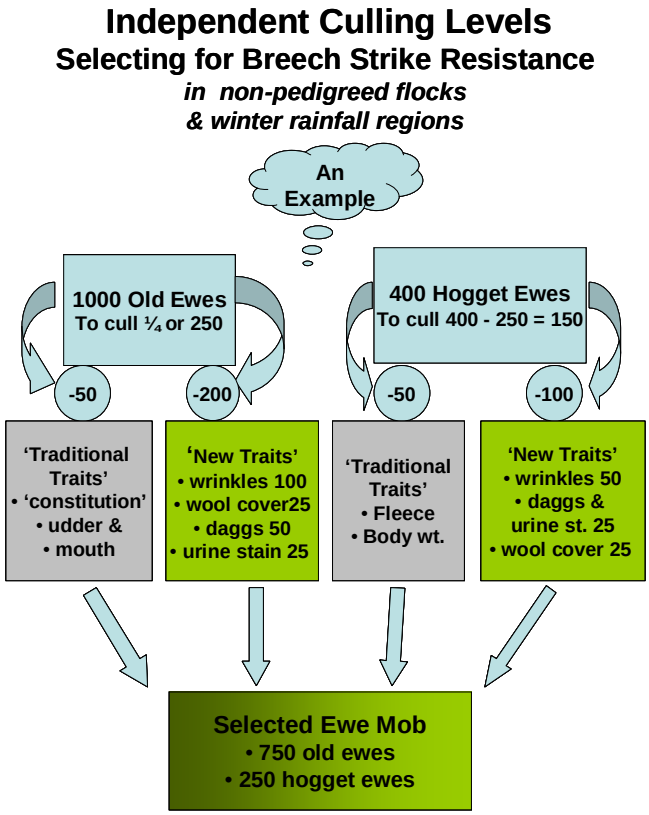

Figure 8. Independent culling levels

The big benefit of this approach is because culling information becomes available at different times. Wrinkles may be scored at marking, while breech

cover is scored at weaning and daggs at yearling age. Using this approach allows culling at each stage so that the more susceptible animals are removed from the flock at the earliest convenience without the threat that not enough animals are available at hogget age after shearing. Even if there is an over expression of one trait at a particular stage then following this approach will prevent over culling too many animals for any particular trait.

Flystrike results in 2007-08 – Armidale site

Jen Smith, CSIRO Armidale

337 flystrikes were recorded between October and March, about ¾ of which were on the breech. See Table 2.

The differences among selection lines in breech strike rates (Figure 9) and indicator traits (Table 3) suggest that reducing the average breech wrinkle of the flock by about 0.5 - 1 score can make a sizable (30-50%, and statistically significant) difference in breech strike rates. As a guide, to reduce the average breech wrinkle score of an unselected flock by 0.5 score (say from 3.0 to 2.5) would require a cull rate of 30%.

Although not detailed here, there is evidence that body strike rates do not reflect breech strike rates. That is, the Selected lines have body strike rates similar to, or even higher than the Control line. This suggests that simply changing ram source (bloodline) may not be a simple answer for everyone. That is, introducing a new ram source (especially in high rainfall regions) to reduce breech strike may have adverse implications for body strike rates.

Table 2. Flystrike incidence (% of flock) by sheep class 2007-08

Class	Body	Breech	Repeats[#]
Breeding ewes (n=600)	5.0	23.8	24.6
Ewe hoggets (n=207)	3.3	7.6	16.7
Ram hoggets (n=176)	3.2	0.7	14.3
Lambs/weaners (n=243)	6.3	9.9	30.3

[#] of struck animals, % that got struck (either body or breech) more than once

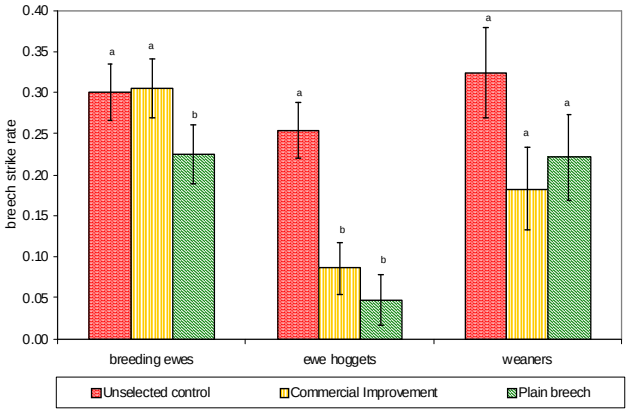

Figure 9. Breech strike rates. Within sheep classes, different superscripts indicate significant differences among selection lines (P<0.05).

Table 3. Selection line means for breech strike indicators.

Trait	Plain	Commercial	Contr.
2007 drop weaners (post weaning 5 months)			
breech cover	4.0	4.2	4.6
crutch cover	3.1	3.2	3.5
breech wrinkle	2.1	2.3	3.0
2006 drop ewe hoggets (yearling)			
breech cover	3.8	4.0	4.4
crutch cover	3.4	3.3	3.9
breech wrinkle	2.1	2.1	2.6
2005 drop breeding ewes (pre-lambing, 2yo)			
breech cover	4.1	4.2	4.2
crutch cover	3.4	3.5	3.5
breech wrinkle	2.3	2.8	2.8
All indicator traits scored 1-5 where 1 is 'best'			

Team Changes in WA

Lysandra Slocombe, DAFWA Mount Barker

The past year has seen a number of changes in personnel with Bindi Murray leaving the Department to work on the family property and was replaced by myself in mid February. This time also saw Kelly Jones come on board as a Technical Officer in October only to leave the project in May due to her partner being transferred to Katanning.

Mt Barker Field Day

The WA results will be on display at the Mount Barker Research Station Field Day on the 21st of October, starting at 9.00. Where you are invited to come along and talk to us about this topical subject. Please note this year we will have our display at the home farm.

Acknowledgment

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

Next Edition

The next edition of the newsletter will provide an update on the 2007 drop of lambs.

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