Breeding Sheep for Breech Strike Resistance

Jen Smith, CSIRO Livestock Industries
April 2010
Project Background

• Selection to reduce body strike has been practiced for a long time, but less is known about how to select for breech strike

• Selective breeding - widely viewed to be the best long-term alternative to mulesing

• **Aim:** use indicator traits - e.g. breech & crutch cover, body & breech wrinkle, dags, urine stain, fleece traits
AWI Projects

- Breeding for Breech Strike Resistance (2005-2010)
  - CSIRO Armidale, summer rainfall/fine wool
  - DAFWA Mt Barker, winter rainfall/medium wool
  - Calcookara Project (Uni. of Adelaide)

*Ardvale weaners*  
*WA weaners (bioclipped)*
Objectives and Design

1. Develop industry best practice guidelines for including breech strike resistance in Merino breeding programs

2. Evaluate the effect of selection using traits thought to indicate resistance to breech strike

3. Estimate heritability of indicator traits, correlations between breech strike and indicator traits, and between indicator traits and production traits – enabling prediction of response to selection
Breeding program design

1. CONTROL LINE
   - 200 unselected ewes mated to 4 unselected sires
     - Mulesed: 100 ewes
     - Unmulesed: 100 ewes

2. COMMERCIAL IMPROVEMENT LINE
   - 200 unselected ewes mated to 4 plain breech sires
     - Mulesed: 100 ewes
     - Unmulesed: 100 ewes

3. PLAIN BREECH LINE
   - 200 selected ewes mated to 4 plain breech sires
     - Mulesed: 100 ewes
     - Unmulesed: 100 ewes

Link sires across sites & years

600 breeding ewes (sourced from 2005 drop industry flocks)
What gets measured and recorded

- **Breech strike resistance indicators**
  - at birth, marking, post-weaning, yearling and adult

- **Fleece traits** (yearling & adult)

- **Fly population & weather conditions**

- **Lambing & pedigree information** (inc. fertility)

- **Disease traits** (including flystrike under challenge conditions)

- **Crutching/shearing time & measures of cost of production**

- **Bodyweight** (at birth, post-weaning, yearling & adult)

600 ewes and their followers
Response to selection – how long is it going to take?

Is dependent upon:

- Correlations among traits
- Heritability
- How many traits in the breeding objective
- Relative ‘weighting’ on those traits
- Selection intensity
- Generation interval
- Use (or not) of outside genetics
Breech cover – distribution in unselected, unmulesed population

Yearling breech cover

% of flock

0 10 20 30 40 50 60

CSIRO. Jen Smith, Leader, Breech Strike Genetics

Information contained on these pages is the intellectual property of CSIRO and AWI and may not be reproduced in any publication or used in any presentation without the permission of CSIRO or AWI.
Breech wrinkle – distribution in unselected, unmulesed population

![Breech wrinkle distribution graph](image_url)
Factors affecting breech traits

- Property-of-origin/year
- Selection line
- Mulesed/not
- Genetic group (wool type)

Specific to experimental design

- Birth and rearing type
  - animals born and reared single are more wrinkly (approx ½ score) than those born and reared multiple
- Dam age
  - animals born to adult ewes more wrinkly (approx ¼ score) than those born to maidens

- Sex
- Operator
- Body weight and/or cannonbone length – body size
## Candidate traits

<table>
<thead>
<tr>
<th>Trait</th>
<th>Variable</th>
<th>Heritable</th>
<th>Correlated with breech strike</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breech wrinkle</td>
<td>✔ ✔ ✔</td>
<td>✔ ✔ ✔</td>
<td>✔ ✔ ✔</td>
</tr>
<tr>
<td>Breech cover</td>
<td>✔ ✔</td>
<td>✔ ✔</td>
<td>✔</td>
</tr>
<tr>
<td>Crutch cover</td>
<td>✔</td>
<td>✔ ✔ ✔</td>
<td>✔</td>
</tr>
<tr>
<td>Dags</td>
<td>✔ ✔</td>
<td>✔</td>
<td>✔ ✔ ✔</td>
</tr>
<tr>
<td>Urine stain</td>
<td>✔ ✔</td>
<td>✔ ✔</td>
<td>✔</td>
</tr>
</tbody>
</table>

Better in WA flock
## Indicator trait differences between selection lines

**Incidence of significant difference between Selected and Control**

<table>
<thead>
<tr>
<th>Trait</th>
<th>NSW</th>
<th>WA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breech wrinkle</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Dags</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Breech cover</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Urine stain</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Wool colour</td>
<td>✗</td>
<td>✔</td>
</tr>
<tr>
<td><strong>Breech strike</strong></td>
<td>✔#</td>
<td>✔#</td>
</tr>
</tbody>
</table>

# Not in every sheep class or every year – dependent upon sheep age, sex, physiological state, climate, fly challenge etc.
Incidence of breech strike in unmulesed sheep
Average over 4 years

WA
Courtesy Johan Greeff, DAFWA

NSW
Flystrike rates in 2009-10, NSW

Breeding ewes, mixed age – selection line and mulesing effect

2nd generation weaners, mixed sex - selection and mulesing effect
Breech wrinkle at post-weaning

WA

Courtesy Johan Greeff, DAFWA

NSW
Breech cover

WA, weaning
Courtesy Johan Greeff, DAFWA

NSW, post-weaning
Note: n=2 for breech cover=1, n~500 for breech cover>=4 so this is not a good guide to the usefulness of breech cover
Dag

WA, weaning
Courtesy Johan Greeff, DAFWA

NSW, post-weaning
Note: only 3 animals with dag=5
Wool colour

WA, weaning
Courtesy Johan Greeff, DAFWA

NSW, yearling
Note: I think white wool is not actually associated with higher flystrike rates - its just that sheep in the control line (which are more wrinkly etc) tend to have whiter wool
Importance of dags and breechcover

Incidence of breech strike within breech wrinkle score = 2

Incidence of breech strike (%)

Dag score

BCVR=3
BCVR=4

Courtesy Johan Greeff, DAFWA
Breech strike rates by sire
WA, unmulesed progeny

% of breech strike per sire group

Year 1
Year 2
Year 3

Sire

Similar to mulesed flystrike results

Courtesy Johan Greeff, DAFWA
Weaner breech strike rates by sire
NSW, unmulesed progeny

![Graph showing weaner breech strike rates by sire for 2006, 2007, and 2008 drops. Legend includes colors for Intense, Commercial, and Control.](image-url)
Using breech traits

Independent cull on phenotype
- e.g. cull very wrinkly / daggy
- Or, score whole flock and cull worst x%

But, **birth-rearing type and dam age** effects will slow response
- *good reason to use ASBV’s*

Combine breech and production traits
- rank on fleece and wrinkle

ASBVs and multi-trait selection indices
- more precise than culling on phenotype – takes account of pedigree and other factors that can affect breech traits (if recorded)
Take home message

1. This works, gains are cumulative and permanent

2. Rate of response will be different for every flock

3. For those starting out, look at wrinkles 1\textsuperscript{st}
   - Faster early gains with wrinkles than breech cover
   - Score wrinkles in short wool
   - Defer scoring breech cover until older age

4. But, which trait(s) breeders focus on may depend on
   - Where you are (geographical location)
   - What sort of sheep you have (whether already plain/not)
   - Which sector of the wool market supplying to

5. Don’t select on breech traits in isolation
   - There are some unfavourable relationships with some production traits

6. How individuals use the data might depend upon
   - stud or commercial wool producer
CSIRO Livestock Industries
Jen Smith
Leader, Breeding for Breech Strike Genetics

Phone: 02 6776 1381
Email: jen.smith@csiro.au

Thank you
Incidence of breech strike, Mt Barker

**2005 drop**

- **Mulesed**
- **Un-mulesed**

**2006 drop**

- **Mulesed**
- **Un-mulesed**

**2007 drop**

- **Mulesed**
- **Un-mulesed**

**2008 drop**

- **Mulesed**
- **Un-mulesed**

**Sheep stuck (%)**

- **Intense selection**
- **Commercial selection**
- **Control**

**Sheep struck (%)**

- **Intense selection**
- **Commercial selection**
- **Control**
- **RM**

*Courtesy Johan Greeff, DAFWA*
Incidence of weaner breech strike, Armidale

2005 drop

2006 drop

2007 drop

2008 drop

CSIRO. Jen Smith, Leader, Breech Strike Genetics

Information contained on these pages is the intellectual property of CSIRO and AWI and may not be reproduced in any publication or used in any presentation without the permission of CSIRO or AWI.