Breeding sheep for resistance to breech strike: selection results in Western Australia (WA)

LJE Karlsson, JC Greeff & AC Schlink, Department of Agriculture and Food, Western Australia (DAFWA)

# Introduction

Blowfly strike as a serious problem for the Australian sheep industry was first reported in the early 1900’s. This also coincides with the first reports of the primary sheep blowfly, *Lucillia cuprina.* Observations at this time suggested that some sheep types appeared to be more susceptible to blowfly strike than others. This lead to a four year experiment starting in the late 1920’s that clearly demonstrated that sheep could be classified as fly strike resistant and susceptible lines primarily based on the degree of wrinkles on the sheep. The advent of the ‘Mules Operation’ and effective chemical controls in the 1930’s effectively stopped future development of breeding for blowfly resistance.

In 2004 a major animal ethics campaign against surgical mulesing was launched against the wool industry. This lead Australian Wool Innovation (AWI) to commission a major research program on alternatives to surgical mulesing for breech strike control. This paper reports the AWI and Department of Agriculture and Food (DAFWA) funded project at the DAFWA Mount Barker Research Station on ‘Breeding for Breechstrike Resistance (BSR)’ in the great southern area of Western Australia (WA), representing the winter rainfall areas of Australia. A similar experiment is being undertaken by AWI and CSIRO near Armidale New South Wales, representing the summer rainfall areas of Australia.

# Biology

The gravid female fly is ‘programmed’ to seek out sites that will facilitate rapid growth of the larval stages. The main olfactory cue for the blow fly is smell associated with a nutrient rich liquid medium required by the first two stages of the developing blowfly larvae. This smell is associated with increased skin moisture and resultant increase in bacterial growth producing in the nutritional requirements for larval growth.

# Sheep factors

Early observations that some sheep were more predisposed to blowfly strike than others leading to recognition that skin wrinkles was one of the first traits associated if increased rates of fly strike. Subsequently additional sheep and wool traits have been recognised and are referred to as ‘Indicator Traits’. The potential indicator traits and their association with the three main types of blowfly strike are shown in Table 1.

A standardised descriptive language of these traits have been developed by AWI, Meat and Livestock Australia (MLA), Sheep Genetics (SG), Australian Merino Sire Evaluation Association (AMSEA) and research organisations involved in this work. This is now available as a set of standard ‘Visual Sheep Scores’. These traits are scored on a 1 to 5 scale where 1 is the most favourable and 5 the least favourable score.

See Sheep Genetics’ [Visual Sheep Scores](http://www.sheepgenetics.org.au/ViewImage.aspx?ITEM=105&NAME=VisualSheepScores.pdf).

| **Potential indicator traits** | **Poll strike** | **Body strike** | **Breech strike** |
| --- | --- | --- | --- |
| Horn and/or deep fold at horn site | √√ | No data | No data |
| Wrinkles; neck, body, rump/tail & breech | √√ | √√ | √√ |
| Fleece rot, dermo, suint, wool colour, fleece moisture | √√ | √√ | √√ |
| Excessive wool coverage breech and points | No data | √ | √√ |
| Dags and urine stain | No data | √ | √√ |
| Crimp or staple structure, ‘water proofing’, smell/odour, others? | √ | √√ | √√ |

# Prevention of flystrike

Broadly, prevention of flystrike includes the following two approaches:

## Non-genetic

This includes; mulesing, preventative chemicals and management procedures such as time of crutching and shearing. These interventions have to be repeated for every drop of sheep and apart from mulesing, repeated at least every year. All these interventions come at some recurrent costs to the industry.

## Genetic

The genetic approach has two strategies under consideration;

* Selection for increased resistance (immune response). This has attracted considerable research effort since the 1990’s, especially as it could lead on to potential vaccines. Some animals manage a ‘self cure’ at a considerable cost to the affected individual in terms of lost wool from the strike site. If the stress is severe enough there is often a break in the wool resulting in very low staple strength outcomes for the remaining fleece.
* Selection of sheep that are less predisposed to fly strike. This is an indirect selection method involving Indicator Traits and the culling of any fly struck sheep in the flock.

# Research results from breeding for blowfly resistance in WA

Because of the urgency to find alternatives to surgical mulesing the primary focus of this report will be on ‘Breeding for Breech Strike Resistance’. However, we can also expect favourable responses to the other types of blowfly strike and changes in the other sheep welfare and economically important traits.

The incidence of fly strike in sheep is strongly influenced by environmental factors that govern fly activity as well as on sheep predisposing factors. Rain associated with warmer temperatures tends to increase fleece rot and result in body strike. In the winter rainfall environment both worm larvae picked up from the pasture as well as established adult worms are associated with scouring in late winter and spring result in breech strike if temperatures are high enough to allow fly activity.

## Selected results

The BSR research flock at Mt Barker Research Station started in 2005 with ‘screening in of 600 ewe lambs from 10 industry flocks. The 600 ewes used for the start of breeding in 2006 come from screening in from the collective DAFWA sheep flock.

The flock structure is as follows:

1. Initial Flock Structure (3 x 200 Ewes):-

* Selected A (Intense Selection);

Both Rams & Ewes selected on Blow Fly Resist.

* Selected B (Commercial or Industry);

Selected rams & unselected ewes.

* Control;

Both rams & ewes are unselected

1. Rylington Merino (500 + 100) ewes from 2008

Between 2005 & 07 half of the progeny in each line were mulsed & the other half unmulsed. From 2008 all unmulesed.

In order to expose the susceptible individuals no preventative fly treatments are used and crutching and shearing conducted after the main spring fly season. During the fly challenge season monitoring is in place. Individually struck animals are treated with a short acting fly treatment.

A summary of the incidence of breech strike in unmulesed sheep over 4 years in the four lines are shown in Figure 1.

0

0.05

0.1

0.15

0.2

0.25

0.3

0.35

Selected A

Selected B

Control

Rylington Merino

**Lines**

**Incidence of breech strike**

Line Effect

Figure Incidence of breech strike

The results from the winter rainfall area have found that blow fly activity is related to wrinkle score, breech cover, wool colour and the incidence of dags. The early results have shown highly significant difference between sires and has allowed for preliminary estimations of heritability of blowfly strikes and its correlations with indicator traits. Breech strike has an estimated heritability of 0.57 and the genetic correlations with the indicator traits are positive. The variation between sires is shown in Figure 2.

The sire effect increased year on year from 2006 to 2007 to 2008

Sire Effect

**2006**

**2007**

**2008**

Figure Percentage of breech strike per sire group

# Discussion

A discussion on the type of sheep required to be naturally less susceptible to blowfly strike typically generate some negative comments. The most common negative view is that ‘plain’ type of sheep has a lower fleece weight. Overall there is a slight increase on fleece weight with increased wrinkle scores. However, within the flock there will also be individuals that are above average on fleece weight and below average on wrinkle scores.

The good news is that for traits such as; wool cover on the face, fertility, body weight and general hardiness the relationship with lover wrinkle scores is favourable. Therefore overall we believe that the type of sheep we are selecting for will be easy care and more productive.

# Summary

The preliminary results indicate that genetic progress can be made in breeding for reduced incidence of fly strike in Merino sheep. The indicators traits provide the industry with a means to progress their breeding programmes to reduce fly strike without the necessity of allowing sheep to become fly struck as an indicator of blow fly resistance.

# Acknowledgement

Australian Wool Innovation (funding); CSIRO (collaboration)

Staff at Mt. Barker Research Station and the Albany Parasitology Lab.

Grower contributors of ewe weaners and some rams.