

AWI BREECH STRIKE RD&E PROGRAM

IMPROVING LIFETIME
WELFARE

MASTER - NOV 2017

GEOFF LINDON AWI



AWI - COMMITTED TO ANIMAL WELFARE



- AWI is the research, development & marketing (RD&M) organisation for the Australian wool industry
- Flystrike prevention is AWI's top RD&E priority
- Since 2001 AWI has invested \$59M in health and welfare RD&E, including more than \$35M on Flystrike Prevention

BREECH STRIKE - A LONG AND COMPLEX ISSUE

- 1880s Highly wrinkled Vermonts were imported, fad ceased in 1905
 - 1890s Blowfly entered Australia, took 40 years to spread across all States
 - *1930s JWH Mules developed mulesing, removal of excess breech & tail wrinkle*
 - *1960s Pasture improvement & fertilisers increased stocking rate, worms and dags*
 - *1970s Mulesing widely adopted to control fly strike*
 - 1980s On going trials into alternatives to mulesing, tail docking and castration
 - 1980s Emergence of Animal Welfare and Animal Rights lobby groups
 - 2005 PETA targeted retailers of wool products and the Australian wool industry
 - *2006 AWI commenced the current Breech Strike RD&E Program*
 - 2006 Pain relief first registered for mulesing
 - 2015 Flystrike costs growers \$173M per year (worms \$436M per year)
- } 40yrs

AWI BREECH STRIKE RD&E PROGRAM

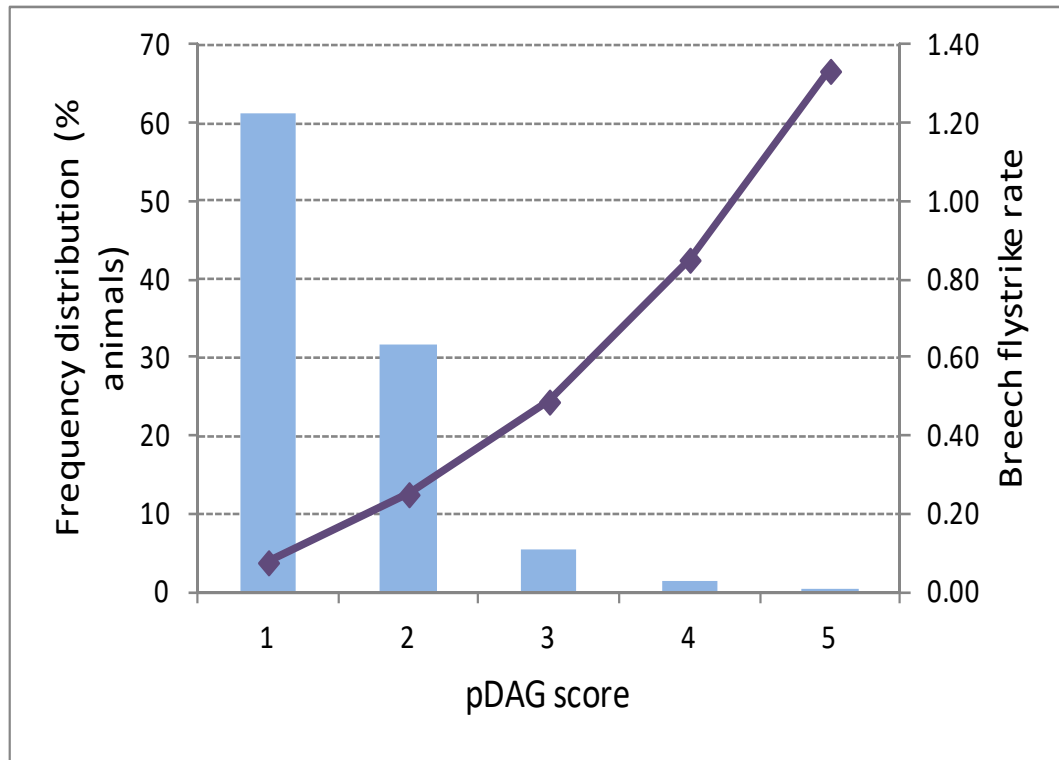
5 Key Areas

- 1) **Breeding and Selection**
- 2) **Breech Modification**
- 3) **Improved Management Practices**
- 4) **Wool Grower Industry & Domestic Extension**
- 5) **International Supply Chain Communication**



The key messages on each slide are bolded

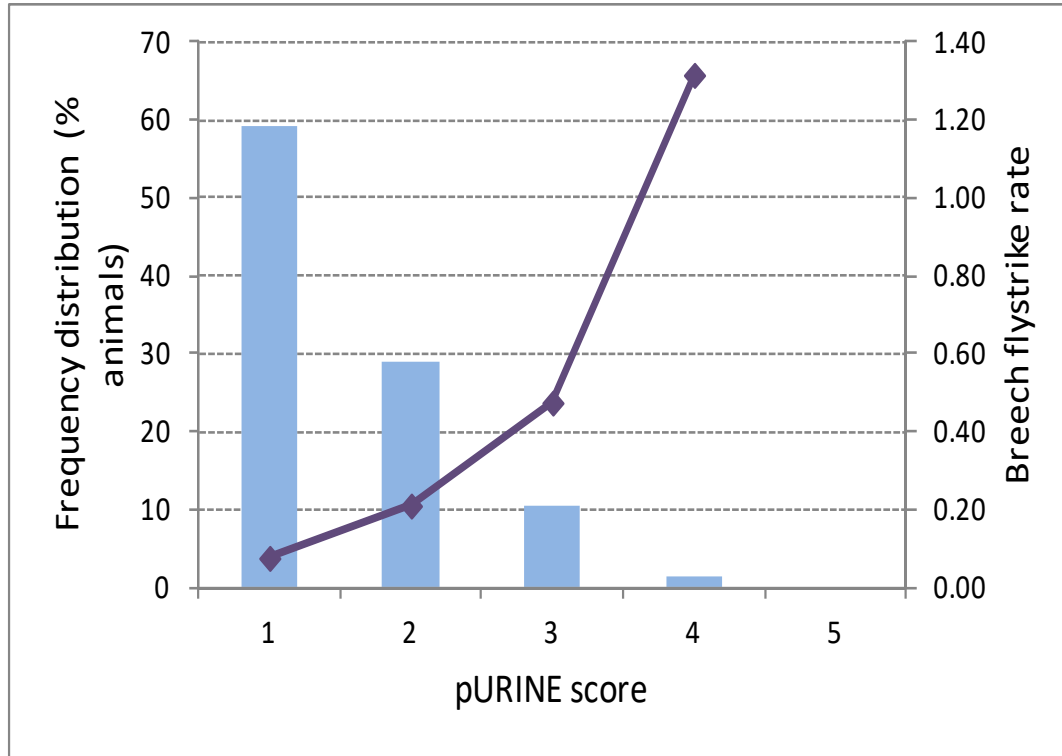
THE LEADING CAUSES OF BREECH STRIKE - DAGS



Risk of Breech Strike increases with increasing dags

Source: AWI Breeding for Breech Strike Resistance Project, CSIRO Armidale 2005 to 2014

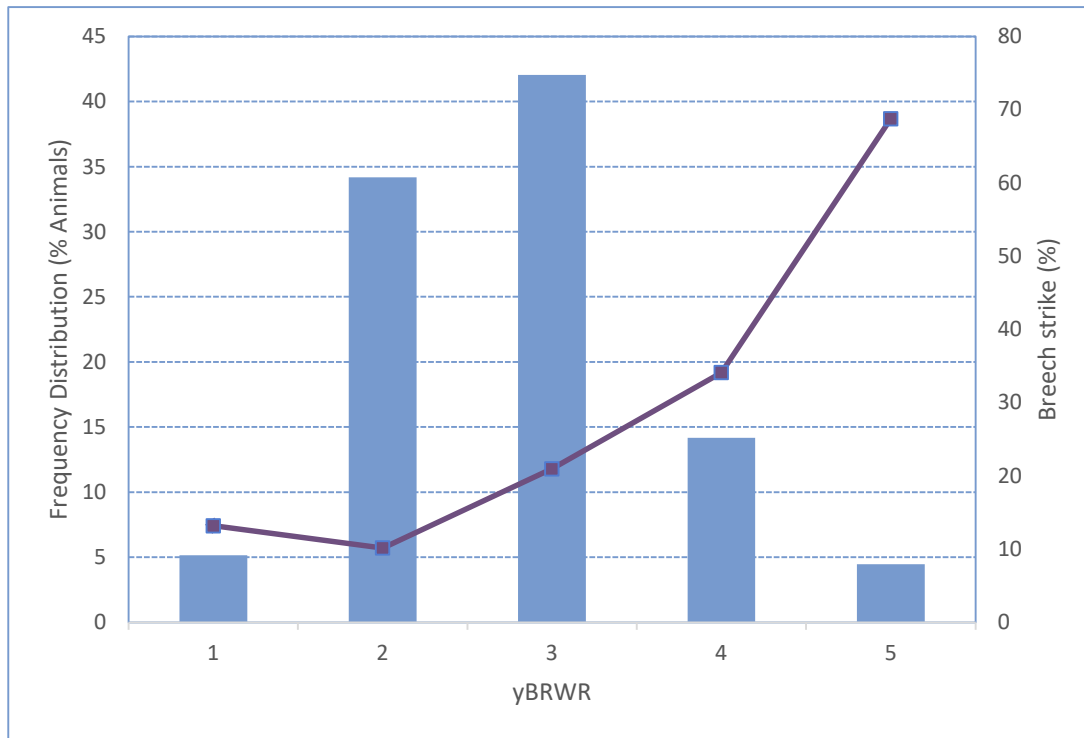
THE LEADING CAUSES OF BREECH STRIKE – URINE STAIN



Risk of Breech Strike increases with increasing Urine Stain

Source: AWI Breeding for Breech Strike Resistance Project, CSIRO Armidale 2005 to 2014

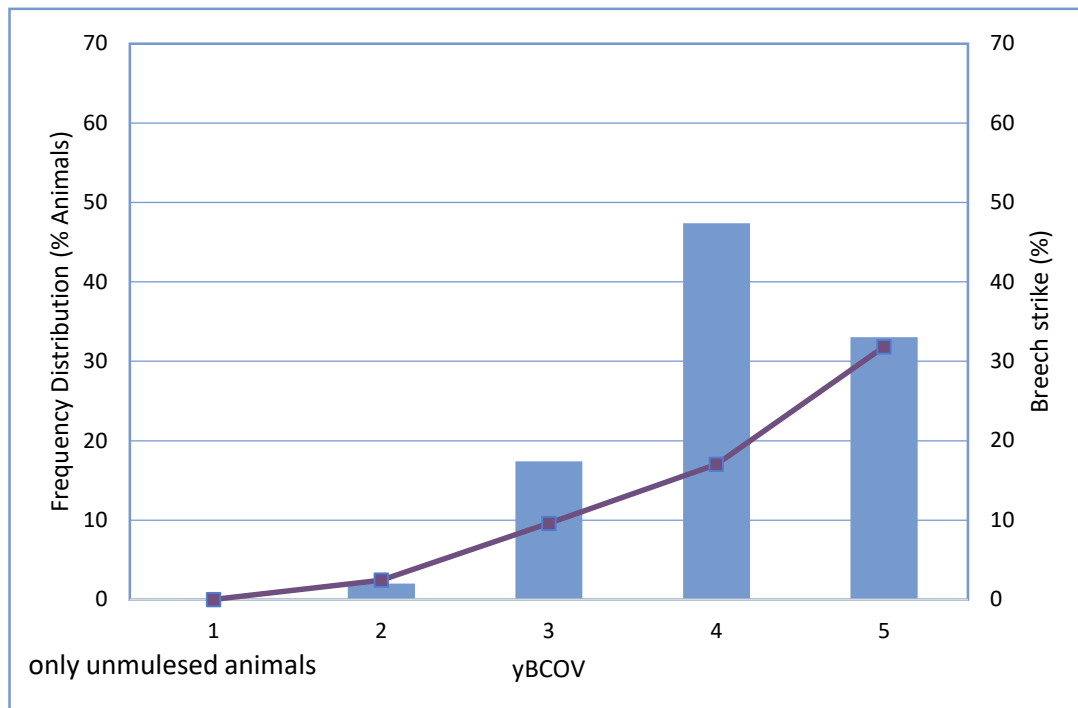
THE LEADING CAUSES OF BREECH STRIKE – BREECH WRINKLE



Risk of Breech Strike increases with increasing breech wrinkle

Source: AWI Breeding for Breech Strike Resistance Project, CSIRO Armidale 2005 to 2014

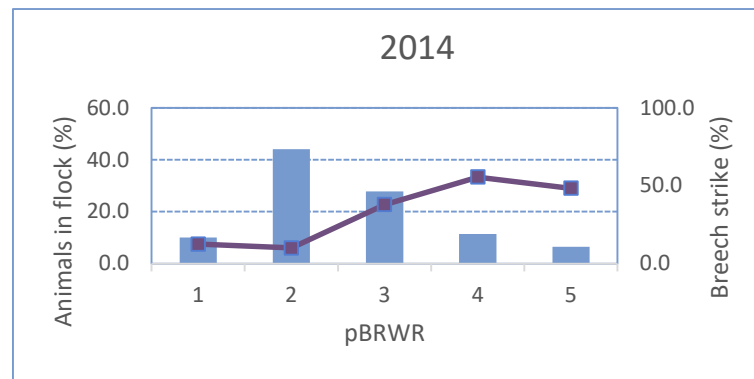
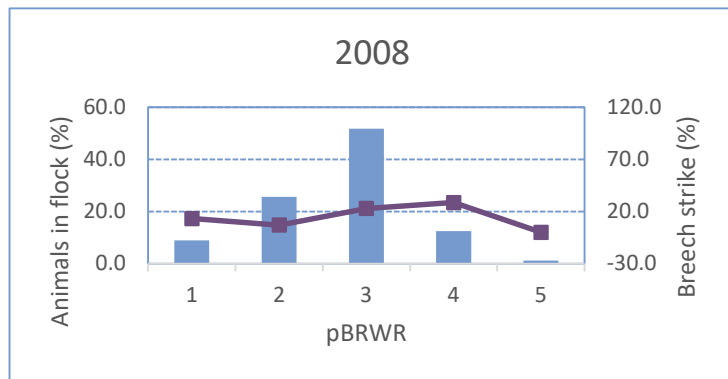
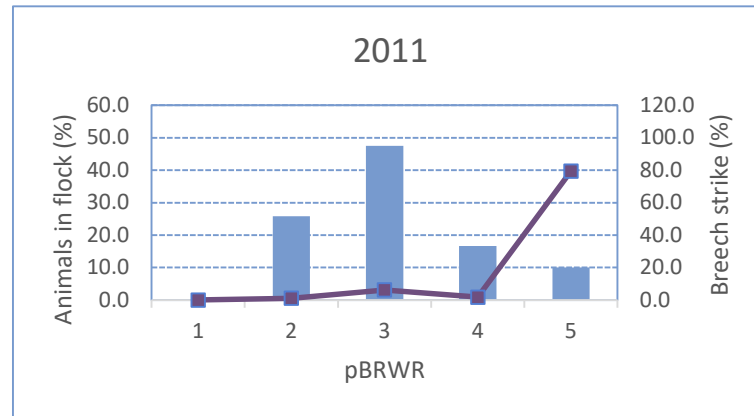
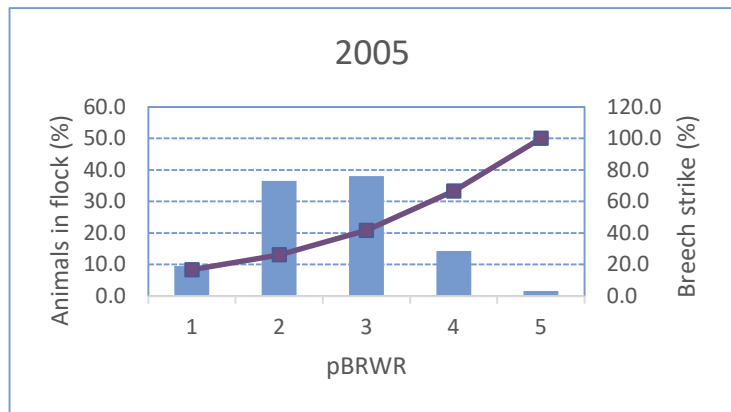
THE LEADING CAUSES OF BREECH STRIKE – BREECH COVER



Risk of Breech Strike increases with increasing breech cover

Source: AWI Breeding for Breech Strike Resistance Project, CSIRO Armidale 2005 to 2014

STRIKE IS VARIABLE BETWEEN YEARS

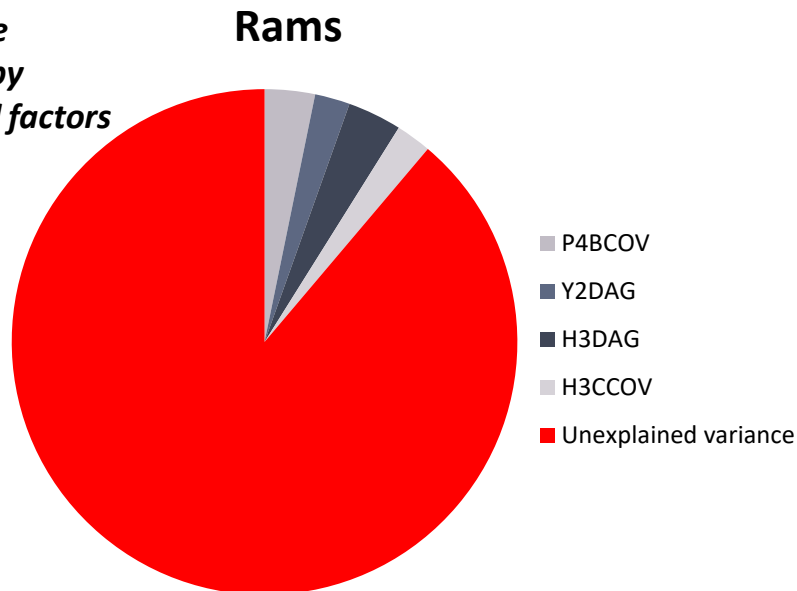


The risk of breech strike varies between seasons

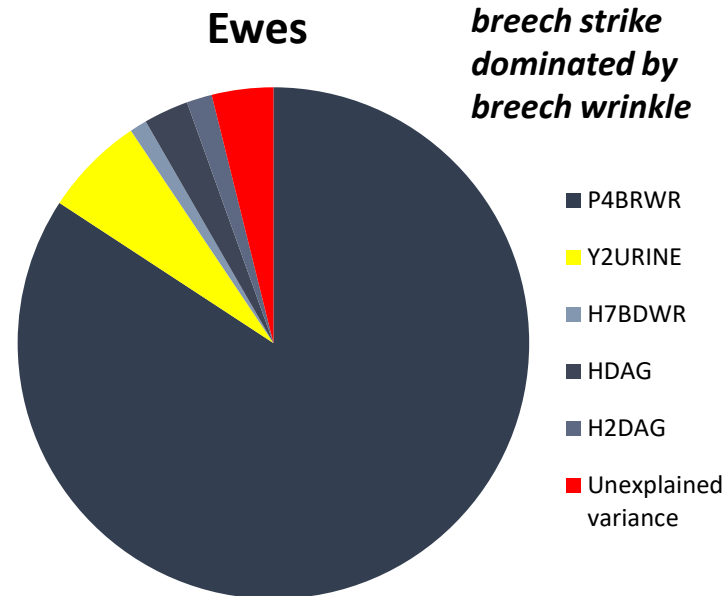
Source: AWI Breeding for Breech Strike Resistance Project, CSIRO Armidale 2005 to 2014

FACTORS EXPLAINING THE VARIATION IN BREECH STRIKE ON INDIVIDUAL SHEEP FROM WEANING TO HOGGET AGE IN CRUTCHED SHEEP (2010-2013)

*Variation in ram
breach strike
dominated by
unexplained factors*



*Variation in ewe
breach strike
dominated by
breach wrinkle*



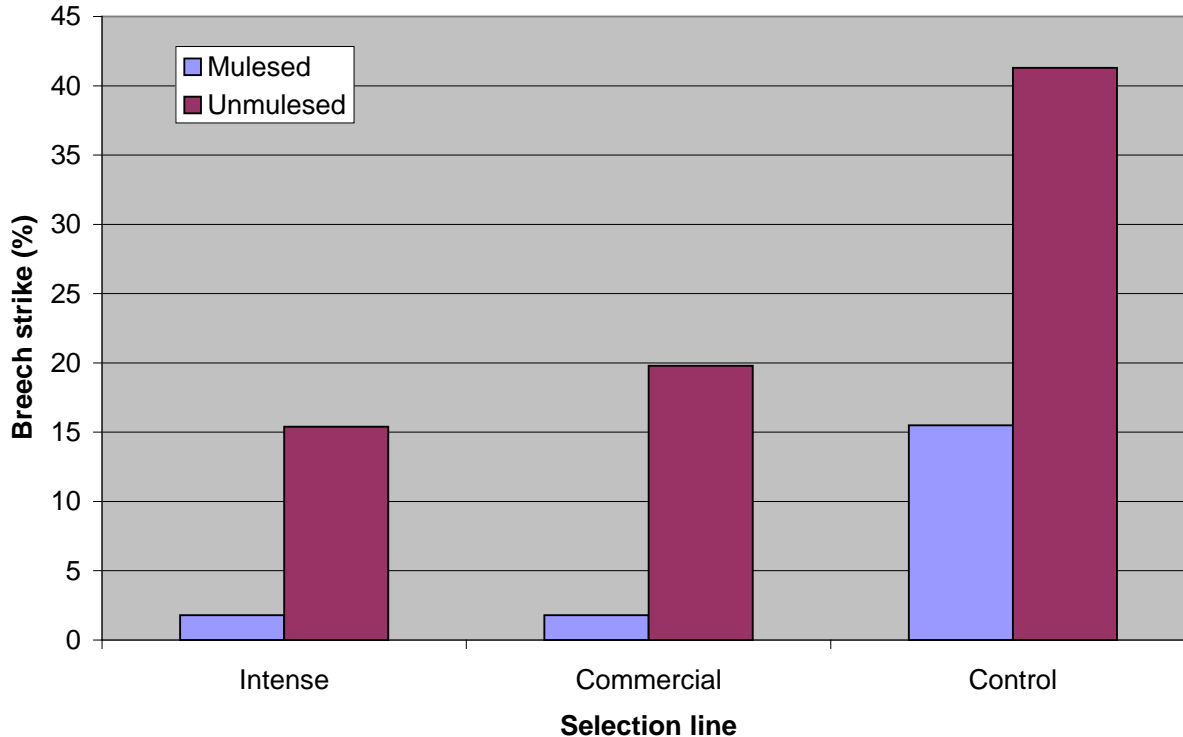
Source: AWI Breeding for Breach Strike Resistance Project, DAFWA Mt Barker 2010 to 2013

EFFECT OF MULESING ON WEANER BREECH STRIKE RATES

Intense Line Rams & ewes selected for low risk of breech strike on visual traits

Commercial Line Only rams selected

Control Line Random selection for both rams & ewes



Mulesing had a major impact on reducing breech strike with large reductions in strike in each selection line.

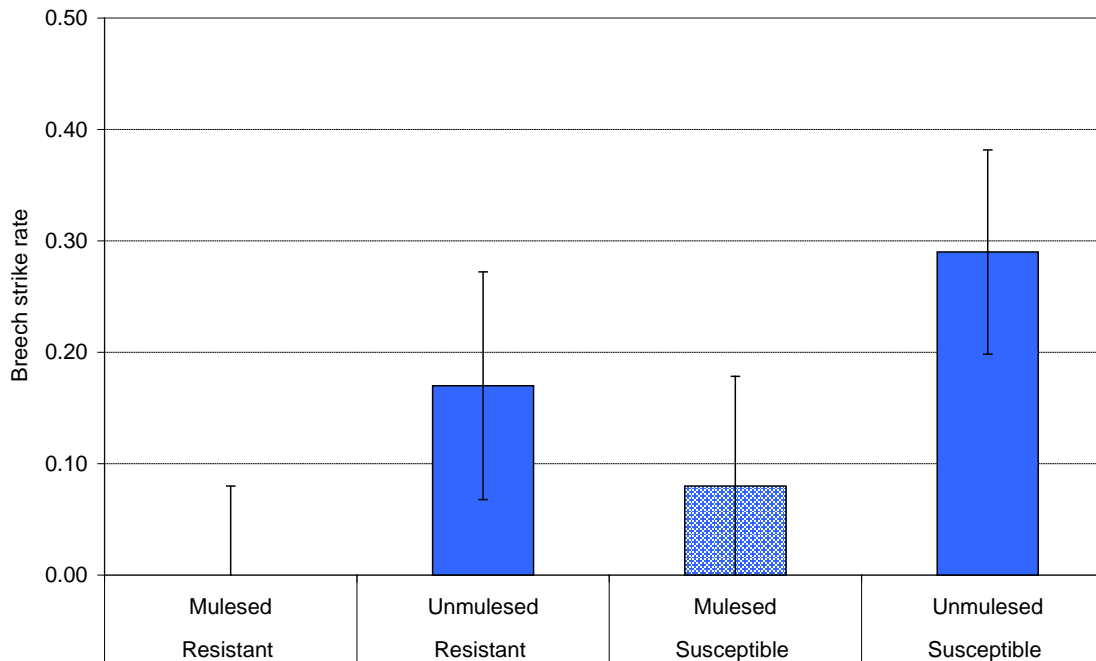
Mulesing reduced breech strike by 90%

Breeding had a major impact on reducing breech strike. Mulesed “control line” similar to unmulesed “intense line”

Source: AWI Breeding for Breech Strike Resistance Project, CSIRO Armidale 2005 to 2009

EFFECT OF MULESING ON BREEDING EWE BREECH STRIKE RATES

Mulesing sheep bred to be resistant, is very effective in reducing strike to very low levels



From a range of trials; mulesing reduces starting wrinkle by 1.0 score, urine by 0.5 score and dags 0.4 score
(Source; CSIRO Armidale & Clip trials)

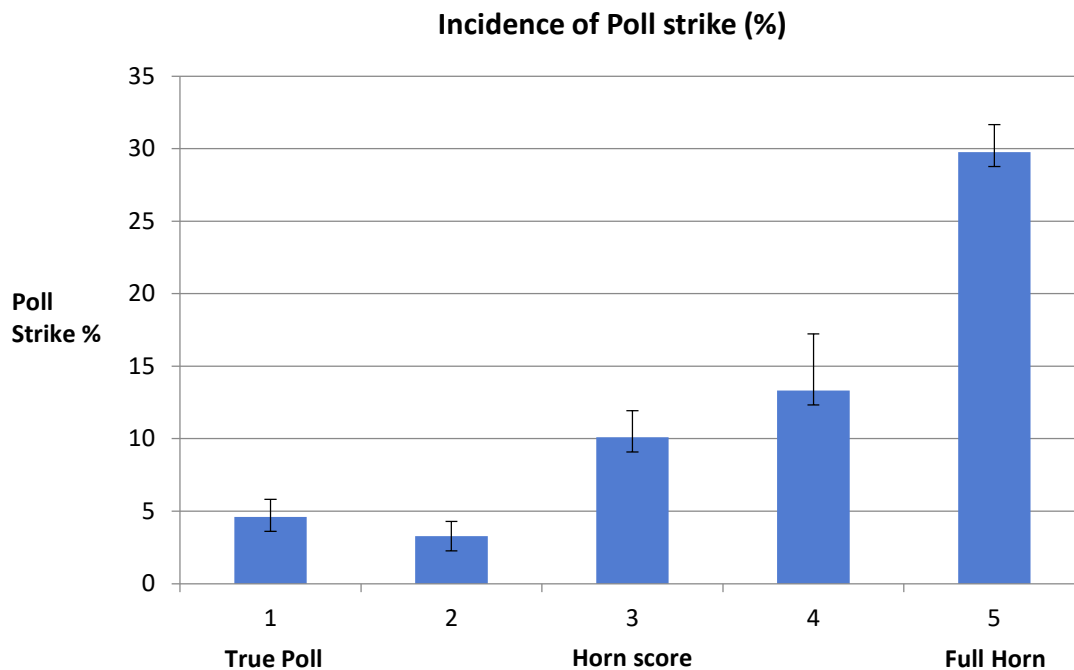
Every 0.1 reduction in starting or natural breech score improves welfare

Every 0.1 reduction in urine stain and dags reduces dark fibre contamination

Selection line and mulesing group effects on breech strike rate in breeding ewes in 2011-12

Source: AWI Breeding for Breech Strike Resistance Project, CSIRO Armidale 2005 - 2014

EFFECT OF HORNS ON POLL STRIKE

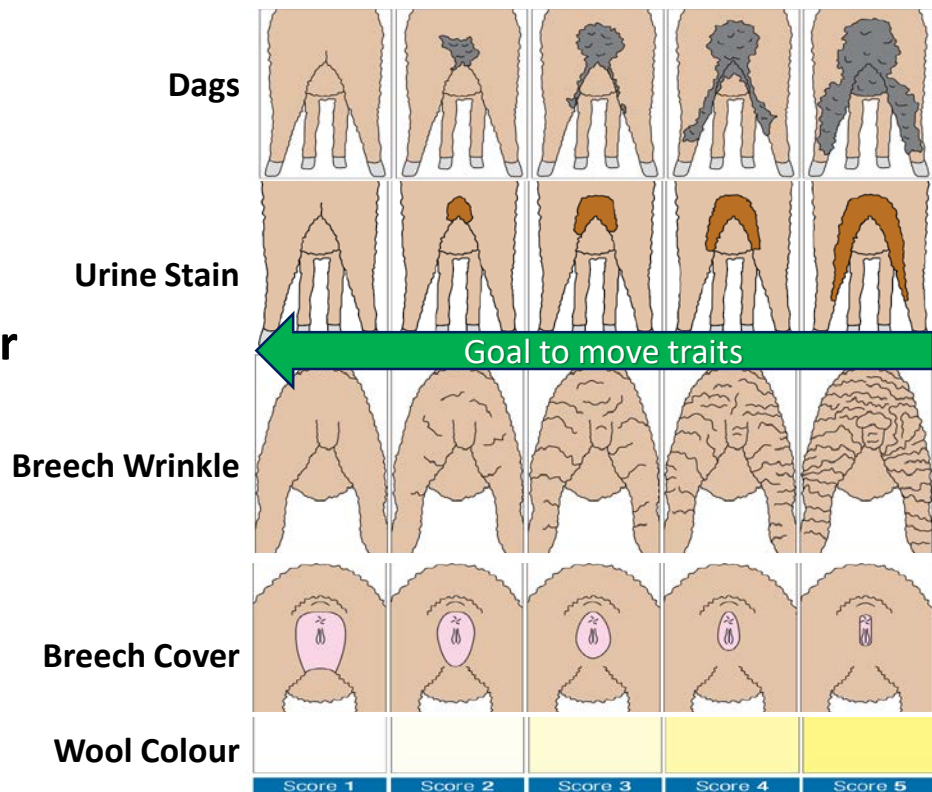


The risk of poll strike is lower with polled rams

Source: AWI Breeding for Breech Strike Resistance Project, DAFWA Mt Barker 2005 to 2014

HOW WOOLGROWERS SEEK TO REDUCE RISK OF FLYSTRIKE

Key
indicator
traits



Breech Strike is reduced by

1. Mulesing; once in a lifetime

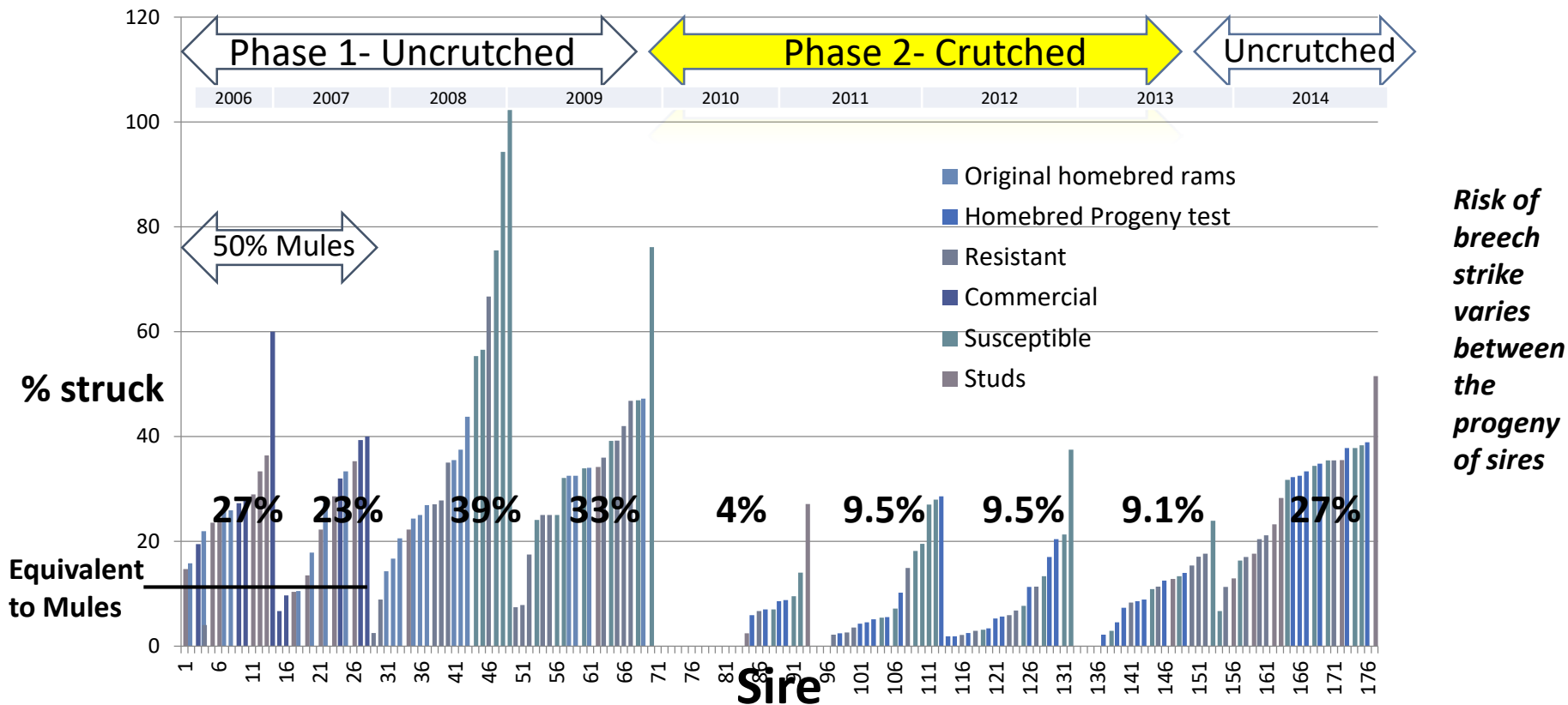
2. Improved worm control –less dags; drenching up to five times per year

3. Shearing and Crutching –removing breech wool; 2 to 4 times per year

4. Use of prevention chemicals; –up to 3 times per year

5. Sheep Selection & Breeding –long term but permanent gain

Large Differences in Breech Strike Between Sire Progeny Groups - Mt Barker DAFWA



CONSEQUENCE OF BREEDING FOR LOWER WRINKLE

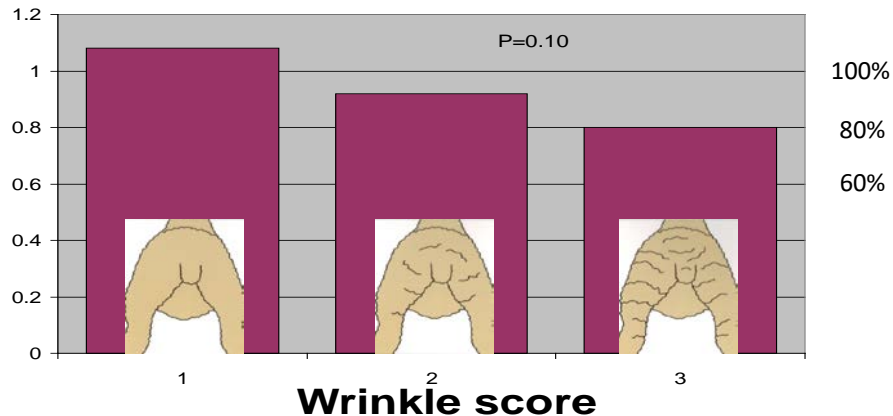
- As breech wrinkle decreases, fleece weight also tends to decrease
 - The correlation of +0.4 is defined as being “moderate” (> 0.5 is high, < 0.3 is low)
 - The correlation between Fibre Diameter and Fleece Weight is also 0.4
 - While generally higher fleece weights are associated with higher wrinkle, the moderate correlation means that ***there are some animals that have high fleece weight with low wrinkle which are strongly preferred*** but there are also low fleece weight animals with high wrinkle (not preferred)
 - Lower fleece weight is the key financial consequence associated with selecting for lower wrinkle breech strike resistant animals

Source: Breeding for Breech Strike Resistance CSIRO Armidale

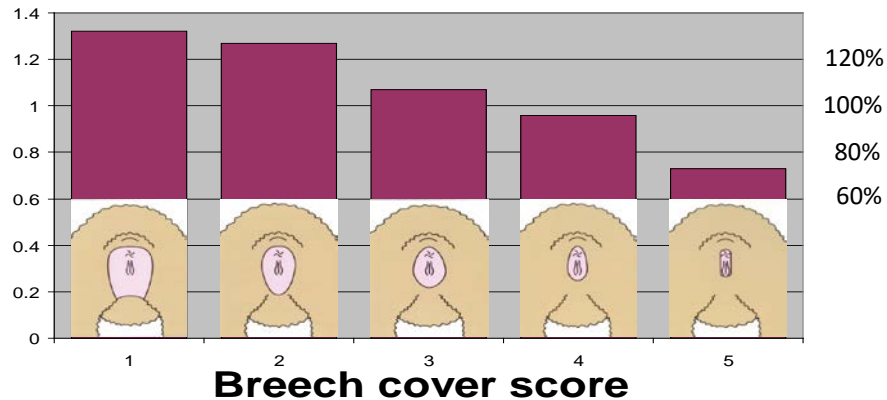
CONSEQUENCE OF BREEDING FOR LOWER WRINKLE

***Within a flock
lower wrinkle
and breech cover
increases the
number of lambs
weaned***

Lambs Weaned
per Ewe Joined



Lambs Weaned
per Ewe Joined



Source: Breeding for Breech Strike Resistance Mt Barker DAFWA
(P=0.10, 10% likely that result due to random chance, 90% likely result is real)

SHEEP SELECTION; VISUAL, RAW DATA AND / OR BREEDING VALUES

Lower breech trait scores can be achieved through use of 1) visual selection, 2) visual selection with raw data or 3) visual selection with Breeding Values.

- ***Visual selection and raw data have advantages for low cost, within flock or mob assessments of key traits that are easy to visually assess and have high heritability.***
- Visual selection at young ages is quick and removes management culls (miss-mothered, diseased and complete outliers).
- Most ram breeders visually reclass stud ewes each year; very few take annual objective measurements of fleece weight, fibre diameter or body weight. Care needs to be taken when reclassing mixed aged ewes not to over promote dry and single bearing ewes and penalise twin bearing ewes.
- Productivity into older age (longevity) tends to be a trait better achieved by use of annual visual assessment, few breeders take objective measurements at adult ages.

COMPARING SHEEP; VISUAL, RAW DATA AND / OR BREEDING VALUES

Visual selection with Breeding Values are more expensive but have benefits where:

- selecting for a large number of traits, particularly where there are a number of antagonistic traits (improvement in one trait is normally associated with a negative change in another trait) such as Wrinkle and Fleece Wt
- traits are not easy to visually assess (Muscle, Fat, Fibre Diameter, Worms)
- key traits have low heritability (Fertility, Worms, Dags)
- comparing animals with progeny across sites

Care is needed when using any selection method (visual, raw data, breeding values) so the down sides of each can be managed and the upsides taken advantage of.

A “balanced” approach is preferred by all, but there are differing views on the optimal balance of the types of assessment in a “balanced” approach.

SHEEP SELECTION; VISUAL, RAW DATA AND / OR BREEDING VALUES

Breeding Value technology uses link sires between sites and between years within each site, to remove environmental factors that can cause differences in actual production.

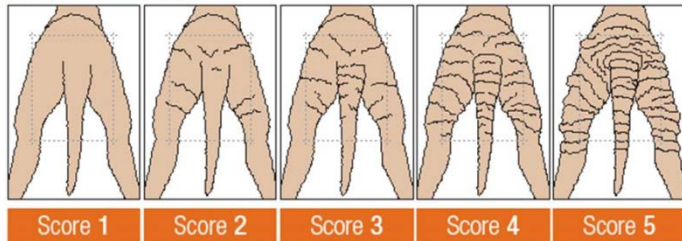
- The base year for the breech traits is 2000, and 1990 for other traits.
- Merino Breeding Values, come from a subset (c35%) of Merino Ram breeders. They tend to be larger breeders & major semen sellers who can justify the additional cost.
- Care is needed for a) the “difficult” to measure and analyse traits, ie Adult age traits, Staple Strength, Fertility, Dags, Worm Resistance and b) sheep types that are slower to mature with lower fleece weights & may earn style premiums in the right environment.
- There are ongoing improvements to the analysis, index models and assumptions.
- All Dohne Studs are involved in Breeding Values, so the trend data is very representative of the Dohne Breed.

BREEDING – PROGRESS IS SLOW BUT PERMANENT

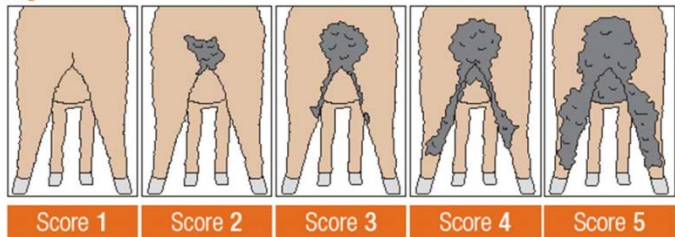
- Selecting for low breech scores is correlated with negative impacts on wool production; but there are low wrinkle animals with high fleece weights.
- Selection for lower breech trait scores and high wool production is slow but permanent.
- Australian Sheep Breeding Values (ASBVs) for the key breech traits were released in 2009 by the national sheep evaluation service “Sheep Genetics”. They can assist breeders to find and breed productive sheep with low wrinkle, cover, and dags.
- ***Medium wool Merinos are generally found in low rainfall areas and have lower wrinkle, less cover and more variation, which means faster genetic progress is possible.***
- ***Super Fine and Fine Merinos are generally found in high rainfall areas, and have higher wrinkle more cover with less variation, which will result in slower genetic progress.***
- ***Breeding for lower dags is difficult and slow in all Merino types.***

TARGETS TO MINIMISE BREECH STRIKE (SIMILAR TO MULESING)

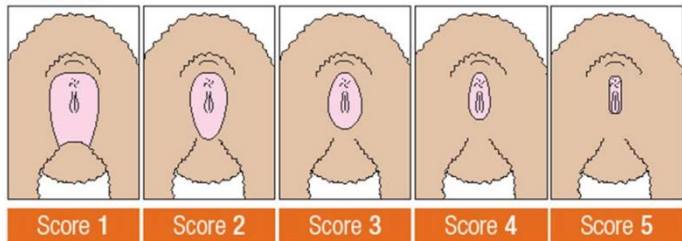
Breech wrinkle – Lambs



Dag



Breech cover



During the Fly Risk Season, need every sheep

- **Breech Wrinkle** **Score 2 or less**
- **Dags** **Score 2 or less**
- **Urine Stain** **Score 2 or less**
- **Breech Cover** **Score 3 or less**

(Breeding for Breech Strike Resistance Project CSIRO Armidale & DAFWA Mt Barker)

How?

Mulesing

(Alternatives to Mulesing)

Extra crutching

Accelerated Shearing

Good adult worm Control

Stockmanship / Nutrition

Breeding

If still too high, need chemical control

BREECH WRINKLE – TARGET ASBVs



The Wrinkle Breeding Value required to produce sheep with a **natural** low risk of strike and low reliance on chemical (all progeny breech wrinkle 2 Score or less) depend on;

- climate, (cold wet & worms v mild dry & no worms)
- pastures, (protein levels and months of green feed)
- management, (double crutching, animal health program, condition score).. but generally:

<i>“Nutritional” / Fly Risk</i>	<i>Target ASBV</i>
<i>Higher</i>	<i>c < -1.0 to -1.2</i>
<i>Moderate</i>	<i>c < -0.6 to -0.8</i>
<i>Lower</i>	<i>c < -0.3 to -0.4</i>

ASBVs trait definitions for following slides

<u>YWT</u>	<u>YEMD</u>	<u>YFAT</u>	<u>YCFW</u>	<u>AGFW</u>	<u>YSL</u>	<u>YFD</u>	<u>YWEC</u>	<u>NLW</u>	<u>EBWR</u>	<u>EBCOV</u>	<u>LDAG</u>	<u>MP+</u>
<u>Kg</u>	<u>mm</u>	<u>mm</u>	<u>%</u>	<u>%</u>	<u>mm</u>	<u>-</u>	<u>%</u>	<u>%</u>	<u>Sc</u>	<u>Sc</u>	<u>Sc</u>	<u>Index</u>
YWT Yearling Body Weight												
		YEMD Yearling Eye Muscle Depth										
		YFAT Yearling Fat										
			YCFW Yearling Clean Fleece Weight									
				AGFW Adult Greasy Fleece Weight								
					YSL Yearling Staple Length							
						YFD Yearling Fibre Diameter						
							YWEC Yearling Worm Egg Count					
								NLW Number of Lambs Weaned				
									EBWR Early Breech Wrinkle			
										EBCOV Early Breech Cover		
											LDAG Late Dags	
												MP+ Merino Prod Index
												DP+ Dual Purpose Index
												SF+ Super Fine Index

<u>Merino Stud</u>	AI Sires	Mules	<u>YWT</u>	<u>YEMD</u>	<u>YFAT</u>	<u>YCFW</u>	<u>AGFW</u>	<u>SL</u>	<u>YFD</u>	<u>YWEC</u>	<u>NLW</u>	<u>EBWR</u>	<u>EBCOV</u>	<u>LDAG</u>	<u>MP+</u>
	Each stud	Status	<u>Kg</u>	<u>mm</u>	<u>mm</u>	<u>%</u>	<u>%</u>	<u>mm</u>	<u>-</u>	<u>%</u>	<u>%</u>	<u>Sc</u>	<u>Sc</u>	<u>Sc</u>	<u>Index</u>
<u>Average</u>	7	NM	9	2.3	1.2	15	5	17	1.6	-18	4	-1.2	-0.6	-0.2	119
<u>ASBVs for</u>	9	NM	12	2.8	1.4	18	3	25	0.4	-5	5	-1.0	-1.3	0.2	137
<u>Semen Sires</u>	11	NM	9	2.5	1.2	19	4	11	0.7	0	1	-0.8	-1.2	0.3	125
Listed in Increasing Breech Wrinkle Order	2		3	0.1	-1.0	33	24	16	-0.9	-14	-1	-0.4	0.1	0.2	174
	4		7	-0.7	-0.3	24	17	13	-0.8	6	6	-0.3	-0.3	0.1	165
<i>There are key differences in "Fleece Weight for Wrinkle"</i>	3	NM	5	1.3	0.8	9	1	13	-1.2	-7	3	-0.3	-0.8	0.2	126
	6	NM	1	0.2	-0.1	13	7	9	-1.0	-4	2	-0.3	-0.1	0.0	139
	8		11	2.2	1.5	25	10	14	-0.1	-71	3	-0.2	-0.6	-0.1	157
	8		10	0.5	0.4	24	11	11	-1.8	-13	10	-0.1	-0.3	-0.1	184
There is less variation for cover and dags	7		6	0.6	0.1	27	15	7	-1.1	23	0	0.0	-0.2	0.2	161
	6		5	0.1	0.4	14	3	7	-1.6	-37	1	0.1	-0.1	0.0	148
	9		3	-0.1	0.0	14	7	2	-2.0	20	4	0.1	0.1	0.0	152
<i>Targets for Not Mulesed (NM) Wrinkle ASBVs, vary with climate and management</i>	8		7	-0.2	-0.2	23	15	13	-1.1	7	1	0.1	-0.2	0.2	158
	11		4	-0.9	-0.7	21	16	8	-1.7	20	-1	0.2	0.0	0.1	159
	3		4	-0.6	-0.6	20	14	5	-0.7	0	1	0.4	-0.1	0.1	144
	10		3	0.2	0.2	15	6	1	-3.0	-35	-2	0.6	0.1	0.0	158
<i>MERINOSELECT Website Jan 2017</i>	5		4	-0.9	-0.7	28	20	6	-2.5	0	-2	0.9	0.2	0.1	172

Current Merino Sire ASBVs, sorted into Fibre Diameter Ranges

Sire FD Range	No of Sires	AWT	YEMD	YFAT	YCFW	ACFW	YFD	YDCV	ACUR	YSL	YSS	YWEC	EBWR	EBCOV	LDAG	FP+	MP+	DP+
<-3.0	33	-1	-0.1	-0.2	-1	-2	-3.7	-0.7	6.5	-3.3	-1.9	-6	0.4	0.3	0.0	147	135	121
-2.9 to -2.5	54	1	-0.1	-0.3	9	6	-2.7	-0.4	1.9	1.0	-1.6	-5	0.3	0.1	0.0	147	147	139
-2.4 to -1.6	271	3	-0.3	-0.3	14	11	-1.9	-0.4	-3.0	4.1	-0.9	-0	0.2	0.1	0.0	143	149	143
-1.5 to -1.1	253	3	-0.1	-0.2	16	12	-1.3	-0.5	-5.9	6.0	0.0	-0	0.1	0.0	0.1	138	147	143
-1.0 to -0.5	296	5	0.3	0.1	17	12	-0.8	-0.7	-6.0	7.3	0.8	-4	-0.1	-0.1	0.1	133	144	145
-0.4 to +0.5	222	6	1.0	0.5	17	11	0.0	-0.9	-7.0	10.2	1.7	-11	-0.3	-0.3	0.1	126	139	147
>0.6	75	8	1.9	1.1	16	9	1.5	-0.8	-6.8	12.8	2.1	-13	-0.7	-0.5	0.1	101	119	138

Low micron sires have higher wrinkle and cover, & lower muscle and fat

There is a clear and large variation in “types” within the merino breed including wrinkle and cover, but there is less variation for dags

<u>Merino Sire</u>	<u>Sire</u>	<u>YWT</u>	<u>YEMD</u>	<u>YFAT</u>	<u>YCFW</u>	<u>YFD</u>	<u>YWEC</u>	<u>NLW</u>	<u>EBWR</u>	<u>EBCOV</u>	<u>LDAG</u>	<u>POLL</u>	<u>MP+</u>
<u>ASBVs;</u>	<u>Kg</u>	<u>mm</u>	<u>mm</u>	<u>%</u>	<u>-</u>	<u>%</u>	<u>%</u>	<u>Sc</u>	<u>Sc</u>	<u>Sc</u>			<u>Index</u>
<u>Search Criteria</u>	Sire A	12	-0.1	-0.1	32	0.0		8	-1.0	-0.1	0.0	PH	182
<u>Trait Leaders</u>	Sire B	9	-0.9	-0.4	27	-1.2			-1.1	-0.1	0.0	PH	177
<u>(top 10%) for</u>	Sire C	12	2.1	0.9	23	-0.2	-39	12	-1.0	-1.5	0.0	PP	176
<u>1) Yearling Fleece Wt</u>	Sire D	8	-1.1	-0.1	31	-0.2	-57	3	-0.7	0.0	0.8	PP	172
<u>2) Wrinkle</u>	Sire E	7	-1.8	-0.5	23	-1.1	46		-1.1	-0.2	0.0		170
<u>3) Merino Prod + Index,</u>	Sire F	10	-0.6	-0.3	25	-1.0	26		-1.0		-0.2		170
<u>Listed in Index Order</u>	Sire G	6	-0.3	-0.3	23	-1.4	-14		-1.4	0.0	0.2	PP	169
<i>There are Medium Wool</i>	Sire H	6	0.0	-0.2	28	-1.3	-20	0	-1.3	-0.1	0.2	PH	168
<i>low wrinkle, high</i>	Sire I	11	2.5	1.5	27	0.0	-64	5	-0.7	-0.9	-0.3	PP	166
<i>Yearling CFW sires</i>	Sire J	10	0.2	0.1	26	0.0	4		-0.9	-0.1	-0.1		162
<i>There is a lack of low</i>	Sire K	4	-0.2	-0.2	25	-1.0	26		-1.0	0.0	0.0		160
<i>wrinkle Fine and Super</i>	Sire L	4	-0.7	0.0	26	-1.1			-0.9	-0.3		PH	159
<i>Fine Merino types</i>	Sire M	13	4.0	2.7	23	-0.3	-51		-1.5	-0.6	-0.2		157
<i>Current market demand</i>	Sire N	4	-0.2	-0.4	27	-1.5	-2	-7	-0.8	-0.1	0.1	PH	154
<i>is for Fleece Weight and</i>	Ave 14 sires	8	0.2	0.2	26	-0.7	-13	0	-1.0	-0.3	0.0		167
<i>Polls</i>	2015 Drop Ave	0.3	0.3	0.1	11	-1.0	-9	1	-0.1	-0.1	0.0		133
<i>MERINOSELECT Website Jan 2017</i>													

1) BREEDING

A HIGH PERFORMANCE LOW WRINKLE MEDIUM MERINO SIRE

Born July 2014

His sire had 372 progeny in 7 flocks

His dam had 7 progeny

Entered in Merino Lifetime Productivity Project - Pingelly WA 2017



Photo; Sire as a 3 year old

At Nov 2017
There are 293 Progeny in 6 Flocks

125 Measured to Yearling Age

An example of a productive ram with good welfare traits

Trait	BWT	AWT	YEMD	YFAT	YCFW	ACFW	YFD	YSL	YSS	YWEC	NLW	EBWR	EBCOV	LDAG	POLL	DP+ Index
ASBV	0.0	10	3.3	1.7	29	17	0.5	12	0	-67	6%	-0.9	-1.1	-0.3	PP	190
% tile	50%	1%	1%	1%	1%	20%	90%	10%	50%	1%	10%	5%	1%	5%		1%

<u>Merino Sires</u>	Sire	<u>YWT</u>	<u>YEMD</u>	<u>YFAT</u>	<u>YCFW</u>	<u>YFD</u>	<u>YWEC</u>	<u>NLW</u>	<u>EBWR</u>	<u>EBCOV</u>	<u>LDAG</u>	<u>POLL</u>	<u>FP+</u>
<u>ASBVs</u>		<u>Kg</u>	<u>mm</u>	<u>mm</u>	<u>%</u>	<u>-</u>	<u>%</u>	<u>%</u>	<u>Sc</u>	<u>Sc</u>	<u>Sc</u>		<u>Index</u>
	Sire A	5.1	0.6	1.0	10.6	-2.4	-57	0%	-0.5	0.0	-0.2		152
<u>Search Criteria</u>	Sire B	2.0	-0.5	-0.7	13.7	-2.6	-40	5%	-0.3	-0.1	0.1	HH	154
<u>Super Fine Type,</u>	Sire C	2.4	-2.3	-1.8	21.9	-2.5	19	11%	-0.1	0.4	0.2	HH	167
<u>Trait Leaders for</u>	Sire D	4.5	-2.0	-0.9	7.2	-3.7	12	-9%	0.0	0.1	0.4		160
<u>Fibre Diameter</u>	Sire E	3.6	0.8	0.0	11.8	-2.8	-26	-2%	0.0	0.3	-0.1	HH	153
<u>& FP+ Index</u>	Sire F	-1.9	-0.3	-0.4	8.7	-2.6	-48	-10%	0.1	0.2	0.0	PH	152
Listed in Increasing Wrinkle Order	Sire G	3.4	-0.5	0.0	2.2	-2.6	60	-1%	0.2	0.2	0.6	PH	146
	Sire H	2.1	-0.5	-0.4	6.7	-3.2	-36	0%	0.2	0.1	0.0		150
<i>Only 3 sires are negative for wrinkle and 2 for cover and dags. Most are horned sires</i>	Sire I	-1.5	-0.9	-0.8	3.7	-4.1	-46	0%	0.3	0.2	0.3	HH	161
	Sire J	1.1	1.5	0.8	15.2	-2.7	-72	-10%	0.3	-0.2	-0.3	HH	162
	Sire K	0.8	0.2	-0.1	10.5	-3.0	33	0%	0.4	0.4	0.2	HH	154
	Sire L	3.9	0.8	-0.2	0.4	-3.3	-28	-2%	0.4	0.3	0.2		146
	Sire M	3.4	0.3	0.0	20.2	-3.2	-27	-2%	0.4	0.0	-0.1	HH	162
<i>Breeding will take a long time for Super Fine Types</i>	Sire N	-0.7	0.1	-0.2	6.1	-3.5	-13	0%	0.4	0.3	0.1	HH	148
	Ave of 54	1.2	-0.2	-0.3	9.9	-3.1	-17	0%	0.6	0.2	0.1		155

<u>Merino Breed - ASBV Trends</u>	Birth	<u>YWT</u>	<u>YEMD</u>	<u>YFAT</u>	<u>YGFW</u>	<u>AGFW</u>	<u>YFD</u>	<u>YWEC</u>	<u>NLW</u>	<u>EBWR</u>	<u>EBCOV</u>	<u>LDAG</u>	<u>MP+</u>
	Year	<u>Kg</u>	<u>mm</u>	<u>mm</u>	<u>%</u>	<u>%</u>	<u>-</u>	<u>%</u>	<u>%</u>	<u>Sc</u>	<u>Sc</u>	<u>Sc</u>	<u>Index</u>
	2003	0.4	0.2	0.0	0.2	-0.4	-1.2	-2.2	-1.7	-0.1	-0.1	0.1	117
	2004	0.8	0.2	0.0	0.6	-0.2	-1.3	-1.6	-1.7	-0.1	-0.1	-0.0	118
<u>128,589</u>	2005	1.1	0.2	0.0	1.7	0.4	-1.2	-0.4	-2.1	-0.2	-0.1	-0.0	120
<u>2015 progeny</u>	2006	1.5	0.2	0.0	2.4	0.8	-1.2	-4.8	-2.2	-0.1	-0.0	-0.0	121
Limitations to data, but it is the best available, more work needed on indexes and lifetime data	2007	1.6	0.2	0.0	3.0	1.0	-1.2	-5.8	-1.7	-0.1	-0.1	0.0	123
	2008	1.8	0.3	0.0	3.8	1.7	-1.2	-4.8	-1.7	-0.1	-0.0	0.0	124
	2009	2.2	0.3	0.0	3.9	1.7	-1.2	-8.4	-1.8	-0.1	-0.1	0.0	125
	2010	2.5	0.4	0.0	5.0	2.6	-1.1	-6.7	-2.4	-0.1	-0.0	-0.0	126
	2011	2.7	0.3	0.0	5.0	2.5	-1.1	-8.9	-1.9	-0.2	-0.1	0.0	126
<i>Progress in:</i>	2012	2.8	0.3	0.0	5.2	2.9	-1.1	-8.7	-2.3	-0.1	-0.1	0.0	128
<i>Fleece Weight</i>	2013	2.9	0.3	0.0	6.6	3.9	-1.1	-9.9	-1.8	-0.1	-0.1	0.0	130
<i>Worm Egg Count</i>	2014	3.1	0.3	0.0	7.2	4.3	-1.0	-11.1	-1.1	-0.1	-0.1	0.0	131
<i>Production Index</i>	2015	3.6	0.3	0.0	8.6	5.4	-1.0	-13.3	-0.6	-0.1	-0.1	0.0	134
	2016	4.3	0.3	0.0	10.2	6.1	-1.0	-17.0	-0.3	-0.2	-0.1	-0.0	138
	Trend	Up	Steady	Steady	Up	Up	Steady	Down	Steady	Steady	Steady	Steady	Up
					✓	✓		✓					✓
<i>MERINOSELECT Website June 2017</i>													

MERINO BREED - ASBV GENETIC TRENDS

Based on approx. 120,000 progeny (2015) over the last 12 years (2003 - 2015);

- Yearling Body Weight is up 3kg
- Yearling Fleece Weight is up 8%, Adult Fleece Weight is up 6%
- Worm Egg Counts are down 15% points (-2% to -13%)
- Merino Production Plus Index is up 17 points
- Muscle, Fat, Fibre Diameter, Fertility, Wrinkle Cover and Dags are Steady

The breed average hides trends that are occurring within the 3 main Merino sub types.

Neonatal Mortality cost sheep producers \$540Mpa, Worms \$436Mpa, Dystocia \$219Mpa, Weaner ill-thrift and mortality \$188M, and Flystrike \$173M per year (MLA 2015)

See MERINOSELECT website for explanation of the Dual Purpose, Merino Production and Fibre Production Indexes

MERINO BREED TYPES

The Merino Breed consists of a range of “Merino types” that have been bred for different market uses and environments, mostly based on rainfall. Today there is less distinction between the traditional types and new ‘Non Mules’ types are evolving.

2015 drop average ASBVs for the 3 Traditional Merino Types.

Year	<u>YWT</u>	<u>YEMD</u>	<u>YFAT</u>	<u>YGFW</u>	<u>AGFW</u>	<u>YFD</u>	<u>YCUR</u>	<u>YSL</u>	<u>YSS</u>	<u>YWEC</u>	<u>NLW</u>	<u>EBWR</u>	<u>EBCOV</u>	<u>LDAG</u>
2015	Kg	mm	mm	%	%	um	Deg/mm	mm	N/Ktex	%	%	Sc	Sc	Sc
Medium	4.9	0.4	0.1	10.1	6.9	-0.6	-6.2	9.0	0.7	-12.8	1.2	-0.5	-0.3	-0.1
Fine	3.6	0.3	0.0	9.9	6.5	-1.0	-3.4	6.0	0.4	-11.5	1.3	-0.1	-0.1	0.0
SuperFine	1.3	0.1	0.0	2.2	-0.6	-1.9	3.5	-0.2	0.1	-16.7	-4.8	0.1	0.1	0.0

However there are still large differences between the 3 types; in fleece weight, fibre diameter, staple length, fertility, breech wrinkle and cover. ***The trends within each type reflect enterprise returns and the trends in wool, lamb, mutton & restocker markets.***

<u>Medium Merino Breed - ASBV Trends</u>	Birth	<u>YWT</u>	<u>YEMD</u>	<u>YFAT</u>	<u>YGFW</u>	<u>AGFW</u>	<u>YFD</u>	<u>YWEC</u>	<u>NLW</u>	<u>EBWR</u>	<u>EBCOV</u>	<u>LDAG</u>	<u>DP+</u>
<u>31,091 2015 progeny</u>	Year	<u>Kg</u>	<u>mm</u>	<u>mm</u>	<u>%</u>	<u>%</u>	-	<u>%</u>	<u>%</u>	<u>Sc</u>	<u>Sc</u>	<u>Sc</u>	<u>Index</u>
	2003	2.6	0.1	0.0	7.8	5.4	-0.5	9.6	0.3	-0.3	-0.1	0.1	126
	2004	3.4	0.4	0.1	7.1	4.5	-0.4	6.5	1.0	-0.4	-0.1	0.1	128
	2005	3.3	0.3	0.1	7.3	4.9	-0.5	-1.6	0.7	-0.3	-0.1	-0.0	127
	2006	4.0	0.4	0.1	7.2	4.5	-0.6	-12.6	2.6	-0.3	-0.1	0.1	130
	2007	3.9	0.5	0.1	7.3	4.2	-0.5	-6.8	1.1	-0.3	-0.1	0.0	128
	2008	3.9	0.5	0.1	7.1	4.3	-0.6	-2.4	1.3	-0.3	-0.1	0.0	129
<i>Progress in:</i>	2009	4.2	0.4	0.1	7.6	4.6	-0.7	-9.0	0.2	-0.4	-0.1	0.0	130
<i>Fleece Weight</i>	2010	4.8	0.6	0.1	8.0	4.8	-0.7	-7.6	-0.1	-0.3	-0.1	-0.0	132
<i>Worm Egg Count</i>	2011	4.5	0.6	0.1	7.5	4.2	-0.8	-15.5	1.0	-0.4	-0.1	0.0	131
<i>Breech Wrinkle</i>	2012	4.7	0.5	0.1	8.2	4.7	-0.9	-19.8	1.4	-0.4	-0.1	0.0	134
<i>Breech Cover</i>	2013	4.4	0.4	0.1	8.8	5.5	-0.6	-16.7	0.9	-0.4	-0.2	-0.1	136
<i>Dual Purpose Index</i>	2014	4.4	0.4	0.1	8.9	5.7	-0.6	-18.3	2.0	-0.4	-0.2	-0.1	136
	2015	4.9	0.4	0.1	10.1	6.9	-0.6	-12.8	1.2	-0.5	-0.3	-0.1	139
	2016	5.4	0.4	0.1	11.7	7.5	-0.6	-18.4	0.9	-0.6	-0.3	-0.1	140
	Trend	Up	Steady	Steady	Up	Up	Steady	Down	Steady	Down	Down	Down	Up
					✓			✓		✓	✓	✓	✓
<i>MERINOSELECT Website June 2017</i>													

MEDIUM MERINO TYPE - ASBV GENETIC TRENDS

Based on approx. 30,000 progeny (2015) over the last 12 years (2003 - 2015)

- Yearling Body Weight is up 2%
- Yearling Fleece Weight is up 2%, Adult Fleece Weight is up 2%
- Worm Egg Counts are down 28% points from +9% to -13%
- Wrinkle is down 0.3 score, Cover is down 0.2 score, Dag is down 0.2 score
- Dual Purpose Plus Index is up 13 points
- Muscle, Fat, Fibre Diameter are Steady

There has been demand for a bigger, lower wrinkle, cover and dag, heavier cutting, more worm resistant, polled Medium Merinos which is well reflected in the trends.

There are studs within the type, that are making faster progress than the type average

<u>Fine Merino Breed - ASBV Trends</u>	Birth	<u>YWT</u>	<u>YEMD</u>	<u>YFAT</u>	<u>YGFW</u>	<u>AGFW</u>	<u>YFD</u>	<u>YWEC</u>	<u>NLW</u>	<u>EBWR</u>	<u>EBCOV</u>	<u>LDAG</u>	<u>MP+</u>
	Year	<u>Kg</u>	<u>mm</u>	<u>mm</u>	<u>%</u>	<u>%</u>	<u>-</u>	<u>%</u>	<u>%</u>	<u>Sc</u>	<u>Sc</u>	<u>Sc</u>	<u>Index</u>
	2003	0.7	0.1	-0.0	3.8	3.4	-1.1	-1.6	-2.1	-0.0	-0.1	0.1	123
	2004	1.2	0.1	-0.0	4.4	3.9	-1.1	-0.0	-2.4	-0.0	-0.1	-0.0	124
	2005	1.5	0.1	-0.0	5.5	4.2	-1.1	7.0	-1.9	-0.1	-0.1	-0.0	126
	2006	1.8	0.2	-0.0	6.2	4.5	-1.0	-1.2	-2.3	-0.1	-0.1	0.0	126
	2007	1.9	0.2	-0.0	6.5	4.7	-1.1	-3.0	-1.3	-0.1	-0.1	0.0	128
<i>Progress in:</i>	2008	2.1	0.2	0.0	7.3	5.0	-1.0	-3.1	-0.1	-0.1	-0.1	0.0	129
<i>Eye Muscle</i>	2009	2.5	0.3	0.0	7.1	4.6	-1.0	-3.9	0.5	-0.1	-0.1	-0.0	130
<i>Fleece Weight</i>	2010	2.6	0.3	0.0	7.4	4.9	-1.0	0.2	-1.4	-0.1	-0.1	-0.0	130
<i>Worm Egg Count</i>	2011	2.8	0.3	0.0	7.0	4.5	-1.0	-4.7	-1.1	-0.2	-0.1	-0.0	130
<i>Breech Wrinkle</i>	2012	2.9	0.3	0.0	7.3	5.1	-1.1	-4.1	-1.8	-0.1	-0.1	0.0	131
<i>Production Index</i>	2013	2.9	0.3	0.0	8.4	5.7	-1.0	-7.8	-0.6	-0.1	-0.1	-0.0	133
	2014	3.2	0.3	0.0	8.8	5.7	-1.0	-7.4	-0.3	-0.2	-0.1	0.0	134
	2015	3.6	0.3	0.0	9.9	6.5	-1.0	-11.5	1.3	-0.1	-0.1	0.0	137
	2016	4.6	0.3	0.0	12.1	7.5	-1.0	-15.1	0.5	-0.2	-0.1	-0.0	143
	Trend	Up	Up	Steady	Up	Up	Steady	Down	Up	Down	Steady	Steady	Up
			✓		✓	✓		✓	✓	✓			✓

FINE MERINO TYPE - ASBV GENETIC TRENDS

Based on approx. 70,000 progeny (2015) over the last 12 years (2003 - 2015)

- Yearling Body Weight is up 3%, Muscle is up 0.2mm
- Yearling Fleece Weight is up 6%, Adult Fleece Weight is up 3%
- Worm Egg Counts are down 13% points from -2% to -12%
- Wrinkle is down 0.2 score,
- Merino ProductionPlus Index is up 14 points
- Fat, Fibre Diameter, Breech Cover and Dag are Steady

There has been demand for bigger, lower wrinkle, heavier cutting, more fertile, worm resistant and polled Fine Merinos

There are studs within the type, that are making faster progress than the type average

<u>Super Fine</u>	Birth	<u>YWT</u>	<u>YEMD</u>	<u>YFAT</u>	<u>YGFW</u>	<u>AGFW</u>	<u>YFD</u>	<u>YWEC</u>	<u>NLW</u>	<u>EBWR</u>	<u>EBCOV</u>	<u>LDAG</u>	<u>FP+</u>
<u>Merino Breed -</u>	Year	<u>Kg</u>	<u>mm</u>	<u>mm</u>	<u>%</u>	<u>%</u>	<u>-</u>	<u>%</u>	<u>%</u>	<u>Sc</u>	<u>Sc</u>	<u>Sc</u>	<u>Index</u>
<u>ASBV Trends</u>	2003	-1.9	0.3	0.1	-10.2	-10.2	-2.0	-3.6	-2.0	-0.1	-0.0	0.0	116
	2004	-1.9	0.4	0.1	-10.1	-10.0	-2.0	-2.4	-2.8	-0.1	0.0	0.0	117
<u>18,658</u>	2005	-1.6	0.3	0.1	-9.0	-9.3	-2.0	-5.3	-3.5	-0.1	-0.1	0.0	119
<u>2015 progeny</u>	2006	-1.3	0.2	0.1	-7.3	-8.1	-2.0	-4.1	-4.8	-0.1	0.0	0.0	120
	2007	-0.8	0.2	0.0	-5.7	-7.3	-2.0	-4.5	-4.6	0.0	0.1	0.0	122
<i>Progress in:</i>	2008	-0.6	0.2	0.0	-5.1	-6.6	-2.0	-5.1	-5.1	0.0	0.1	0.1	123
<i>Fleece Weight</i>	2009	-0.4	0.1	0.0	-5.0	-6.4	-2.0	-10.6	-6.6	0.0	0.1	0.0	124
<i>Worm Egg Count</i>	2010	-0.4	0.1	0.0	-3.5	-4.9	-2.0	-13.7	-5.6	0.1	0.2	0.1	125
<i>Fibre Index</i>	2011	-0.2	0.1	0.0	-3.2	-4.7	-2.0	-9.1	-5.2	0.0	0.1	0.1	126
	2012	-0.2	0.1	-0.0	-4.0	-5.4	-2.0	-8.7	-5.4	0.0	0.1	0.0	126
	2013	0.3	0.1	-0.0	-1.2	-3.0	-1.9	-11.6	-4.7	0.1	0.1	0.0	127
	2014	0.5	0.1	-0.0	-0.3	-2.3	-1.9	-13.8	-3.9	0.1	0.1	0.0	129
	2015	1.3	0.1	0.0	2.2	-0.6	-1.9	-16.7	-4.8	0.1	0.1	-0.0	132
	2016	1.9	0.1	0.0	3.4	0.5	-1.9	-24.5	-1.7	0.1	0.1	-0.0	133
	Trend	Up	Steady	Steady	Up	Up	Steady	Down	Steady	Up	Steady	Steady	Up
					✓	✓		✓		✗			✓

SUPER FINE MERINO TYPE - ASBV GENETIC TRENDS

Based on approx. 18,000 progeny (2015) over the last 12 years (2003 - 2015)

- Yearling Body Weight is up 3%, Muscle is down 0.2 mm
- Yearling Fleece Weight is up 12%, Adult Fleece Weight is up 10%
- Worm Egg Counts are down 13% points from -3 to -16%
- Wrinkle is up 0.2 score, Cover is up 0.1 score
- Fibre Production Plus Index is up 16 points, Fat, Fibre Diameter, Dags are Steady

There has been a strong demand for heavier cutting Super Fine Merinos that are bigger and more worm resistant. The large increase in fleece weight has increased wrinkle.

There are studs within the type, that are making different and or faster progress than the type average. There are a large number of high profile Super Fine studs that are not members of MERINOSELECT. ***There is increased reliance on chemicals and or crutching to control breech strike in Super Fine Merinos.***

<u>Dohne Breed - ASBV Trends</u>	Birth	<u>YWT</u>	<u>YEMD</u>	<u>YFAT</u>	<u>YGFW</u>	<u>AGFW</u>	<u>YFD</u>	<u>YWEC</u>	<u>NLW</u>	<u>EBWR</u>	<u>EBCOV</u>	<u>LDAG</u>	<u>DP+</u>
<u>20,170 2015 progeny</u>	Year	<u>Kg</u>	<u>mm</u>	<u>mm</u>	<u>%</u>	<u>%</u>	<u>-</u>	<u>%</u>	<u>%</u>	<u>Sc</u>	<u>Sc</u>	<u>Sc</u>	<u>Index</u>
<i>Progress in: Eye Muscle Fleece Weight Worm Egg Count Fertility</i>	2003	1.3	0.3	0.0	0.9	0.1	-0.2	2.2	1.7	D O	D O	D O	108
	2004	1.4	0.3	0.0	0.5	-0.1	-0.3	2.4	0.5				108
	2005	1.7	0.3	0.0	0.9	0.2	-0.3	3.0	0.5				110
	2006	2.0	0.3	0.0	0.9	0.0	-0.3	3.4	1.1	N O	N O	N O	111
	2007	2.4	0.4	0.0	1.1	0.0	-0.4	3.0	0.6				112
	2008	2.7	0.4	0.1	1.4	0.2	-0.4	2.6	1.4				T
	2009	3.0	0.4	0.1	1.5	0.1	-0.4	3.3	1.0	M E A S U R E	M E A S U R E	M E A S U R E	114
	2010	3.1	0.5	0.1	1.8	0.3	-0.4	4.1	1.0				116
	2011	2.8	0.5	0.1	2.2	0.4	-0.3	5.7	1.4				116
	2012	3.1	0.6	0.1	2.5	0.4	-0.3	5.4	0.9				118
2013	3.4	0.6	0.1	3.1	0.6	-0.3	6.7	1.6	120				
2014	3.7	0.6	0.1	3.7	1.0	-0.3	6.0	2.1	122				
2015	4.0	0.7	0.1	4.4	1.3	-0.3	7.0	2.5	125				
Cannot compare with MERINOSELECT ASBVs	2016	4.6	0.7	0.1	5.2	1.6	-0.3	4.1	4.9	131			
	Trend	Up	Up	Steady	Up	Up	Steady	Steady	Up				Up
<i>DOHNE ANALYSIS June 2017</i>			✓		✓	✓			✓				✓

DOHNE TYPE - ASBV GENETIC TRENDS (cannot compare with MERINOSELECT data)

Based on approx. 20,000 progeny (2015) over the last 12 years (2003 - 2015)

- Yearling Body Weight is up 3%, Muscle is up 0.4 mm
- Yearling Fleece Weight is up 3%, Adult Fleece Weight is up 1%
- Worm Egg Counts are up 5% from +2 to + 7%
- Dohne Index is up 18 points
- Fat, Fibre Diameter are Steady

There has been demand for bigger, more muscled, heavier cutting Dohnes.

All Dohne Studs get ASBVs, but they do not measure beech traits. Due to the very low variation it is difficult to create Breeding Values. They also tend to be run in low worm and dag regions, where there is low demand for breech trait ASBVs.

ODOUR

- There are still causes of breech strike we don't understand, particularly in males
- ***Will the unknown factors when/if discovered, reduce the need to have such low breech wrinkle, dag and wool cover traits?***

If yes, need to keep R&D going, especially to help reduce the risk of strike for Fine and Super Fine Merino types.

- Have spent 4 years and on breech
 - Odour
 - Bacteria
 - Wool wax and Suint
 - Temperature and Humidity
 - Breech wool follicle density

With no significant breakthrough yet, a review of this line of work is about to occur

AWI'S BREECH STRIKE PROGRAM KEY R&D GOALS



1. Breeding and Selection

Developing better understanding of the heritability and relationships between breech traits, in order to develop practical tools for farmers to selectively breed sheep that are productive and resistant to flystrike.

2. Breech Modification Development

Developing interim solutions to reduce incidence of flystrike until breeding programs achieves resistant sheep.

3. Improved Management Practices

The adaption and/or use of existing farm management and animal husbandry practices, applied in a holistic 'tool box' approach to manage flystrike.

R&D OUTCOMES OF 10 YEARS – SO FAR



1. Breeding and Selection

- Identified key genetic traits, their heritability and correlations
- Developed practical tools to help growers use R&D outcomes on farm to breed flystrike resistant sheep. Breeding Values for Wrinkle, Dags and Cover released in 2009.

2. Breech Modification Development

- Development and commercialisation of clips
- Development and commercialisation of pre-operative pain relief
- Post-operative pain relief products developed, market competition commenced in 2016
- APVMA approval of SkinTraction, further R&D required prior to commercialisation
- Development trials for Liquid Nitrogen

3. Improved Management Practices

- Modified procedure; improved training by contractors
- Timing/freq of crutching, shearing & other husbandry practices to provide flystrike control
- Update of FlyBoss website with strategic use of chemical treatment at high pressure times

ALTERNATIVES TO MULESING

Aim is to reduce wrinkle, dag, stain and cover & improve welfare

SKINTRACTION (Sodium Lauryl Sulphate dissolves skin cells, skin tightens on repair)
Ongoing discussions with Cobbett Directors



LIQUID NITROGEN (Water bursts skin cells on freezing, skin tightens on repair)
Ongoing discussions with Steinfort Ag Vet



CLIPS (Stops blood flow to skin flaps, tightens remaining skin)
Very limited adoption



LASERS
Failed Proof of Concept



AWI invests in research where there is market failure and high Industry risk.

PAIN RELIEF PRODUCTS

APVMA Registrations

- 2006 Tri-Solfen[®] - mulesing
- 2016 Tri-Solfen[®] - castration & tail docking
- 2016 Buccalgesic[®] - castration & tail docking
- 2016 Metacam 20[®] - pain & inflammation
- 2017 Buccalgesic - mulesing

National Wool Declaration Definition of Pain Relief

- ***“All sheep in mob have been mulesed with a registered pain relief product”***

3) IMPROVED MANAGEMENT

PAIN RELIEF PRODUCTS CURRENTLY ON THE MARKET

Bayer Animal Health



Troy Laboratories



Boehringer Ingelheim



Tri-Solfen®

Topical anaesthetic, post treatment

Knife and shears

R&D taking place re use for shearing wounds

Over the counter sales

Buccalgesic®

Buccal application, just prior to treatment

“Meloxicam” circulates in blood, reduces pain chemicals from tissue damage and inflammation

Veterinary prescription & oversight

Metacam 20®

Sub-cutaneous injection, just prior treatment

“Meloxicam” circulates in blood, reduces pain chemicals from tissue damage and inflammation

Veterinary prescription & oversight

Seek veterinarian advice on preferred product(s) for your flock



PAIN RELIEF

Estimated retail prices – ewe lambs



Tri-Solfen®

10kg lamb \$0.78

15kg lamb \$0.96



Buccalgesic®

10kg lamb \$0.48

15kg lamb \$0.72



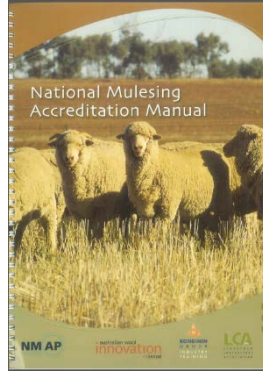
Metacam 20®

10kg lamb \$0.83

15kg lamb \$1.24

NATIONAL MULESING ACCREDITATION PROGRAM

- Originally run by Kondinin; 1,200 attended course; is currently being revamped and updated by WoolProducers Australia and Livestock Contractors Association
- ***Unit of competency approved by AgriSkills Australia. Manual is being updated. “Train The Trainer” training planned with woolgrower training thereafter.***
- Includes mulesing, castration, tail docking, vaccination, ear marking, pain relief, maintenance of equipment, hygiene, welfare. Option to delay if there are multiple stressors and or drought



TAIL LENGTH

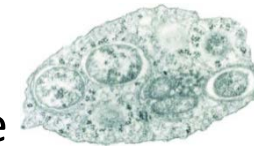
- ***Correct length, cover the vulva, normally between 3rd and 4th joint, & similar length in males; reduces tail strike, improves healing, reduced urine stain, and arthritis – (variable!)***
- AWI website; “Tail Length in Un-Mulesed Australian Merino Sheep”; “Investigation of link between arthritis and tail length in sheep”; Sheep Welfare Standards and Guidelines.

FLYSTRIKE PREVENTION CHEMICALS

- Preventative chemicals are a very important management tool. Vetrazin came on market in 1978 and Clik 1998
- The protection period varies from 4 to 29 weeks depending on the chemical. (Clik “Extra” on market Sept 2017 with 29 weeks protection, 3 mth WithHolding Period)
- ***Poor use or over-use of chemicals increases parasite resistance***
- ***With increased chemical use in not mules enterprises, there are concerns that fly larvae will become resistant sooner***
- ***A large focus of AWI’s R&D program is to better understand the mechanisms which have led to resistance and to find new, more robust chemicals or vaccines for the future***

NEW BLOWFLY CONTROL TECHNOLOGIES

- Blowfly gene fully sequenced, 772 unique genes, 26 of special interest
- Gene editing helps to better understand gene function
- Assists delay resistance to current chemicals and new chemicals
- Potential for new chemicals targeting genes active at early larval stage
- Potential for vaccines, immune reaction kills larvae as they hatch
- Looking for bacteria that could be a fly or larvae parasite



MOVING TO A NON-MULES ENTERPRISE

Need a good plan for moving to a non-mules enterprise and include options of:

- Reducing Breech Wrinkle, Cover, & Dags
- Setting productivity targets
- Shorter joining and lambing, wean at 10-12 weeks
- Accelerated shearing (makingmorefromsheep.com.au/webinars)
- Extra crutching/bung hole
- Increasing chemical control
- Linking with other NM woolgrowers
- Allow young sheep to have a fly & dag challenge
- Marketing of wool and surplus sheep
- Having all people in the business on board, especially shearers



There are conflicting wool and restocker market signals

MOVING TO A NON-MULES ENTERPRISE

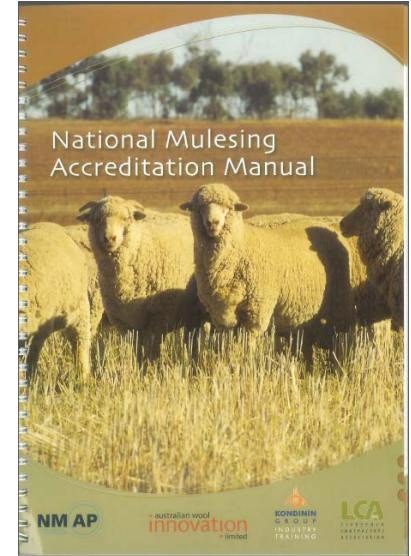
Growers need a good plan for moving to a non-mules enterprise;

- ***The key costs of moving to non-mules tend to be;***
 - ***lower re-stocker sheep prices (0% to 40%)***
 - ***increased shearing/crutching***
 - ***increased chemical use***
 - ***increased labour***
- Lower fleece weights need to be offset with higher fertility, faster growth rates and better “doing ability”
- If using “off type” low wrinkle merinos (not bred for your local conditions), in high fleece rot or fly strike areas - minimise handling when wet to decrease risk of fleece rot and body strike



WOOLGROWER TRAINING

- Woolgrower Presentations
- AWI Networks & Sheep Selection Workshops
- Fly Strike Workshops (ParaBoss and Sheep CRC)
- ParaBoss Website, AWI Website
- Sheep Genetics and MERINOSELECT
- Lifetime Ewe Management LTEM
- AWI Introduction to Stockmanship
- “Ramping up Repro” & “Realising Performance” Workshops
- National Mulesing Accreditation Program (revamped)



Making More From Sheep

WOOLPRODUCERS
AUSTRALIA

lifetimewool
more lambs, better wool, healthy ewes

GOOD ON-FARM PROGRESS – NOT MULESED AND PAIN RELIEF

Large change to Non-Mulesed since early 2000s from 2% to 27%

Large increase in use of Pain Relief since 2006 from 0% to 75%

2013/2014 AWI National Survey	Merino Lambs	All Lambs
Non Mulesed	27%	61%
Mulesed - Pain Relief	55%	28%
Mulesed	18%	11%
TOTAL	100%	100%

- **75% of Mulesed Merino lambs receive pain relief (55/73)**
- R&D Trials show significant welfare improvements from pain relief
- Merino Non Mules increase is mostly wethers sold as prime lambs
- Difficult change remains for Merinos retained for adult wool production

Repeat surveys 2014 to 17; 75-78% of mulesed merinos receive PR

AWEX NATIONAL WOOL DECLARATION (NWD)

Australia is now a large world producer of Non and Ceased Mulesed Wool

	2015/16 Merino Wool	
	% Sold	No of bales
Clip Declared	56%	682,590
Non Mulesed (NM)	6%	71,617
Ceased Mulesed (CM)	3%	33,916
Mulesed with Pain Relief (PR)	27%	323,943
NM CM and PR	35%	429,476
Blank (Mulesed)	21%	253,114
Clip not Declared	44%	534,190
Total		1,216,780

Australia has double the amount of Merino Non Mulesed wool compared to NZ

- 38,200 Merino Bales NZ 15/16

Australia has similar amount of Merino Non Mulesed & Ceased Mulesed wool compared to South Africa

- 111,075 Merino Bales South Africa 15/16

AWEX Integrity Program backs NWD



AWEX NWD ADOPTION RATES



All breeds & wool, first hand offered (no bulk class, interlots or re-offers)

Bales	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
% Clip Decl.	38	37	42	44	45	43	50	55	61
% NM CM PR	9	12	17	20	22	22	29	35	41
% NM	3	4	6	6	6	6	7	9	10
% CM	3	3	3	2	2	2	3	3	3
% PR	3	5	8	12	14	14	19	23	28
% Mulesed	29	25	25	24	23	21	21	20	20
% ND	62	63	58	56	55	57	50	45	39
% Total	100	100	100	100	100	100	100	100	100
Total Bales	1,416,656	1,467,058	1,589,514	1,456,151	1,598,009	1,452,077	1,617,165	1,487,894	

- ***% Clip Declared has increased from 38% to 61%***
- ***% NM has increased from 3% to 10%***
- ***% NM CM and PR has increased from 9% to 41%***
- Considerable variation between States and regions within States



WHY THE NATIONAL WOOL DECLARATION IS IMPORTANT

- Wool buyers, the retail sector and consumers are increasingly looking for sustainable products and reassurance of high animal welfare standards
- NWD is not mandatory, but its use continues to increase
- ***Using the NWD sends an important welfare message to supply chain and legislators.***



AWEX PREMIUMS AND DISCOUNTS FOR NWD 2016/17

Very variable, premiums and discounts slowly increasing...but small

Compared to declared mulesed 19 to 21 micron

- Not Declared *discount* -6 c/kg clean
- Pain Relief *premium* +3 c/kg clean
- Ceased-Mulesed *premium* +4 c/kg clean
- Not-Mulesed *premium* +17 c/kg clean
- Not-mules premium 16 -18 microns: +15 to +30 c/kg

Larger premiums are being reported for direct wool sales in order of 4% to 6% (approx. 60c to 90c/kg)

A 4-6 cent premium - covers cost of pain relief



Seek wool broker advice

SUMMARY OF RECENT ON-FARM PRACTICE CHANGE

- Overall trend to lower wrinkle and Poll Merinos over last 20 years
- Breech trait ASBVs for Medium Merinos are falling; (- 0.3 wrinkle, -0.2 cover & - 0.2 dags since 2003)
- 15% overall Merino improvement in resistance to internal parasites
- Increasing numbers of Merino sires with high productivity and low breech trait ASBVs
- 61% of all lambs now NM, 27% of Merino lambs NM, (Also influenced by Clik & Lamb Market)
- Pain Relief now used on 75% of mulesed Merino lambs, large change in 10 years
- 61% of Aust clip declared via with the National Wool Declaration (16/17)
- 10% of Aust clip declared Non-Mulesed, now a major producer of non-mulesed wool
- 3% Aust clip declared Ceased Mulesed, 28% declared Pain Relief; 41% for NM CM PR
- 3 pain relief products registered by APVMA for use on sheep

WHAT CAN WOOL GROWERS DO NOW?

- Use a number of tools now, to reduce future risk of breech strike, don't rely on one or two "silver bullets" (ie chemical or "alternatives")
- Consult Vet and use pain relief for mulesing, tail docking and castration
- Increase sheep selection for both welfare and productivity; every reduction in the natural breech traits improves welfare, consult with your ram supplier
- Use chemicals wisely, monitor resistance and protect on-farm biosecurity
- Good training, husbandry and sheep health and welfare programs
- Tell the supply chain you are listening and provide transparency via
 - Consult Broker, use the National Wool Declaration & other QA Schemes
- Incremental progress over time, tail strip rather than mules?
- Have pride in everything you do, market your product

SUPPLY CHAIN ENGAGEMENT & ISSUE MANAGEMENT

Engagement and feedback occurs with a wide range and number of Stakeholders

- Brokers Exporter and Processors
- Domestic & International Retailers
- International Woolgrower Orgs
- Domestic Governments
- International Governments
- Animal Welfare and Activist Groups
- Media
- Woolgrower Representative Orgs
- Australian Veterinary Association Audit & Genetic Reviewers

WORKING WITH ANIMAL WELFARE GROUPS



- In 2009 AWI established the Animal Welfare Forum, bringing together animal welfare organisations, animal rights groups, researchers and woolgrowers to develop an improved understanding on welfare issues.
- Twice a year, the Australian Veterinary Association conducts independent audits of AWI's R&D program, providing expert independent advice on AWI's work in this area. There is also an annual review of the Genetic RD&E. These reports are available on request from AWI.

ANIMAL WELFARE GROUP EXPECTATIONS

- Variable expectations between Rights & Welfare groups
- Good on-farm health and welfare
- End to Mulesing
- Use of pain relief until alternatives for tail docking and castration available
- “National Mulesing Accreditation Program” to cover all marking procedures & Property Animal Welfare Plans
- Shearing ... welfare training and use of pain relief on shearing cuts where required
- Cameras in sheep yards and shearing sheds
- Information and transparency on the progress and timelines for changing on-farm practices



MARKET AND CONSUMER EXPECTATIONS

- Variable expectations along supply chain
- Good On-Farm Health and Welfare
- Welfare is one of a range of issues but increasing
- “Don’t expect a premium” – social licence
- Wanting to see more progress with practice change
- Information, transparency, traceability



WOOLGROWER EXPECTATIONS

- Good on farm health and welfare and ongoing improvements to lifetime welfare. Able to control sudden, severe fly waves
- Commercially driven change. ***Woolgrowers are in the prime position to determine the best welfare outcomes for their sheep***
- Must retain tail docking and castration with pain relief, (Worlds Best Practice); and Mulesing with pain relief for as long as possible
- Reduced reliance on mulesing where possible, new welfare improved commercial alternatives to mulesing
- Faster breeding gains for strike resistance and profitability
- Clear flow of market signals along supply chain
- Industry confidence in the management of welfare issues



NEXT STEPS FOR RD&E?

- More information and training to growers
- NMAP (WoolProducers)
- Evolving National Wool Declaration (AWEX)
- Further adoption of pain relief and NWD
- More ram breeders collecting breech trait data
- Monitoring efficacy of current chemicals (NSW DPI)
- Numnuts - local anaesthetic for rings, (MLA)
- Longer acting pain relief (Pharmaceutical Cos)
- Further development of alternative(s) to mulesing
- Breeding Progress, importance of odour?
- New control chemicals and techniques
- On going consultation with all stakeholders



Numnuts - R&D in progress



NEXT STEPS FOR RD&E?

- Update predictions of genetic gain
- Monitoring wool chemical residues
- Use of neck & body wrinkle to reduce breech wrinkle
- Precision of Weaner, Hogget and Adult age traits and how best to get precision “early in life”
- Better understanding of dags, immune responses
- What causes variation in Urine Stain
- Moving to a Not Mules Enterprise, Case Studies, Training Package, “LTEM style”, Non-Mulesed Network
- Monitoring practice change



Numnuts - R&D in progress



WEBSITES

www.wool.com/flystrikelatest

www.flyboss.com.au

www.makingmorefromsheep.com.au

www.sheepgenetics.org.au

www.awex.com.au

***GET ADVICE FROM YOUR LOCAL VET,
WOOL BROKER & RAM BREEDER***

