



Field studies of a clip alternative for breech flystrike prevention

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Advantages of the clips

- Improved welfare compared to mulesed lambs based on both behavioural & physiological measures

(Hemsworth PH & Arnold AA. Mulesing: can the acute stress and pain associated with the procedure be minimised? In: *Proceedings of the Australian Sheep Veterinarians 2006 Conference (Wagga Wagga & Hobart)*, Australian Sheep Veterinarians 2006. Hemsworth PH *et al.* Effects of mulesing and alternative procedures to mulesing on the behaviour and physiology of lambs *Appl Anim Behav Sci* 2009;117:20-27.)

- Higher growth rate when managed under field or pen conditions

(Hemsworth *et al.* Effects of mulesing and alternative procedures to mulesing on the behaviour and physiology of lambs *Appl Anim Behav Sci* 2009;117:20-27. Allworth B. Further field trials on mulesing and alternative strategies. In: *Proceedings of the Australian Sheep Veterinarians 2007 Conference (Melbourne)*, Australian Sheep Veterinarians 2007.)

Clip field studies conducted

Study	Aims	Location	Number of sheep
Clip product development & testing study	Assess effect under a variety of conditions (operator, sheep types, regions, climate)	208 properties around Australia	32,028
Positive control study	Assess effect compared to mulesed and unmulesed lambs, including bodyweight & survival to 90 days post-application	5 properties in south-eastern Australia	1,483
Universal clip study	Compare effect of universal clip to standard breech and tail clips	5 properties in south-eastern Australia	1,199
T6 study	Compare effect of different clip designs and application techniques	4 properties in New South Wales	2,071
Clip serial removal study	Assess effect of removing clips at different times after application	1 property in western New South Wales	491

Inclusion criteria for a combined analysis

- 2007 clip prototype used (unmodified design, standard angular application technique)
- Clips removed day 14-30
- Treatment evaluations on or about days 0, 30 and/or 60 and/or 90
- All perineal & tail bare area measurements collected
- Sheep weighed at each treatment evaluation

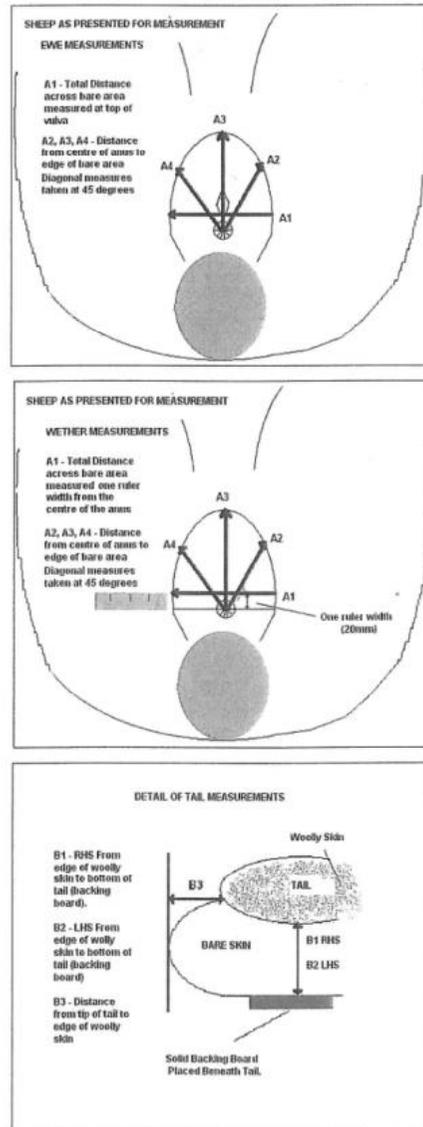
Clip field studies that meet criteria

Study	Aims	Location	Number of sheep
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Sites & sheep included in the combined analysis

Location	Number of lambs	Gender	Mean bodyweight on day 0 (range)
Eyre Peninsula SA	310	Mixed	14.3 (4.5-23.0)
Southern Tablelands NSW	179	Mixed	24.8 (16.0-34.5)
Northern Tablelands NSW	355	Female	15.1 (7.0-25.0)
Western District VIC	346	Male	20.3 (10.5-32.0)
Western District VIC	293	Mixed	16.0 (8.5-27.0)
Western District NSW	115	Female	22.4 (7.9-30.9)
Eyre Peninsula SA	170	Mixed	18.3 (10.0-26.5)
Western District VIC	160	Female	18.9 (9.5-29.0)
Western District VIC	147	Mixed	17.8 (10.0-28.0)
Northern Tablelands NSW	125	Mixed	17.4 (7.5-26.5)
Western District NSW	188	Female	17.5 (10.5-33.5)
Western District NSW	200	Female	17.5 (7.7-30.5)
Southwest Slopes NSW	200	Female	14.2 (10.0-20.6)
Northwest Plains NSW	200	Female	16.3 (10.9-26.8)

Treatment evaluations



On all sites measurements collected by trained personnel from Veterinary Health Research

Visual breech scores

Breech Wrinkle – Lambs

Age: 6 to 10 weeks
When: Docking/Marking
 Breech Wrinkle refers to the degree of wrinkle at the tail set and down the hind legs.
Rule of thumb: A Score 1 animal has no wrinkle and a Score 5 animal has extensive wrinkle at the tail set and extending down the hind legs.



Breech Wrinkle – Lambs



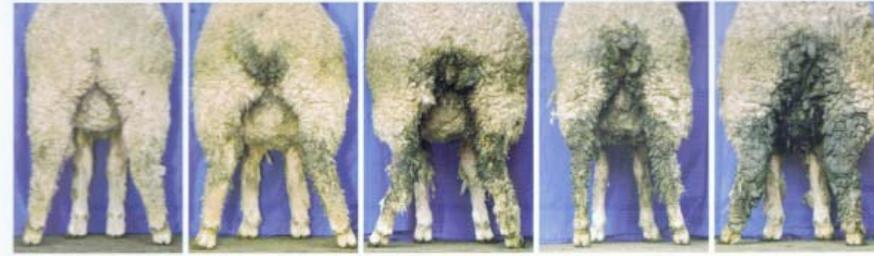
Score 1 Score 2 Score 3 Score 4 Score 5

Dag – Weaners / Hoggets

Age: Over 4 months
When: Prior to crutching; 60 days following 'the break' to the dominant rainfall season or when 30 to 40 per cent of flock is scouring.
 Dag formation is caused by the adhesion of faecal material to the breech area. Dag scores refer to the quantity of faecal material adhering to the wool surrounding the breech and extending down the hind legs.
Rule of thumb: An animal with Score 1 has no dags and an animal with Score 5 has extensive dags not only remaining in the breech area, but extending down the hind legs.



Dag – Weaners / Hoggets



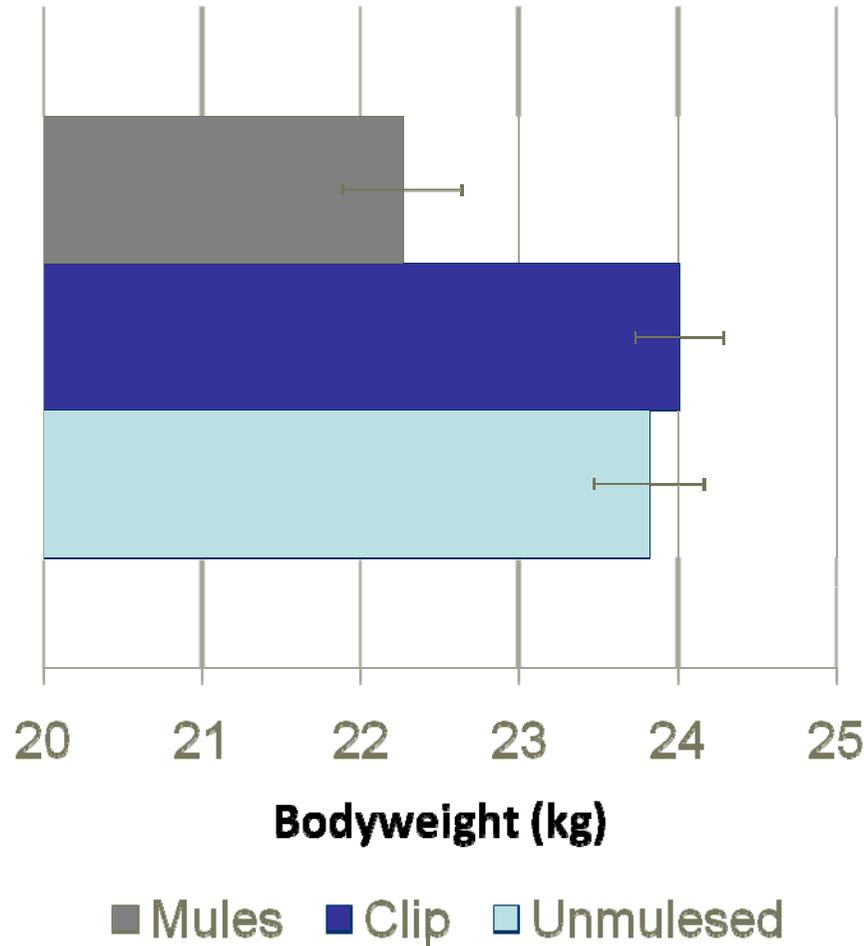
Score 1 Score 2 Score 3 Score 4 Score 5

Analysis method

Mixed-effects multiple linear regression

- Treatment as a fixed effect
- Site as a random effect
- Day 0 measurement or score as a co-variate
- For tail measurements Day 0 bodyweight used as surrogate co-variate
- Clip group used as reference group
- Statistical significance declared at 0.05

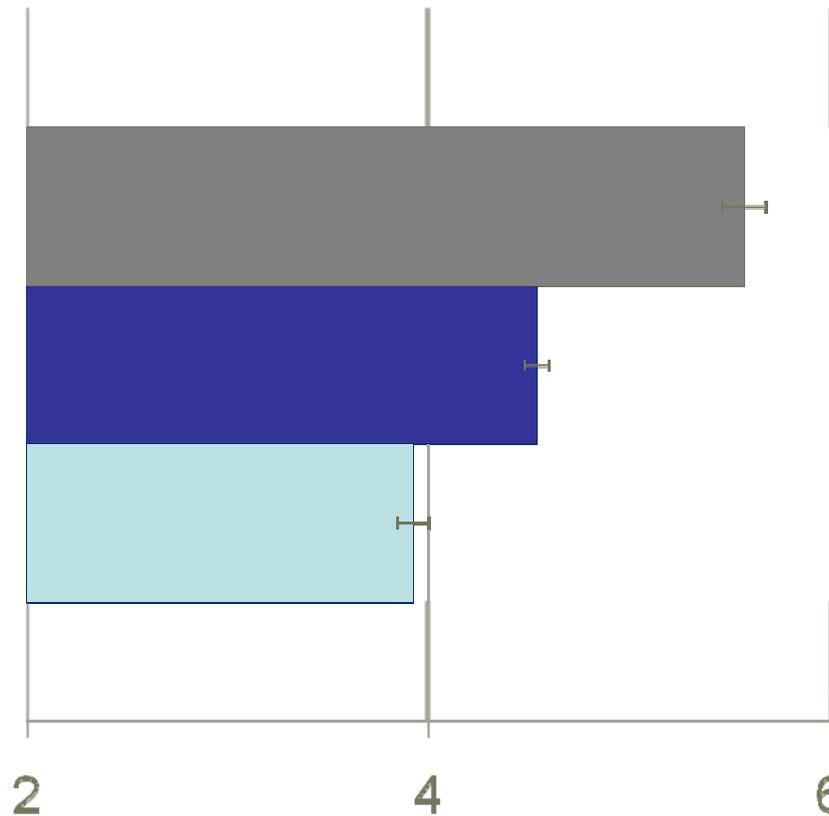
Bodyweight on Day 60



Mixed-effects multiple
linear regression

Unmuled=Clip>Mules

A1 measurement (width) on Day 60



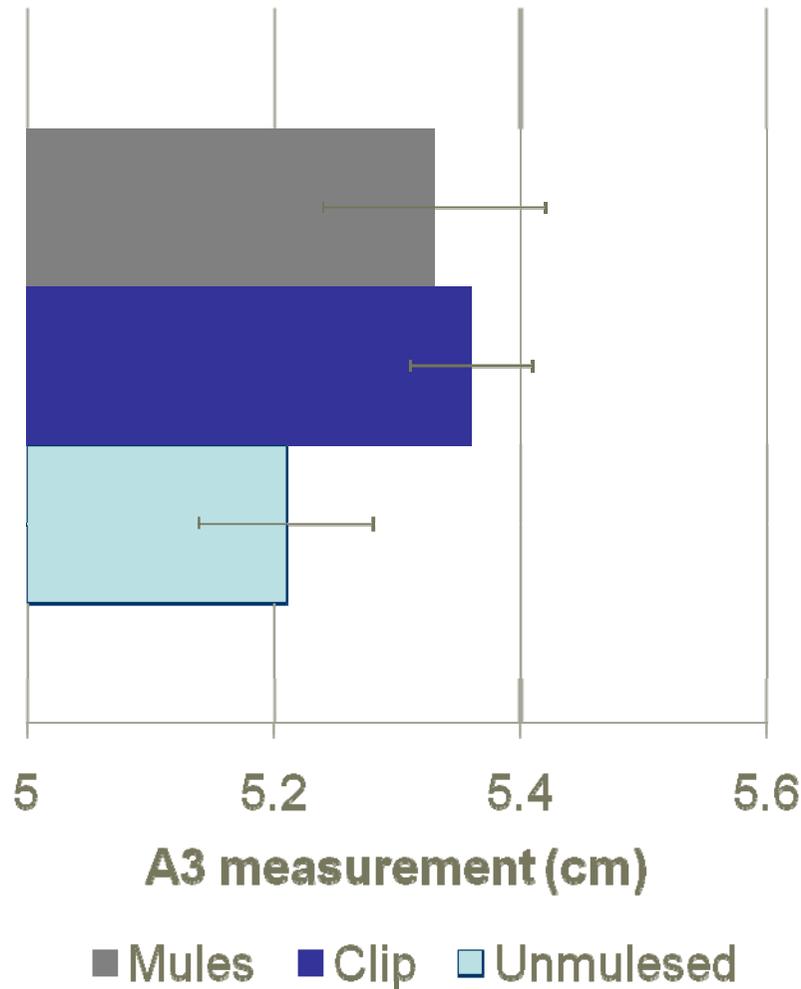
Mixed-effects multiple
linear regression

Unmulesed < Clip < Mules

A1 measurement (cm)

■ Mules ■ Clip ■ Unmulesed

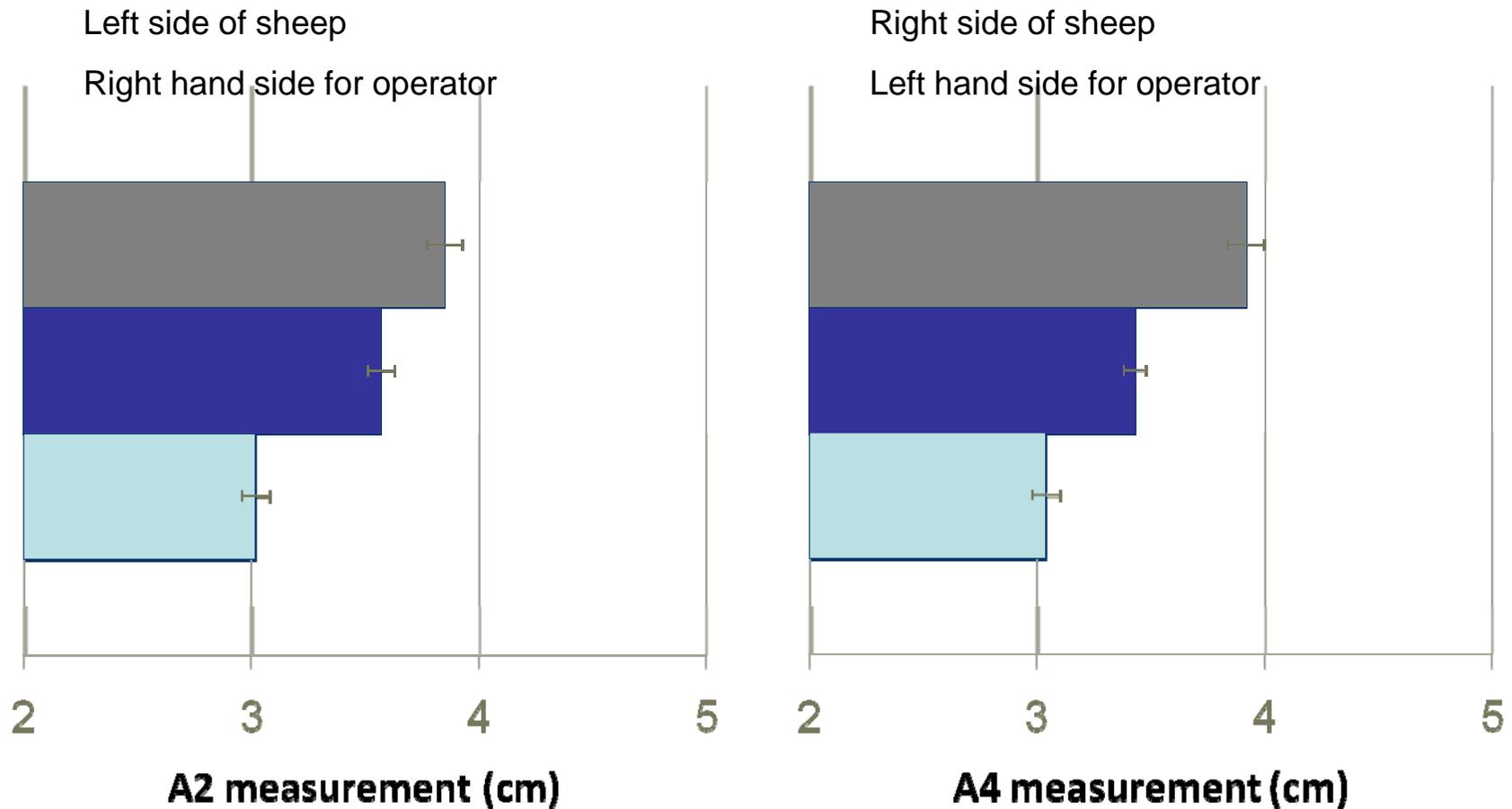
A3 measurement (height) on Day 60



Mixed-effects multiple
linear regression

Unmulesed < Clip = Mules

A2 & A4 measurements (diag) on Day 60

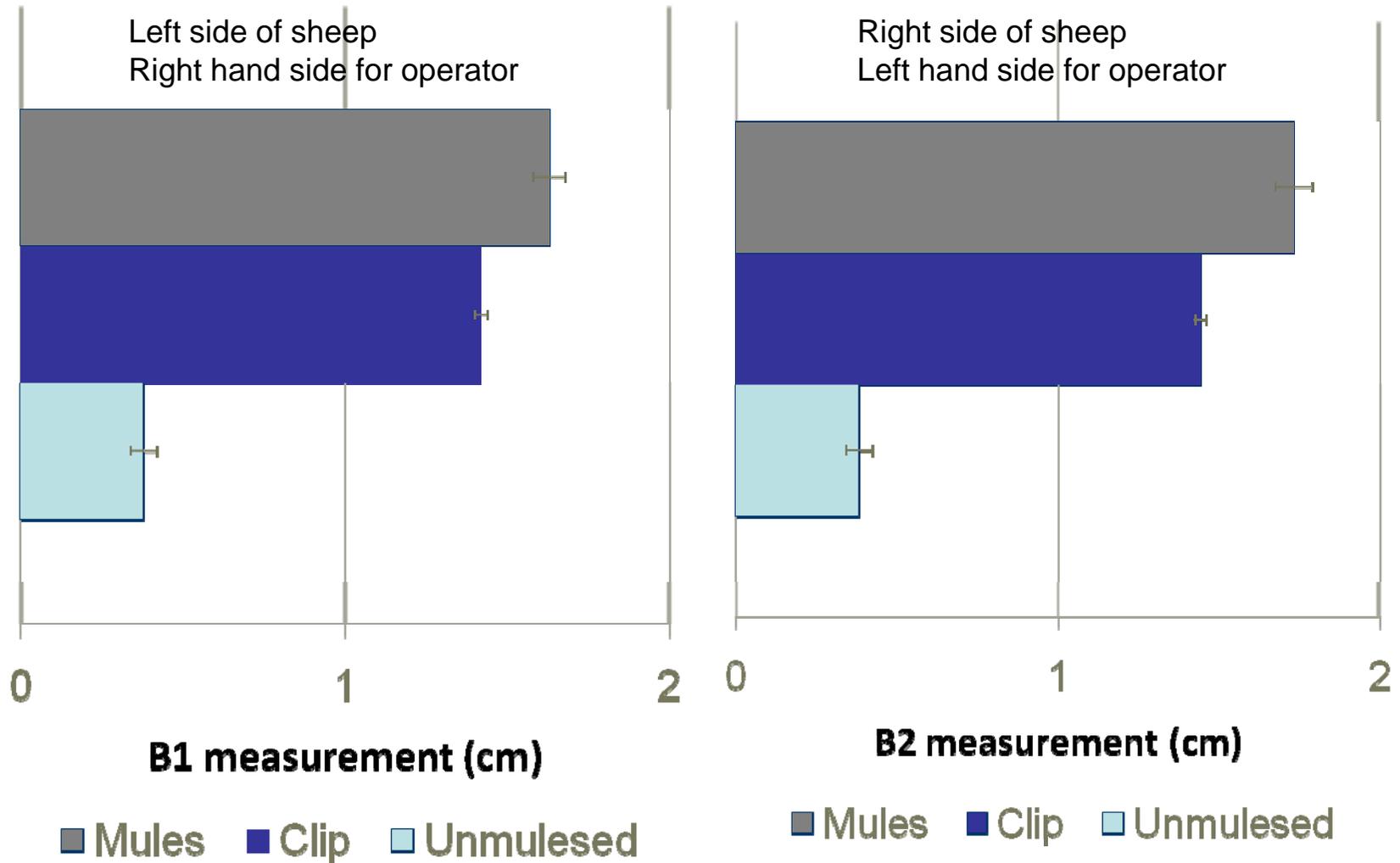


■ Mules ■ Clip ■ Unmulesed

■ Mulesed ■ Clip ■ Unmulesed

Mixed-effects multiple linear regression Unmulesed<Clip<Mules

B1 & B2 measurements on Day 60



Mixed-effects multiple linear regression $\text{Unmulesed} < \text{Clip} < \text{Mules}$

Distribution of wrinkle scores on Day 60

Treatment	Min	5%	25%	50%	75%	95%	Max	Mean	SD
Mulesed (626)	1	1	1	1	1	2	3	1.18	0.4
Clip (1386)	1	1	1	1	2	3	5	1.53	0.67
Unmulesed (788)	1	1	1	1	2	3	5	1.58	0.76

50% unmulesed control sheep score 1



Distribution of urine stain scores on Day 60 (female sheep)

Treatment	Min	5%	25%	50%	75%	95%	Max	Mean	SD
Mulesed (441)	1	1	1	1	1	2	3	1.09	0.29
Clip (1001)	1	1	1	1	2	3	5	1.48	0.69
Unmulesed (548)	1	1	1	2	2	3	5	1.74	0.73



Distribution of dag scores on Day 60

Treatment	Min	5%	25%	50%	75%	95%	Max	Mean	SD
Mulesed (626)	1	1	1	1	1	3	5	1.35	0.72
Clip (1386)	1	1	1	1	2	3	5	1.48	0.81
Unmulesed (788)	1	1	1	2	2	4	5	1.75	0.91



Conclusions

- Clipped lambs weighed more than mulesed lambs to Day 60
- Clips achieved similar effect as mulesing in elongating perineal bare area (A3)
- Clips achieved about 80% of the result achieved with mulesing on the sides of the tail
- For other measurements clips partway between unmulesed and mulesed lambs
- Clips increased urine stain and dag score 1 sheep from 25% to 50%

360 Day Results

Positive control study

The longest running trial of the 3 trials included in the combined analysis

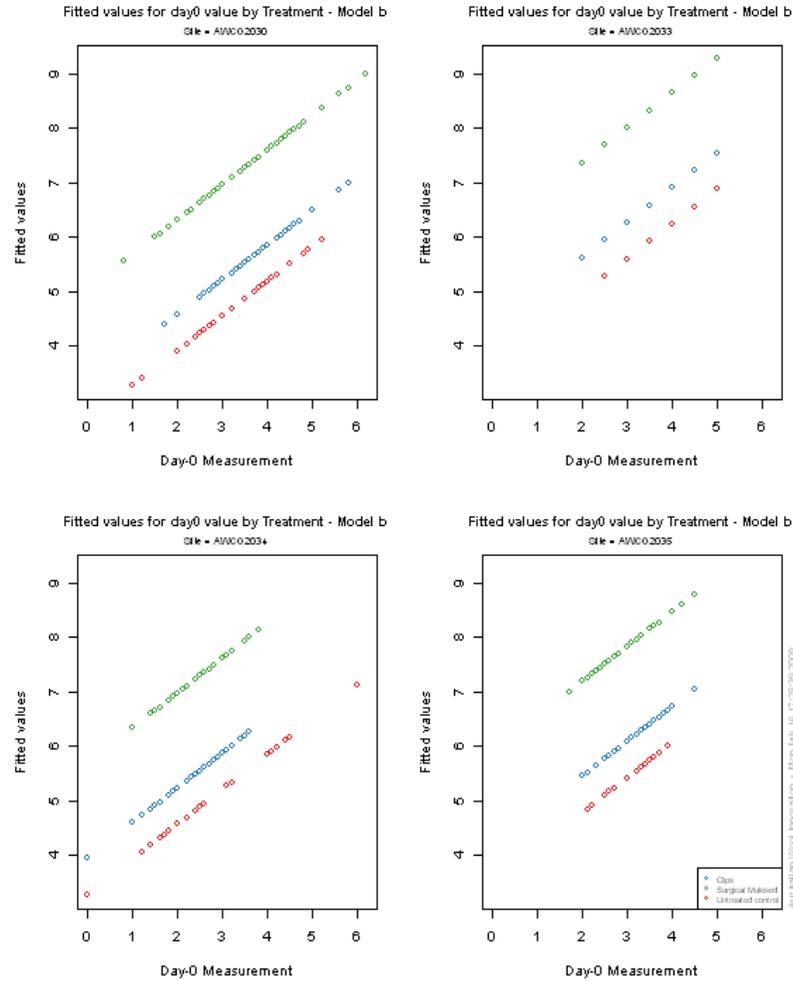
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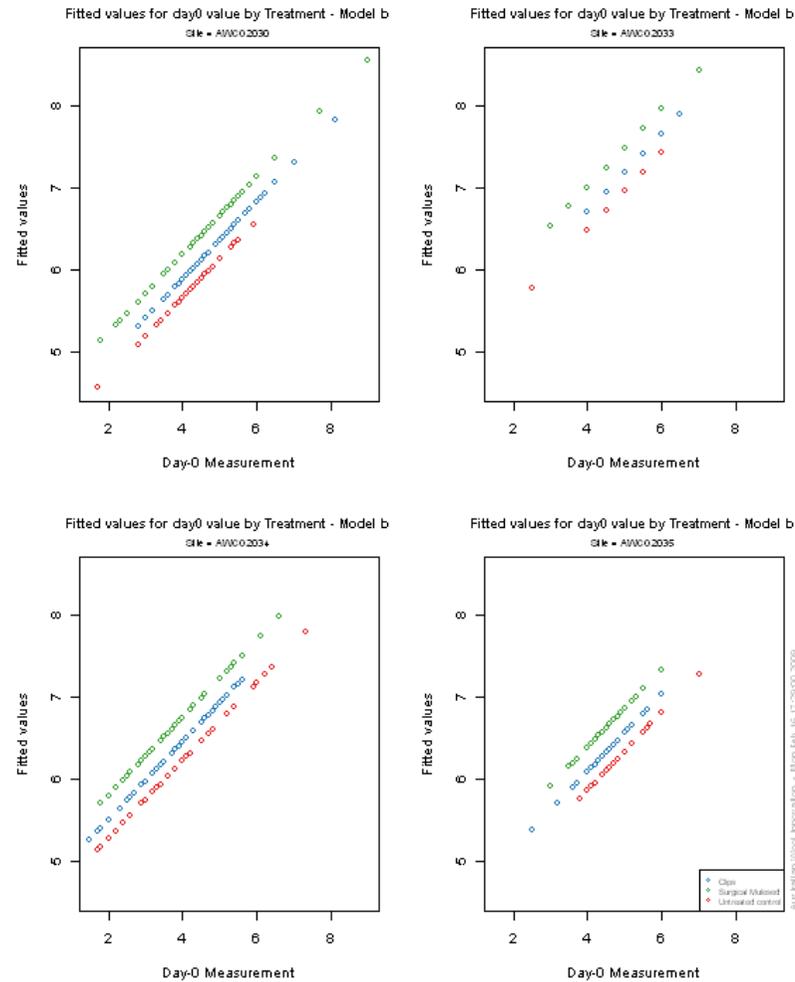
Sites & sheep included in the 360 day analysis

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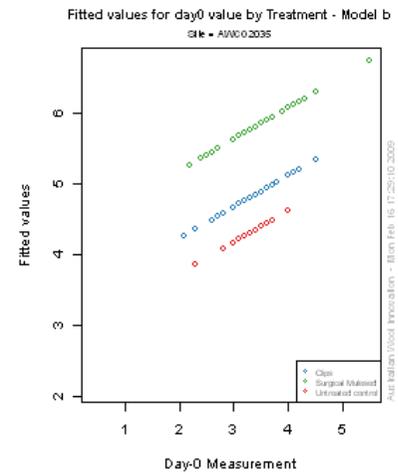
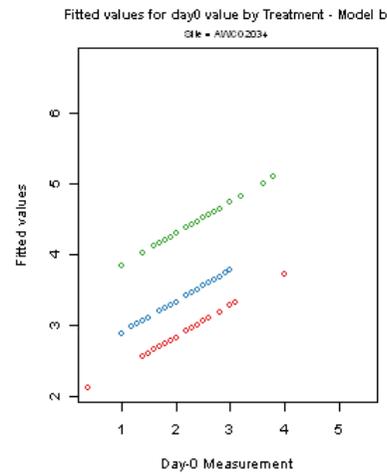
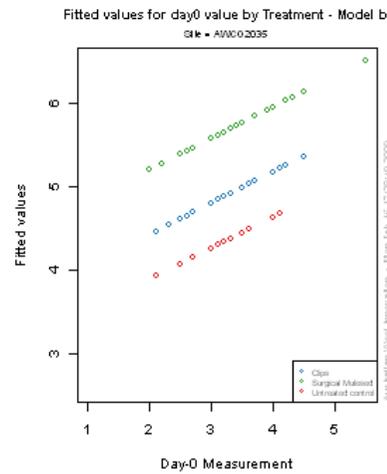
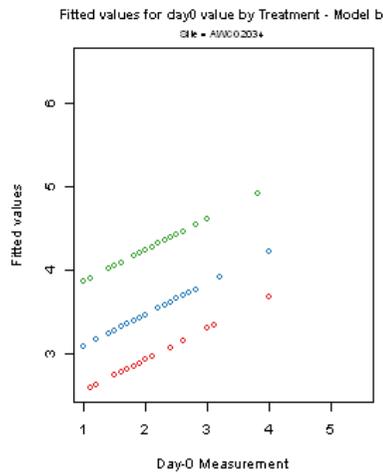
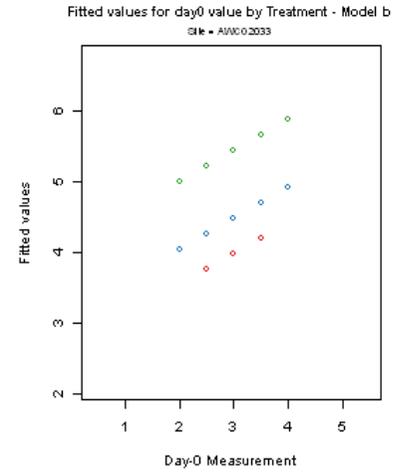
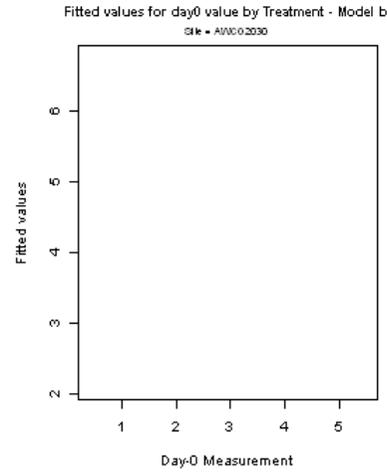
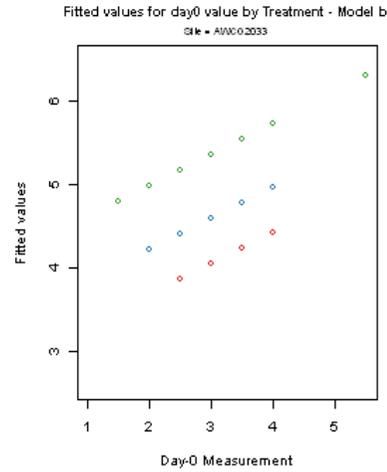
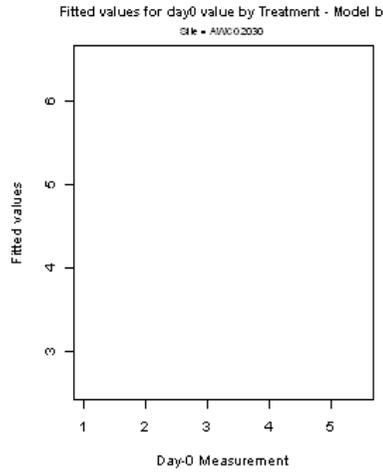
A1 measurement (width) on Day 360



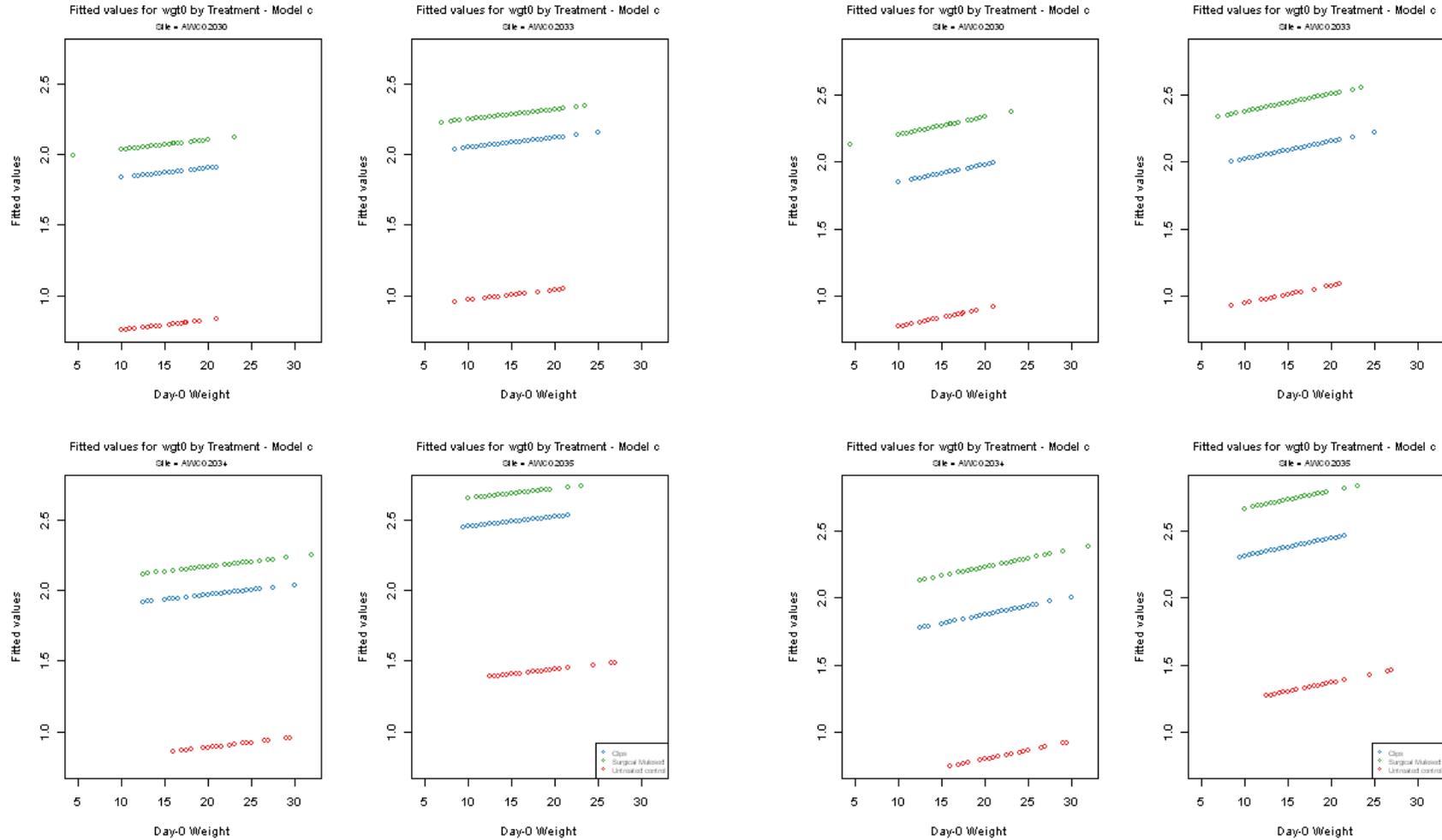
A3 measurement (height) on Day 360



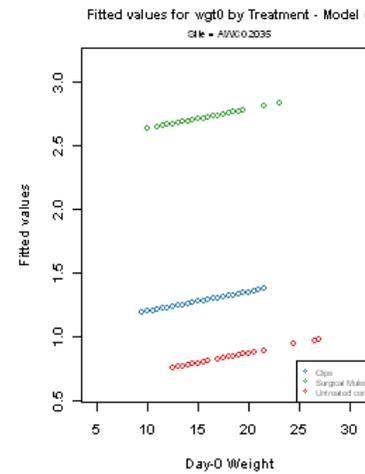
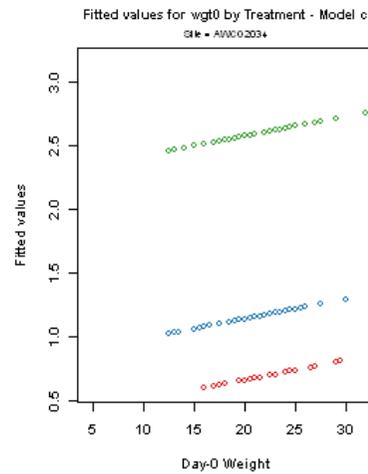
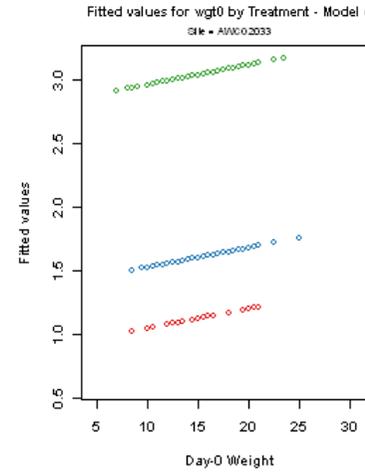
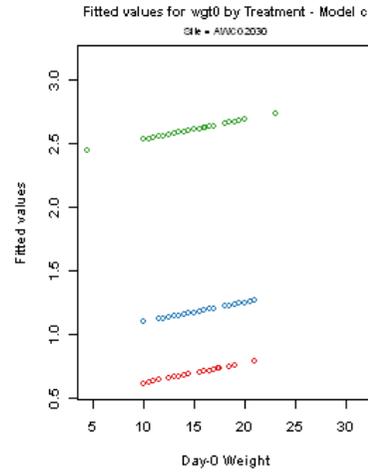
A2 and A4 measurements (diag) on Day 360



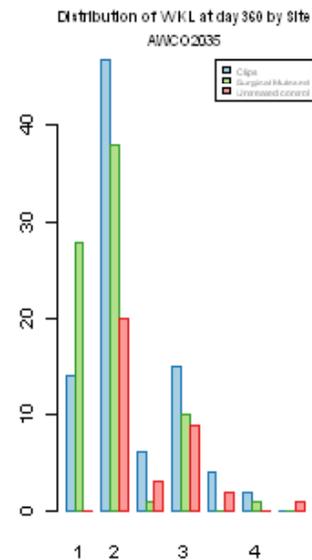
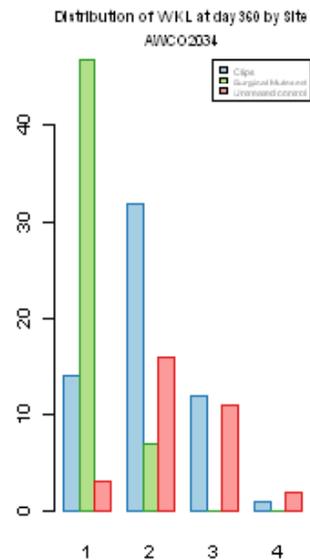
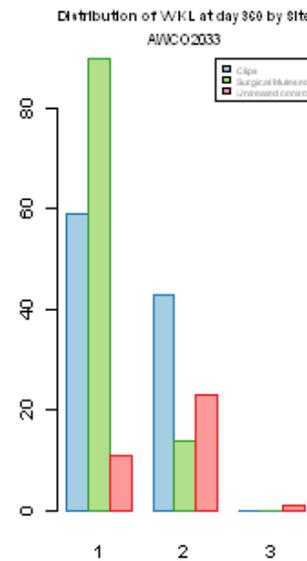
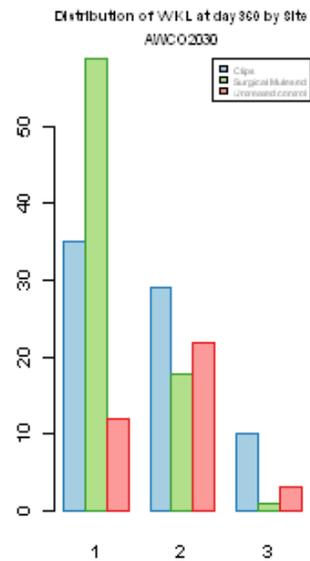
B1 & B2 measurements (sides tail) on Day 360



B3 measurement (end of tail) on Day 360



Wrinkle score on Day 360



Blue = Clips
Green = Mulesed
Red = Unmulesed

Distribution of wrinkle scores on Day 360

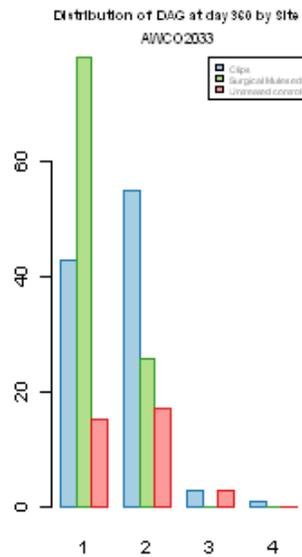
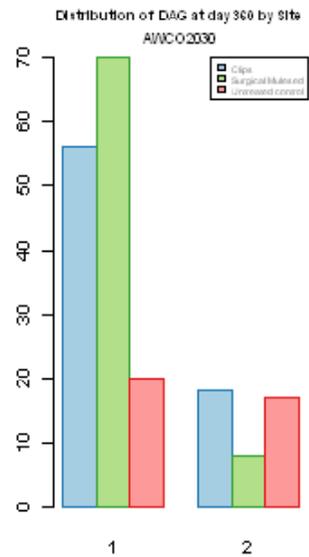
Treatment	Min	5%	25%	50%	75%	95%	Max	Mean	SD
Mulesed (314)	1	1	1	1	2	2	4	1.33	0.56
Clip (323)	1	1	1	2	2	3	4	1.78	0.72
Unmulesed (139)	1	1	2	2	2	3	4.5	2.06	0.71



Clips reduced wrinkle by 0.28

Mulesing reduced wrinkle by 0.73

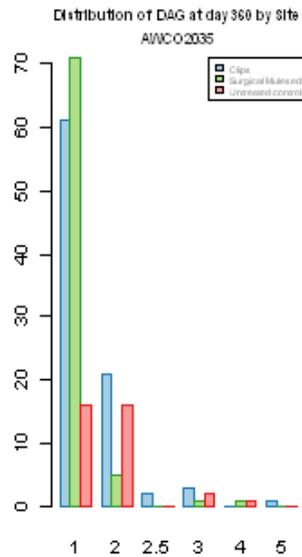
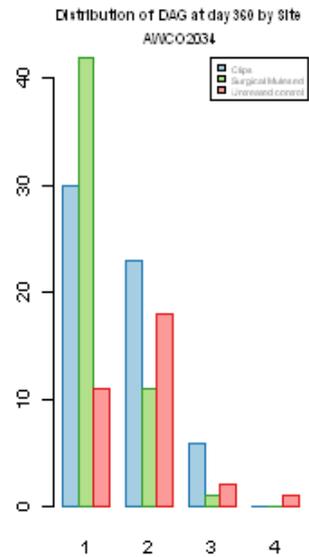
Dag score on Day 360



Blue = Clips

Green = Mulesed

Red = Unmulesed



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Distribution of dag scores on Day 360

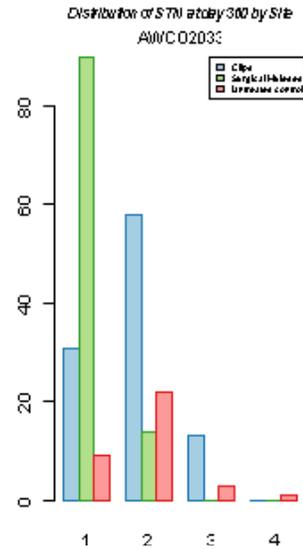
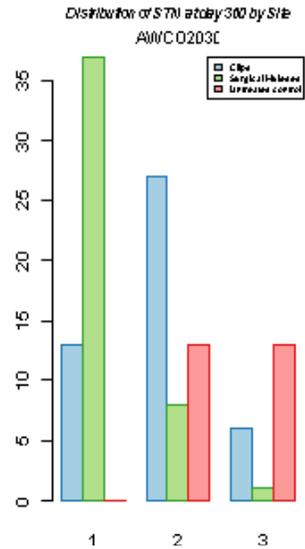
Treatment	Min	5%	25%	50%	75%	95%	Max	Mean	SD
Mulesed (314)	1	1	1	1	1	2	4	1.18	0.43
Clip (323)	1	1	1	1	2	2	5	1.47	0.62
Unmulesed (139)	1	1	1	2	2	3	4	1.63	0.65



Clips reduced dags by 0.16

Mulesing reduced dags by 0.45

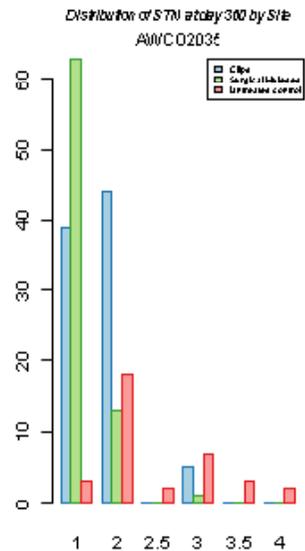
Urine stain score on Day 360 (female sheep)



Blue = Clips

Green = Mulesed

Red = Unmulesed



Distribution of urine stain scores on Day 60 (female sheep)

Treatment	Min	5%	25%	50%	75%	95%	Max	Mean	SD
Mulesed (236)	1	1	1	1	1	2	3	1.17	0.4
Clip (227)	1	1	1	2	2	3	3	1.75	0.63
Unmulesed (96)	1	1	2	2	3	3.5	4	2.23	0.72



Clips reduced stain by 0.48

Mulesing reduced stain by 1.06

Summary

- Four of five sites continued to 360 days
- Results are consistent with the combined analysis of 60 day results from 14 sites
 - Clips achieve results partway between that of mulesing and doing nothing
 - Magnitude of the result varies with the parameter
 - Best results are achieved on the sides of the tail, at elongating the bare area and at reducing urine stain score in female sheep



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