



New supplementation opportunities to improve twin lamb survival

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The problem: too many lambs die

High lamb mortality rates are a significant risk for the Australian sheep flock

- Cost ~ \$540 million in lost production each year
- Represent a major welfare issue

Approximately 10 – 40% of lambs die between the start of birth and marking

- 13 – 21% of singleton lambs
- 21 – 38% of twin lambs

The problem: when and why do lambs die?

The majority (74%) of lambs die within 3 days of birth:

Of these deaths, 60 – 70% are attributed to:

- Dystocia (birthing difficulties) and starvation, mismothering and exposure (SME)

The birth process significantly impacts lamb viability, vigour and lamb-ewe interactions

- Difficult births will lead to
 - Stillbirths and/or delayed death due to starvation, mismothering or exposure



The problem: the birth process is dangerous

- All lambs experience some oxygen deprivation (hypoxia) during birth
- Degree of hypoxia increases with labour length and is higher in multiples
- Consequences of hypoxia are severe:
 - Damage to the brain, nervous system, vital organs
 - Impaired neuro-motor activity, udder seeking behaviour, vocalisation
 - Delays in standing and suckling
 - Impaired thermoregulation
 - Greater chance of maternal rejection

**Increasing the
likelihood of death**

The problem: the cost of birth hypoxia

Birth hypoxia is associated with

- ~ 70% of early lamb deaths
- 115 to 197 dead lambs from a mob of 1000 ewes (30% twinning rate).

Objectives of the current project

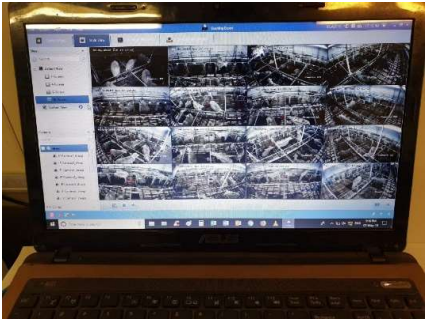
L.LSM.0015: *Novel strategies to increase the weaning rate of the national flock*

The objective of this project is

- To increase the ability of twin lambs to cope with birth hypoxia, resulting in
 - More vigorous, vital lambs able to thrive when the environment is challenging
 - More twin lambs weaned
- By supplementing twin bearing ewes during the second half of pregnancy
 - Using four compounds: caffeine, rumen protected amino acids, betaine and melatonin

Three stages to this project

**Stage One
(Animal House)**



**Stage Two
(Field Research)**



**Stage Three
(Commercial validation)**



Why Melatonin?

Hormone secreted in the brain during night

- Regulates circadian and seasonal rhythms

Neuroprotective properties

- Potent antioxidant actions minimise impacts of hypoxia in lamb brain
- Freely crosses placenta allowing delivery to fetus via maternal supplementation

Previous studies

- Supplementing pregnant ewes with melatonin
 - Decreased brain damage and improved udder seeking behaviour in hypoxic lambs
 - Increased brown adipose tissue and birthweight, when nutrition and photoperiod sub-optimal

Melatonin: stage one

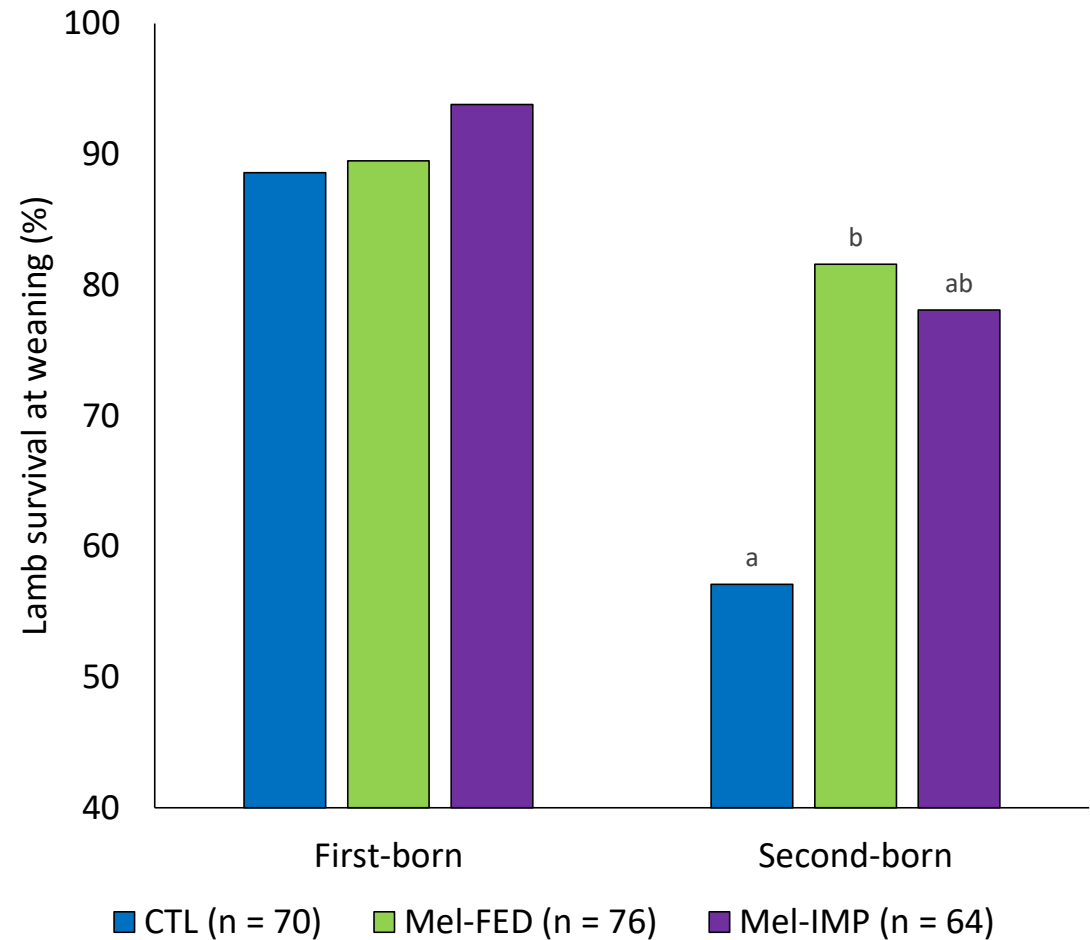
3 treatments for pregnant Merino ewes:

- Control: no melatonin treatment
- Mel-FED: 2 mg melatonin daily from d 80 until birth
- Mel-IMP: 18 mg melatonin implant (Regulin) at d 80 and d 125

2 lambing seasons: autumn and spring

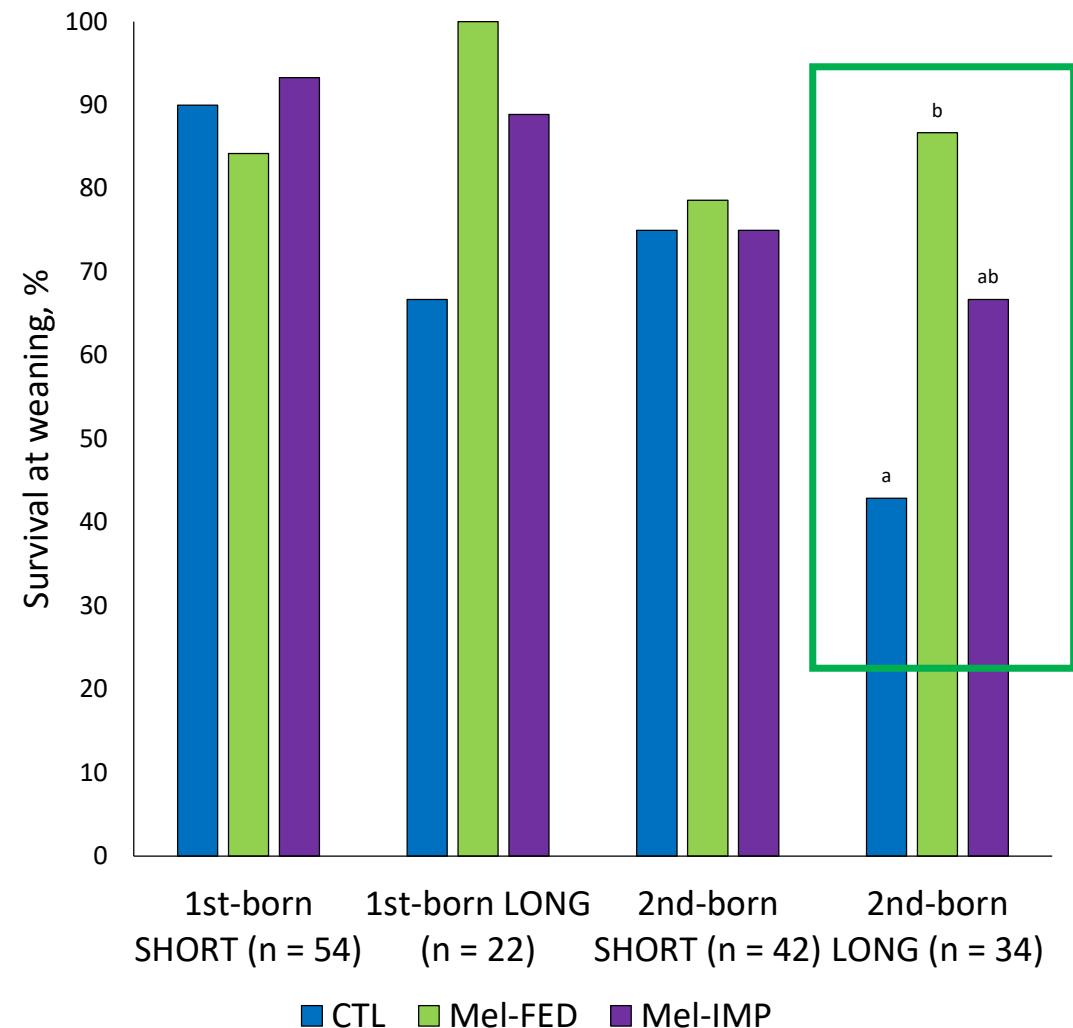
Melatonin improves twin lamb survival

- Overall, melatonin improved survival to weaning ($P < 0.06$)
 - Control: 73%
 - Mel-FED: 86%
 - Mel-IMP: 86%
- Survival similar for first born twins
- Melatonin improved survival of second-born twins ($P < 0.05$)



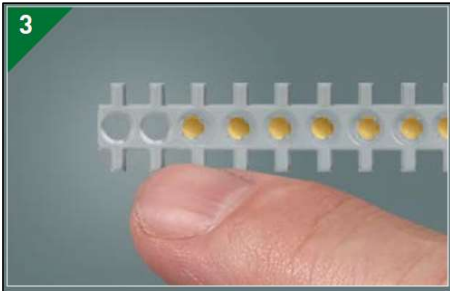
Melatonin protects against hypoxia

- Beneficial effects of melatonin on lamb survival are most profound for extended labours
- Extended labour increased mortality of second born twins in untreated ewes
- Melatonin increases the survival of second born twins which experience an extended birth process



Melatonin: stage two

- Three treatments x two birth types (singleton vs. twin) at Minnipa Research Centre
- Pregnant Merino ewe treatment groups:
 - Control: no melatonin treatment
 - M1: one 18 mg implant ~90 d post-joining
 - M2: two 18 mg implants ~90 d post-joining





Melatonin increases twin lamb survival

Twin lamb survival

	Control (n = 108)	1 Implant (n = 100)	2 Implants (n = 106)	<i>P</i>
Born alive (%)	93.5 ^a	100.0 ^b	99.1 ^b	0.005
3 days (%)	83.3 ^a	99.0 ^a	95.3 ^b	< 0.001
7 days (%)	81.5 ^a	97.0 ^b	93.4 ^b	< 0.001
Weaning (%)	79.6 ^a	94.0 ^b	92.5 ^b	0.001

There were no treatment differences for the survival of singleton lambs

Benefits of melatonin for twin lamb survival

- Implanting twin bearing ewes with melatonin (Regulin) on ~ day 90 of pregnancy:
 - Protects the lamb from the damage caused by birth hypoxia
 - Increases lamb survival to **weaning by 13 – 14%**
 - Results in an additional **26 – 28 lambs weaned** per 100 twin bearing ewes
- This improvement in lamb survival has been observed in intensively housed ewes and under field conditions

Where to from here?

- Regulin is easy and quick to implant, and is cost effective
- CEVA will need to apply for a label change for its use in pregnancy
- Progression to stage three (commercial validation) in the near future,
 - Quantify the expected improvement in twin lamb survival, as affected by
 - Breed
 - Ewe age and condition
 - Lambing time

If you are interested in being part of these trials, please come and see me

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Thank you for your attention, any questions?

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Return on investment: Model 1

Producers **already scanning for litter size** (mob of 1000, **30% twinning rate**)

- Costs for twin bearing ewes: \$2,400 for implants (@ \$7 each + \$1 labour / ewe)
- Benefit: 84 additional lambs (14% increase in survival)

Ewe type	Profit		Break even point: lamb survival increase	
	\$5/kg cwt	\$8/kg cwt	\$5/kg cwt	\$8/kg cwt
Merino	\$1,968	\$5,244	7.7%	4.4%
Terminal Merino	\$3,816	\$8,478	5.4%	3.1%
Maternal	\$3,480	\$7,890	5.7%	3.3%

Return on investment: Model 2

Producers **who only scan for wet/dry** (mob of 1000, **30% twinning rate**)

- Costs: \$2,900 (\$0.5 /ewe for LS + implants @ \$7 each + \$1 labour / ewe)
- Benefit: 84 additional lambs (14% increase in survival)

Ewe type	Profit		Break even point: lamb survival increase	
	\$5/kg cwt	\$8/kg cwt	\$5/kg cwt	\$8/kg cwt
Merino	\$1,468	\$4,744	9.3%	5.3%
Terminal Merino	\$3,316	\$7,978	6.5%	3.7%
Maternal	\$2,980	\$7,390	6.9%	3.9%