

## Supplementing pregnant Merino ewes with melatonin may improve twin lamb survival

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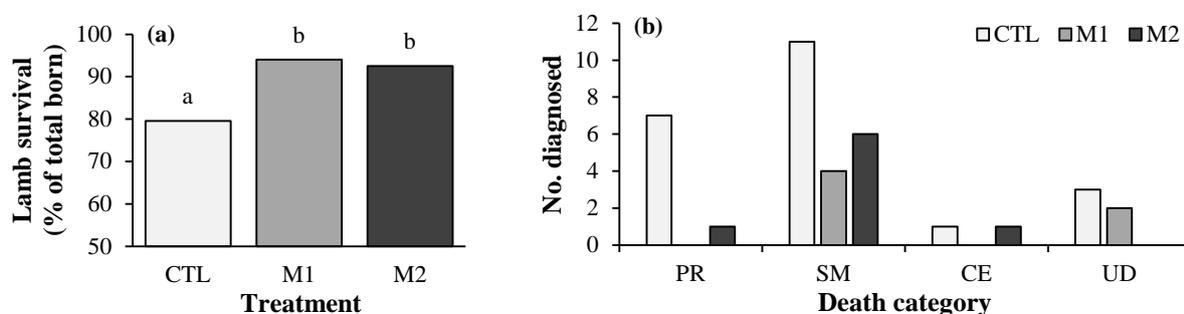
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High incidences of pre-weaning mortality continue to limit the output of Australian sheep enterprises, costing the industry an estimated \$540 million per annum in lost production (Lane *et al.* 2015). Low birthweight lambs, especially twins, are highly susceptible to hypoxic brain injury via prolonged or traumatic parturition, leading to stillbirth or impaired neuro-motor activity and ensuing starvation or hypothermia (Refshauge *et al.* 2016). Maternal melatonin supplementation can potentially increase birthweight and thermogenic capacity by enhancing uterine bloodflow and delivery of oxygen and nutrients to the fetus (Sales *et al.* 2019). Melatonin also provides neuroprotection to the neonatal brain via potent antioxidant and anti-inflammatory actions, which improves teat-seeking behaviour of hypoxic lambs (Aridas *et al.* 2018).

Our study investigated whether supplementing Merino ewes with melatonin would improve birthweight and survival of twin lambs under extensive farm conditions. Pregnant twin-bearing mixed age Merino ewes were implanted with one (M1,  $n=50$ ) or two (M2,  $n=53$ ) slow-release melatonin implants (18 mg, Regulin®), 90 days after ram introduction (35 day joining period; term ~148 days). Control ewes received no supplementation (CTL,  $n=54$ ). Ewes were separated by treatment into 3 paddocks 14 d before lambing and monitored twice daily throughout the lambing period. Lamb survival, weight, and rectal temperature were recorded at tagging on the day of birth. Lamb blood samples were taken the next day for serum IgG analysis to determine total colostrum intake. Lamb survival and weight were recorded again at marking and weaning. Lambs were autopsied whenever a carcass was found (Holst 2004). Chi-square test was used to analyse lamb survival and causes of death.

Both melatonin treatments increased lamb survival to day 3 post-partum ( $P<0.01$  for each) and this improvement was maintained through to weaning (M1=94.0%; M2=92.5%; 79.6%;  $P<0.01$  for each, Figure 1a). There were no significant treatment effects on lamb weights, rectal temperature, colostrum intake, or growth rate. Lamb autopsies revealed a higher proportion of parturition-related deaths (comprising dystocia, stillbirth, and birth injury) for CTL lambs vs. both M1 ( $P=0.010$ ) and M2 ( $P=0.033$ ) (Figure 1b).



**Figure 1. (a) Twin lamb survival to weaning (% of total born). (b) Causes of death within treatment. Death categories: PR = parturition-related, SM = starvation/mismothering, CE = cold exposure, UD = undiagnosed (no carcass found).**

The marked reduction in parturition-related deaths suggests that improved survival is linked primarily to melatonin-induced neuroprotection, though further studies are required to clarify the underlying mechanisms. This study is ongoing, with planned replication involving multiple breeds and environmental conditions. However, these early results indicate that supplementing pregnant twin-bearing Merino ewes with melatonin may be a simple and cost-effective strategy to reduce neonatal mortality and improve weaning rates.

### References

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