

Sheep reproduction RD&A alert

This sheep reproduction RD&A alert is an initiative of the Sheep Reproduction Strategic Partnership (SRSP).

MLA has established the SRSP together with industry. The SRSP aims to help sheep producers to profitability and sustainably increase lamb production through increasing lamb survival and weaning rates and will coordinate a national approach to improving sheep reproductive performance.

The sheep reproduction RD&A alert provides a snapshot of the latest research, development and adoption initiatives related to improving the reproductive performance of sheep. Contact details for each initiative are provided to encourage communication and collaboration across the sheep reproduction RD&A community.

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Review papers

A review of dystocia in sheep

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Highlights

- dystocia is an important contributor to lamb and ewe mortality
- ewe nutrition, stress, environment and genetics impact dystocia incidence and severity
- opportunities exist to improve lamb and ewe survival
- significant knowledge gaps in understanding risk factors and mitigation strategies.

Abstract

This review aims to describe the nutritional and non-nutritional factors that may affect parturition and dystocia in sheep. Dystocia is associated with fetopelvic disproportion, uterine inertia, failure of the cervix to fully dilate, malpresentation and disease or congenital defects in lambs. Dystocia can result in lambs that are born dead, or lambs that survive parturition but sustain birth injury including central nervous system damage. Dystocia risk is increased with high or low birthweight lambs, high (fat) or low live weight ewes, and small first parity ewes. Other factors implicated include low muscle glycogen, pregnancy toxæmia, mineral imbalance causing hypocalcaemia, and a lack of antioxidant nutrients. Addressing these risks requires

differential nutritional management for single and multiple bearing ewes. There is also evidence for stress and environmentally related dystocia. The stress related hormones cortisol, adrenaline and ACTH play a major role in the initiation and control of parturition in the sheep indicating a need for adequate supervision during lambing, provision of adequate feed and shelter at the lambing site, and small flock size to reduce physical and environmental stress. Hormonal control of parturition can be further disrupted by xenoestrogens or phytoestrogens in clovers and medics. Oestrogenic plants are still widely grown in mixed pastures but should be not be grazed by pregnant ewes. There is clearly a genetic component to dystocia. This is partly explained by incompatibility in physical size and dimensions of the ram, ewe and lamb. A rapid reduction in dystocia through direct genetic selection is problematic with low heritability of dystocia and some of its indicator traits such as lambing ease. This review provides broad interpretation of the literature, but conclusions are not definitive with widespread inconsistency in reported results. Further research is required to investigate dystocia under commercial production conditions, and this should be complemented by focussed studies under controlled conditions. Priorities include defining the fitness of the ewe to lamb, the role of stress and environment on parturition and the use of indicator traits to select for ease of birth.

Neonatal lamb mortality: major risk factors and the potential ameliorative role of melatonin

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Abstract

High incidences of pre-weaning mortality continue to limit global sheep production, constituting a major economic and welfare concern. Despite significant advances in genetics, nutrition, and management, the proportion of lamb deaths has remained stable at 15–20% over the past four decades. There is mounting evidence that melatonin can improve outcomes in compromised ovine pregnancies via enhanced uterine blood flow and neonatal neuroprotection. This review provides an overview of the major risk factors and underlying mechanisms involved in perinatal lamb mortality and discusses the potential of melatonin treatment as a remedial strategy. Supplementing pregnant ewes with melatonin enhances uterine blood flow and fetal oxygenation, and potentially birthweight and neonatal thermogenic capacity. Melatonin freely crosses the ovine placenta and blood-brain barrier and provides neuroprotection to the fetal lamb during periods of chronic and acute hypoxia throughout gestation, with improved behavioural outcomes in hypoxic neonates. The current literature provides strong evidence that maternal melatonin treatment improves outcomes for lambs which experience compromised in utero development or prolonged parturition, though to date this has not been investigated in livestock production systems. As such there is a clear basis for continued research into the effects of maternal melatonin supplementation during gestation on pre-weaning survival under extensive production conditions.

Scientific papers

Behaviour of twin-and triplet-born lambs and their dam 3–18 hours after birth is not a useful predictor of lamb survival to weaning

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Abstract

Objective: An experiment was designed to determine if behaviour traits expressed by twin-and triplet-bearing lambs and their dams at 3–18 hours of age (after the immediate ewe lamb bonding had occurred) were associated with lamb survival to weaning.

Methods: The behaviour of twin and triplet lambs and their dams was assessed in the paddock at 3–18 hours after birth. Observations were made of the number of high- and low-pitched bleats, time to stand, make contact with dam, suck from dam and follow dam were recorded for each lamb. The maternal behaviour score of each dam was assessed. A random sub-sample of lambs were assessed during a maternal-recognition test at 12 or 24 hours of age. Traits included time spent standing, sitting, walking, time taken to reach the ewes and time spent with the ewes as well as the number of high- and low-pitched bleats emitted by the lamb.

Results: In the paddock, for each additional second required for twin-born lambs to follow their dam, lambs were 1.004 (95% confidence interval [CI] 1.000 to 1.008) times more likely to survive to weaning ($p < 0.05$). The opposite relationship, however, was seen in triplet lambs. For each additional second required for triplet-born lambs to follow their dam, lambs were 0.996 (95% CI 0.993 to 0.999) times as likely to survive to weaning ($p < 0.05$). During the maternal recognition test, twin-born lambs were 0.989 (95% CI 0.979 to 1.000) times as likely to survive to weaning for every additional second they took to reach the contact zone ($p < 0.05$). Similarly, triplet-born lambs were 0.994 (95% CI 0.989 to 0.999) as likely to survive for every additional second they took to reach their dam ($p < 0.05$).

Conclusion: All ewe behaviours and the majority of lamb paddock and test behaviours were not associated with the survival of twin- or triplet-born lambs and, therefore, are of little use as indicators of lamb survival to weaning.

Relationship between *Toxoplasma gondii* seroprevalence and lamb marking in South Australian sheep flocks

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Australian Veterinary Journal Volume 9 – November 2020

DOI onlinelibrary-wiley-com.ezproxy.csu.edu.au/doi/10.1111/avj.13004

Abstract

Objective: Toxoplasmosis in sheep has negative impacts on reproductive performance. This study aimed to estimate the prevalence in *Toxoplasma gondii* infection in the South Australian sheep population, and assess any association between within-flock prevalence and reproductive efficiency (measured by lamb marking percentage), climatic region and rainfall.

Methods: A total of 875 individual mixed-age breeding ewes from 29 South Australian properties were blood sampled with an average of 30.2 ewes per property (min 28, max 32). Sera were tested for *T. gondii*-specific IgG antibody using a commercial modified agglutination test kit.

Results: Overall, 209 of 875 (23.9%; 95% confidence interval [CI] 16.3% to 31.4%) of individual ewes tested seropositive for *T. gondii*-specific IgG antibodies, with a flock level seroprevalence of 28/29 (96.6%, 95% CI 96.6% to 100%). On individual farms, the seroprevalence ranged from 0% to 93.3%. Analysis showed that Kangaroo Island properties had significantly higher mean seroprevalence than any mainland climatic regions, and that the mainland regions did not significantly differ from each other. Linear regression revealed a significant association between seroprevalence and lamb marking percentage, with a slope of -5.4% lamb marking per +10% seroprevalence.

Usefulness of pathological examinations of the central nervous system for monitoring and controlling perinatal lamb mortality

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Abstract

Correct diagnosis of cause of death is necessary to suggest the most effective management interventions to reduce perinatal lamb mortality. Haemorrhage on the surface of the brain has been used as a field diagnostic tool to allocate lambs to a cause of death category, but the usefulness of this method was unclear. This study aimed to evaluate whether gross pathology was related to neuronal death and whether haemorrhage of the central nervous system (CNS) was distinct between differing causes of death, enabling indicators to be used in field diagnoses. Lambs dying from natural causes (n= 64) and from euthanasia (n= 7) underwent postmortem examination, then the brain and spinal cord were extracted and examined histologically. Histological changes consistent with neuronal death were not detected in any lamb. Haemorrhage of the meninges and/or parenchyma of the CNS occurred in all lambs. The age of the haemorrhage indicated that it occurred near the time of death in most lambs. Dilatation of blood vessels varied in severity but appeared to be unrelated to causal diagnosis, severity of subcutaneous oedema, breathing or milk status. Moderate or severe dilatation of blood vessels and haemorrhage of the CNS did not occur in all lambs with alternative clear indicators of dystocia and occurred in all death classifications, so it could not be used as diagnostic indicators for classification of cause of death. Dilatation and haemorrhage were unrelated to neuronal damage and may have been artefactual. In conclusion, haemorrhage of the CNS was not indicative of neuronal damage and

could not be used to distinguish between lambs with clear indicators of differing causes of death, so it is not recommended as a field diagnostic tool.

Mid and late pregnancy ewe shearing affects lamb neonatal reactivity and vigour

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Abstract

Poor lamb survival is an important production and welfare issue, and the lamb must express complex behaviours to successfully transition to life ex-utero. Even under best management practices, sheep husbandry events, such as shearing, yarding and transport can be stressful for animals, and when they take place during pregnancy these stressors could possibly impact the neonate as well as the dam. This study examined the effects of some of the common stressors produced by shearing during pregnancy on neonatal lamb behaviour. Pregnant ewes were either subjected to shearing/cold stress or were handled (sham treatment), during mid or late pregnancy (four groups, $n = 15$ per group). Shorn ewes were wetted using sprinklers on three occasions the week following shearing to exacerbate the effect of cold. Neonatal lamb behaviour was assessed using a separation test and observance of lamb vigour related measures: latency-to-bleat; latency-to-stand; and return-to-ewe times, before and after a cold challenge at 4 °C of 1 h duration. Overall, lambs born to ewes shorn during pregnancy displayed higher latency-to-bleat than control lambs ($P = 0.04$). Mid-pregnancy shearing resulted in shorter latency-to-bleat than mid-pregnancy control treatment ($P = 0.03$). When shearing treatment was applied during late-pregnancy, lamb return-to-ewe time was higher than for lambs from ewes treated during mid-pregnancy which was in turn shorter than for control lambs ($P = 0.006$ & $P = 0.04$). Regardless of treatment groups, single lambs exhibited higher latency-to-stand than twin lambs ($P = 0.02$). Lambs reacted faster and had shorter latencies to display behaviour after a cold challenge than before ($P = 0.004$). It seems that prenatal stress due to shearing of ewes during pregnancy adversely impacted neonatal behaviours but improved the behavioural responses of lambs after a cold stress challenge. Overall, shearing of ewes during pregnancy affected neonatal lamb behaviour and responses to cold challenge; however, the effects varied depending on litter size and timing of shearing. Differences between treatment groups and particularly between different timing of the stress treatment suggest there may be different mechanisms impacting on neonatal behaviour. Exposure to physiological stressors during pregnancy may improve resilience to these specific stressors. Further work is required to understand the underlying mechanisms leading to the observed changes in lamb behaviour.

Genetic and environmental parameters and trends for early growth and yearling traits in the Elsenburg Dormer resource flock

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Highlights

- the Dormer is the most important South African terminal sire breed
- the Elsenburg flock is the base flock and was founded in the 1940's
- live weight and wool traits in this breed were all variable and heritable
- genetic progress should thus be feasible
- genetic gains were 0.16% for weaning weight and 0.45% for yearling weight.

Abstract

The Dormer is a composite breed and constitutes the most numerous terminal sire breed in South Africa. The Elsenburg Dormer flock is the foundation flock of the breed and is still being maintained at the Elsenburg research farm in the Western Cape province of South Africa. Data from 1943 to 2019 were used to investigate genetic and environmental parameters and trends for early growth traits and lamb survival (LS) in the flock. Yearling live weight and wool traits were recorded for a shorter period from 2008 to 2018. REML-procedures were used to estimate fixed effects as well as genetic parameters and trends in the flock. The fixed effects of birth year, sex, birth type and age of dam had a significant influence on all the early growth traits. There was an interaction between birth year and sex for most traits. Direct single-trait heritability estimates were 0.15 for birth weight (BW), 0.06 for weaning weight (WW), 0.02 for LS, 0.19 for yearling weight (YW), 0.63 for clean yield, 0.56 for clean fleece weight, 0.59 for staple length, 0.59 for staple strength, 0.60 for coefficient of variation of fibre diameter and 0.80 for fibre diameter. Maternal genetic effects amounted to 0.21 for BW, 0.08 for WW and 0.06 for YW. Dam permanent environmental effects ranged from 0.03 for LS to 0.08 for BW and litter effects from 0.12 for LS to 0.28 for BW. Multi-trait heritability estimates were fairly consistent with the above single trait estimates. Genetic correlations among live weight traits ranged from low (-0.11) for BW and YW to very high (0.93) for WW and YW. Genetic correlations of YW with wool traits ranged from low to moderate. Genetic correlations among wool traits were mostly consistent with literature estimates for wool breeds. Genetic trends for all weight traits suggested a significant positive trend with time. Expressed relative to the overall phenotypic mean, these trends amounted to 0.12 % for BW, 0.16 % for WW and 0.45 % for YW. The study indicated that all traits were heritable and variable. Purposeful selection for a well-defined objective should allow faster genetic improvement than the annual rates of gain that were realised.

Maternal supplementation with dietary betaine during gestation to improve twin lamb survival

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DOI [mdpi.com/2076-2615/10/10/1749](https://doi.org/10.3390/animals10101749)

Highlights

- feeding ewes 2 g/day of betaine for the duration of pregnancy decreased lamb survival but increased lamb body weight at weaning
- lamb vigour and early post-natal survival were improved following ewe supplementation with 4 g/day of betaine during the second half of pregnancy
- maternal supplementation with 4 g/day of betaine during the second half of pregnancy may be a useful strategy to improve twin lamb survival.

Abstract

Betaine increases the synthesis of creatine, an energy-rich amino acid that increases adenosine triphosphate (ATP) and has neuroprotective properties which may improve post-natal lamb survival. This study determined whether maternal betaine supplementation during gestation would improve body weight, thermoregulation, time to stand and suck, colostrum intake and survival to weaning of twin lambs. Twin-bearing Merino ewes received dietary betaine at either 0 g/day (Control, CTL), 2 g/day from ram introduction to parturition (early betaine, EB) or 4 g/day from Day 80 of gestation to parturition (late betaine, LB). Ewes were housed individually during parturition and measures were collected at 4, 24, 72 hours, and day 7 post-partum, and at marking (53.2 ± 0.2 days of age) and weaning (99.3 ± 0.2 days of age). The EB treatment resulted in heavier lambs at weaning compared with CTL and LB lambs ($p < 0.05$). Time to stand and suck from birth was longer in EB lambs ($p < 0.05$), whereas, the interval from birth to first suck was shorter for LB lambs ($p < 0.05$). Lamb survival rate was the highest for LB lambs at 72 hours and day 7 ($p < 0.05$), and lowest for EB lambs on day 7 ($p < 0.05$). These data indicated that betaine supplementation at 4 g/day during the second half of pregnancy improved twin lamb survival to day 7 and shortened the interval from birth to first suck; whereas feeding ewes 2 g/day of betaine for the duration of pregnancy increased twin lamb body weight at weaning, but increased both the time to attain behavioural milestones and mortalities before day 7.

Project final reports

Managing breeding ewes in containment areas. A guide for producers

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Meat & Livestock Australia – October 2020

[Managing breeding ewes in containment area](#)

Upcoming events

Date	Event	Location
1–3 February 2021	The new face of animal science conference Australian Association of Animal Sciences (AAAS)	Fremantle, WA
1 February 2021	The great livestock industry day out Australian Association of Animal Sciences (AAAS)	Fremantle, WA
12 February 2021	Better management practices workshop Delta Agribusiness	Dubbo, NSW
23 February 2021	RAMping up repro workshop Sheep Connect SA	Eyre Peninsula, SA

Funding calls

Program	Open	Close
Producer Demonstration Sites Meat & Livestock Australia	1 April 2021	12 May 2021