

AUGUST 2024

Sheep reproduction RD&A alert

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

The [Sheep Sustainability Framework](#) (SSF) has released its fourth [annual report](#) which details the SSF activities for FY2024. The data status for 48% of indicators is positive, either holding steady or showing directional improvement. Data on biodiversity and producer wellbeing are now included in the framework.



Program coordinator

Dr Sue Hatcher

M: 0407 006 454

E: sue@makinoutcomes.com.au

Highlights include improvements in the adoption of pain management for most animal husbandry procedures and a general decline in net greenhouse gas (GHG) emissions generated by the sheep industry.



The [Making More From Sheep](#) (MMFS) resource package was relaunched this month. MMFS is a one-stop-shop for Australian sheep producers and has been updated to include the latest sheep industry research, tools and information covering all aspects of sheep production.

The best-practice principles covered in MMFS support a sustainable and profitable sheep and wool operation,

helping to reduce costs and optimise production while minimising risk in an ever-changing environment.

The MMFS offering now includes 12 Modules which cover all aspects of sheep production from breeding, reproduction, pastures and feedbase to animal health and welfare. The 2024 update includes the Making More From Sheep eLearning course, which is housed on both the [AWI](#) and [MLA](#) e-learning platforms.

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.

Feature project update

Investigating heat stress in ewes – reproductive performance

Background

In sheep production, extreme heat events are known to affect development, growth, and reproduction. In the extensive pasture and pastoral based systems typical of Australia, sheep are exposed to a diverse range of extreme climatic conditions and have little to moderate access to shade. During the natural breeding period, cycling and pregnant ewes, as well as working rams, are often exposed to conditions that challenge

their homeothermy, wellbeing, and reproductive function. The frequency and amplitude of heat events have increased and are likely to increase further with climate change.

Aim

To quantify the effects of heat events on sheep reproduction, thermoregulatory capacity, behaviour, and wellbeing through long term data collection during a range of climatic conditions in diverse production settings.

Project Objectives

- Quantify and map the microclimates, including landscape and vegetation utilisation by ewes and rams at a minimum of six (diverse) locations including a minimum of one rangeland site and a minimum of one location in NSW.
- Quantify the impact of heat stress on ewe and ram physiology, behaviour and fertility.
- Quantify the impact of heat stress on reproductive rate and lamb survival.

Current progress

The third joining at the commercial sites on-farm and intensive sites was completed earlier this year. Rams and ewes at the former were equipped with GPS and activity logs with those at the latter equipped with proximity and temperature loggers. Weather data, food on offer (FOO) and supplementary feeding information has been collected. The project now has a large dataset of proximity, movement and activity for the animals as well as detailed environmental and husbandry data. Preliminary analysis of the data indicates that there is large variability in the capacity of individual sheep to cope with heat stress.

For more information on the [investigating heat stress in ewes – reproductive performance](#) project contact Shane Maloney (08 6488 3394 shane.maloney@uwa.edu.au).

Scientific papers

An analysis of fertility and fecundity in the Australian sheep flock between 2006 and 2019

Gordon Refshauge (gordon.refshauge@dpi.nsw.gov.au), Madison Golledge, Jess Rickard and Simon de Graaf

Scientific Reports, Volume 14. Article number 17781 **OPEN ACCESS**

DOI <https://doi.org/10.1038/s41598-024-67847-4>

Abstract

After decades of decline, the Australian sheep flock aspires to rebuild its population of breeding ewes. A successful, rebuild will rely on high pregnancy rates and number of lambs born and reared. To examine this potential, a cross-sectional study of historical ultrasound pregnancy scanning records was undertaken using records collated from two experienced sheep pregnancy scanning businesses (years 2006 to 2019) from 15,397 mobs of ewes, totalling 7,443,314 ewes. Client details were de-identified and excluded from analyses, but details describing the mobs were retained when available, such as season of mating, production zone, ewe age, and breed. The key finding was a mean pregnancy rate (ewes pregnant per ewe scanned) of 0.76 ± 0.24 , with a median of 0.83. Mobs scanned to identify fetal number had a higher mean (0.84 ± 0.15) and median (0.89) pregnancy rate. The mean reproduction rate (fetuses per ewe scanned) was 1.21 ± 0.27 and the median was 1.25. Differences were observed between the factors including age, breed, season, year or production zone but all results were lower than anticipated. The unexpected findings imply a problem exists with the fertility of many Australian sheep flocks.

Including magnesium sulfate in the diet of twin-bearing ewes in the last week of gestation improves the adaptation of lambs to extrauterine life

M. A. Minteguiaga (maurominteguiaga@gmail.com), C. López Mazz, S. Fierro and G. Banchemo

Animal Production Science, Volume 64, Issue 12, August 2024

DOI <https://doi.org/10.1071/AN24022>

Abstract

Context: Most deaths of lambs in the first days of life are due to failure to adapt to extrauterine life.

Aims: This study aimed to test the hypothesis that adding magnesium sulfate (MgSO₄) to the diet of twin-bearing ewes in the last week of gestation improves the adaptation to the extrauterine life of the lambs.

Methods: Eighty-three multiparous Finnish × Polwarth ewes carrying twins in the last week of gestation were MgSO₄ supplemented (n = 40) or allocated to control (n = 43). We recorded the durations of gestation, expulsion and lambing, interlambing interval, and birthweights, meconium score, lamb rectal temperature (at birth and 3 h after birth), whether assistance was needed (yes or no) and time from lamb expulsion to stand and to suck (n = 148). A jugular blood sample of the lambs was analysed for acidity, partial pressures of CO₂ and oxygen; active and standard HCO₃, blood base excess (BE b) and extracellular fluid base excess (BE ecf), saturated oxygen, and total CO₂ concentration. Glucose was analysed with a portable device.

Key results: Gestation was longer in supplemented ewes (147.7 ± 2.0 vs control: 146.7 ± 1.7 days, P < 0.05). Birthweight and litter birthweight of lambs were higher when ewes were supplemented (3.74 ± 0.6 and 7.47 ± 0.9 kg vs control: 3.51 ± 0.5 and 7.02 ± 0.9 kg, P < 0.05). The need for assistance, meconium score, durations of expulsion and lambing, and time to stand and to suck were not different between treatments (P > 0.05). The interlambing interval was shorter in the supplemented ewes (6.7 ± 2.7 m vs control: 10.4 ± 2.6, P < 0.05). Lamb rectal temperature was not different between treatments 3 h after birth, but at birth was lower in lambs of supplemented ewes (P < 0.05). Treatments did not differ in blood acidity, CO₂ partial pressure and total concentration, active and standard HCO₃, both measures of base excess, nor blood glucose. Lambs of supplemented ewes had higher oxygen saturation and partial pressure (P < 0.05).

Conclusions: The MgSO₄ supplementation improves the adaptation to extrauterine life in pen conditions.

Implications: It should be tested whether maternal supplementation with MgSO₄ reduces the mortality of twin lambs.

High concentrate supplementation during late pregnancy and lambing reduced mortality of triplet-bearing maternal ewes

Emmanuelle Haslin (emmanuelle.Haslin@murdoch.edu.au), Sarah E. Blumer, Darren Gordon, Gavin A. Kearney, Paul R. Kenyon, Lyndon J. Kubeil, Gordon Refshauge, Jason P. Trompf and Andrew N. Thompson
animals, Volume 14, Issue 16, August 2024 **OPEN ACCESS**

DOI <https://doi.org/10.3390/ani14162302>

Simple Summary

This study investigated the effects of feed-on-offer (FOO) and supplementation with concentrates during late pregnancy and lambing on the survival of triplet-bearing ewes and their lambs in Australia. High and low levels of FOO and concentrate supplementation during late pregnancy and lambing were tested on 10 commercial farms between 2019 and 2021 using 1772 triplet-bearing Maternal ewes. Lamb survival and ewe mortality were estimated at lamb marking. Survival of triplet-born lambs was not impacted by levels of FOO or supplementation. Triplet-bearing ewes receiving high levels of supplementation had a 40% decrease in mortality to marking compared with those receiving lower levels of supplementation. These findings suggest no additional benefits to survival of triplet-bearing ewes when FOO levels exceed 1200 kg DM/ha during late pregnancy and lambing, but increased supplementation with concentrates can reduce ewe mortality.

Abstract

Low survival of triplet-bearing ewes and their lambs represents lost production and a welfare issue. The effects of feed-on-offer (FOO; low: 1205 vs. high: 1980 kg DM/ha) and concentrate supplementation (low: 50 vs. high: 300+ g/ewe/day) levels during late pregnancy and lambing on the survival of triplet-bearing ewes and their lambs were investigated on 10 commercial farms using 1772 triplet-bearing Maternal ewes. Ewe and lamb survival were estimated at marking, and ewe body condition score (BCS) was recorded in late pregnancy and at marking. Although FOO treatment had no effect on triplet-bearing ewe mortality, receiving higher supplementation decreased mortality by 40% and increased BCS at marking by 0.14 compared with a lower supplementation ($p < 0.05$). Supplementation, FOO treatments, weather conditions during lambing and shelter availability had no effect on triplet-lamb survival. These findings suggest no additional benefit to triplet-bearing ewe survival when FOO levels exceed 1200 kg DM/ha during late pregnancy and lambing, but increased supplementation can reduce ewe mortality. Further research is required to determine the response to the supplementation level at lower FOO levels on triplet-bearing Merino ewes and their lambs and establish whether supplementation of triplet-bearing ewes during late pregnancy and lambing with higher levels of concentrates would be cost-effective.

MLA Project L.LSM.0013 *Managing fecund flocks to improve survival of triplet dams and their lambs*

Isolation of aerobic bacterial species associated with palpable udder defects in non-dairy ewes

Mandefrot M. Zeleke, Paul R. Kenyon, Kate J. Flay, Danielle Aberdein, Sarah J. Pain, Niluka Velathanthiri and Anne L. Ridler (A.L.Ridler@massey.ac.nz)

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Simple Summary

Milk or mammary tissue swab samples were collected from both defective and normal udder halves in three different studies to identify the bacterial species involved. Samples were collected at different physiological time points: pre-mating, throughout lactation, at weaning and post-weaning. Numerous bacterial species were identified, with Staphylococcus species, Mannheimia haemolytica and Streptococcus being the most frequently isolated. Bacteria were isolated from at least one third (udder lumps) or more than half (hard udder) of defective udder halves, whereas no bacteria were isolated from more than two thirds of normal udder halves. Frequently isolated bacterial species tended to persist longer, whereas less frequently isolated bacterial species showed less stability over time. Bacterial species more frequently identified from defective udder halves and which appear more stable over time should be considered as a factor for making culling decisions.

Abstract

The objectives of these studies were to identify associations between udder half defects (hard or lump) and bacteria isolated from milk or mammary tissue swabs, to compare with samples from normal udder halves at different physiological time points and to compare bacterial species isolated via milk and swabs of mammary tissue from within the same udder halves. A total of 1054 samples were aseptically collected from each udder half of 199 non-dairy breed (Romney) ewes from three different studies (Study A, $n = 77$; Study B, $n = 74$; and Study C, $n = 48$). Conventional bacterial culture and MALDI-ToF mass spectrometry were used for bacterial identification. Of the 225 samples from which bacteria were isolated, Mannheimia haemolytica and Streptococcus uberis were the dominantly identified species from defective udder halves, whereas coagulase-negative staphylococcus (CNS) species, mostly Staphylococcus simulans and Staphylococcus chromogenes, were more frequently isolated from normal udder halves. The ongoing presence of bacterial species over time was variable, although less frequently identified species showed less stability over time. A very high agreement (91.5%) of bacterial species identified was observed between the mammary tissue swab

and udder half milk samples during post-weaning. In summary, palpable udder half defects were associated with bacterial positivity, and the ongoing presence of the bacteria over time was dependent on the species involved. Hence, culling ewes with palpable udder half defects that had more stable bacterial species could contribute to reducing the recurrence of palpable defects or mastitis.

Dynamic changes in the nutrient digestibility, rumen fermentation, serum parameters of perinatal ewes and their relationship with rumen microbiota

Jiixin Chen, Siwei Wang, Xuejiao Yin, Chunhui Duan, Jinhui Li, Yueqin Liu and Yingjie Zhang
(zhangyingjie66@126.com)

animals, Volume 14, Issue 16, August 2024 **OPEN ACCESS**

DOI <https://doi.org/10.3390/ani14162344>

Simple Summary

Changes in physiological and biochemical parameters are crucial for the reproductive performance and health of perinatal ewes. However, dynamic changes in feed utilization, rumen fermentation, and serum biochemical indexes of perinatal ewes are unclear. This study aims to explore dynamic changes in dry matter intake, nutrient digestibility, rumen fermentation, and serum biochemical indexes in perinatal ewes and their relationship with rumen microbiota. We found that the dry matter intake and glucose gradually decreased during prepartum and increased during postpartum. The digestibility of dry matter, crude protein, and acid detergent fiber increased before lambing, and decreased on day 3 after lambing. The concentrations of acetate, propionate, and butyrate gradually decreased before lambing and increased after lambing. The rumen microbiota composition was different in perinatal ewes, and the changes in dry matter intake, serum glucose, acetate, and propionate were related to rumen bacteria (*g_Anaerovibrio*, *g_Lachnobacterium*, *g_Schwartzia* and *g_Bacillus*). The results provide a basis for the regulation of physiological and biochemical parameters of perinatal ewes by rumen microbiota.

Abstract

Changes in physiological and biochemical parameters are crucial for the reproductive performance and health of perinatal ewes. This study investigated the temporal variations in feed intake, nutrient digestibility, serum parameters, and ruminal fermentation on days 21, 14, and 7 before lambing (Q21, Q14, and Q7) and days 3, 7, and 14 after lambing (H3, H7, and H14). The results showed that dry matter intake (DMI) and glucose (Glu) gradually decreased ($p < 0.05$) before lambing and increased ($p < 0.05$) after lambing. The digestibility of dry matter (DMD), crude protein (CPD), and acid detergent fiber (ADFD) increased ($p < 0.05$) before lambing, then decreased ($p < 0.05$) on day H3, and then increased ($p < 0.05$) on day H14. The rumen pH, NH₃-N, and triglycerides (TG) gradually increased ($p < 0.05$) before lambing and were higher ($p < 0.05$) on day Q7 than after lambing. The concentrations of acetate, butyrate, and total volatile fatty acids (T-VFA) were lower ($p < 0.05$) on day Q7 than those on days Q21 and Q14, then increased ($p < 0.05$) after lambing. Total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C), and low-density lipoprotein cholesterol (LDL-C) concentrations gradually decreased ($p < 0.05$) in perinatal ewes. BHBA and NEFA concentrations were lower ($p < 0.05$) on day Q21 than those from days Q14 to H14. The rumen microbiota compositions were different ($p < 0.05$) in perinatal ewes, and *g_Anaerovibrio*, *g_Lachnobacterium*, and *g_Schwartzia* were positively correlated ($p < 0.05$) with DMI, Glu, acetate, propionate, and T-VFA, and negatively correlated ($p < 0.05$) with LDL-C. *g_Bacillus* was negatively correlated ($p < 0.05$) with DMI, Glu, acetate, propionate, butyrate, and T-VFA, but positively correlated ($p < 0.05$) with rumen pH and LDL-C. In summary, the DMI, nutrient digestibility, rumen fermentation, and serum parameters changed during the perinatal period of ewes, and the changes in DMI, serum glucose, acetate, propionate, and T-VFA were related to the rumen bacteria.

Estimation of genetic parameters for reproductive indices in sheep

Beatriz Bastos Senes, Valdecy Aparecida Rocha da Cruz, Hymerson Costa Azevedo, Raphael Bernal Costa and Gregório Miguel Ferreira de Camargo (gregorio.camargo@ufba.br)

Journal of Animal Breeding and Genetics, Volume 141, Issue 5, September 2024

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Abstract

This study aimed to estimate two reproductive efficiency indices in sheep based on the ratio between litter weight (at birth and weaning) and dam weight, as well as their genetic parameters. Phenotypic and pedigree data comprising the period from 1990 to 2018 were obtained from the Santa Inês sheep database of Embrapa Tabuleiros Costeiros. For estimation of the genetic parameters of the indices, a repeatability model was applied in single- and two-trait analyses by a Bayesian approach. The mean reproductive efficiency index was 0.069 ± 0.0163 and 0.43 ± 0.0955 at birth and weaning, respectively. These values indicate that, on average, ewes give birth to 69 g of lamb per kg body weight and wean 430 g of lamb per kg body weight. Described here for the first time, the heritability estimate obtained in single- and two-trait analyses was 0.24 for the index based on birth weights and ranged from 0.13 to 0.15 for the index based on weaning weights. The estimates indicate the possibility of genetic gain by selection and are similar to those reported for reproductive traits in sheep, representing an option for selection criterion. The genetic correlation between indices was positive and moderate (0.26). The repeatability estimates were high (0.49 for the birth weight index and 0.71 for the weaning weight index). These values indicate good prediction of future performance with few observations. The weaning weight index might be a good culling criterion of females.

Examining across year genotype by environment interactions for production and reproduction traits in Merino sheep

Gus Rose (gus.rose@une.edu.au), H.A. Mulder, J.C. Greeff, A.N. Thompson, J.H.J. van der Werf and J.A. M. van Arendonk

Small Ruminant Research, Volume 238, September 2024 **OPEN ACCESS**

DOI <https://doi.org/10.1016/j.smallrumres.2024.107325>

Highlights

- Sheep breeding programs in environments with variable feed availability are affected by pasture availability across years.
- Reproduction was most effected so the best genetically animal in one year may not be the best animal in other years.
- This makes selection of animals that will perform well in all years difficult.
- Animal performance distinguishes genetic differences between years better than pasture growth.

Abstract

Variation in feed resource availability within production systems can cause genotype by environment interactions that change the ranking of the best animals to select between environments. Mediterranean environments have high variation in pasture growth between years that could cause genetic by environment interactions for sheep production traits. Therefore, we estimated heritabilities for live weight, fleece weight, fibre diameter and number of lambs weaned in six years from 2000 to 2005 and correlations between years comparing multivariate analysis and random regression analysis. We compared 3 methods: 1 multivariate analysis estimating (co)variances for traits in each year, 2 Random regression estimated (co)variances for intercept and slope for traits as repeated measurements fitted against average pasture growth in each year and 3. Random regression fitted against corrected average performance of animals in each year. Random

regression was estimated with an order of polynomial of one for additive genetic variance and zero for permanent environmental effects. This combination of polynomials was the best fit based on Bayesian information criterion. We estimated heritabilities for each year and correlations between years using records from 3299 pedigreed Merino ewes managed at Katanning in Western Australia. There were 4651 records for adult live weight, 6750 for adult clean fleece weight, 6965 for adult fibre diameter, and 7774 for number of lambs weaned across all 6 years. Number of lambs weaned had more genotype by environment interactions than other traits, with fibre diameter and fleece weight having genotype by environment interactions between only a few years. Based on Bayesian information criterion values, multivariate analysis fit the data better for live weight, fleece weight and fibre diameter. Additionally, random regression estimated higher genetic correlations between years than multivariate analysis suggesting there was not enough flexibility in the random regression analysis, which used only first order polynomials, to fit differences between years. Pasture growth across years did not explain differences in performance for traits across years. Therefore, for number of lambs weaned, random regression using corrected average performance was a better fit than average pasture growth. For other traits, more years or a better indicator of variation in performance within and between years are required to use random regression for genotype by environment interactions.

Brushing rams before and during electroejaculation improves sperm motility and kinetics with slight changes in stress biomarkers

Juan Carlos Orihuela (orihuela.juancarlos@hotmail.com), Aline Freitas-de-Melo, Livia Pinto-Santini, Julia Giriboni, Florencia Beracoche, María Noel Viera and Rodolfo Ungerfeld (rungerfeld@gmail.com)

Animal Reproduction Science, Volume 268, September 2024

DOI <https://doi.org/10.1016/j.anireprosci.2024.107565>

Highlights

- Brushing rams before and during electroejaculation increased sperm mass motility.
- Curvilinear, linear, and average sperm velocities were greater in brushed rams.
- Sperm concentration tended to increase with brushing.
- Cortisol tended to be lower in rams brushed before and during electroejaculation.
- Brushing is an easy tool to include in semen collections with electroejaculation.

Abstract

The aim of this study was to determine whether brushing rams before and during electroejaculation (EE) reduces their stress response and improves the characteristics of the ejaculate. A single person brushed each ram for 5 min daily, for 15 days, in an individual pen. Semen was collected from five rams brushed before and during EE by the same brusher, while the other five were electroejaculated without being brushed. The treatments were exchanged three days later, so semen was collected from all the rams with both treatments. Brushing increased mass motility ($P = 0.05$), and curvilinear ($P = 0.001$), linear ($P = 0.02$), and average path ($P = 0.01$) velocities of sperm, as well as the average amplitude of lateral displacement of the sperm head ($P = 0.05$), and tended to increase sperm concentration ($P = 0.09$). Brushing tended to reduce the cortisol concentration ($P = 0.06$) and the duration of head movements when 2 V pulse series V was applied ($P = 0.1$). Brushing increased creatine kinase concentration ($P = 0.04$) and tended to increase rectal ($P = 0.06$) and maximum eye surface temperatures ($P = 0.1$), total time, and number of electrical pulses administered ($P = 0.07$ for both variables), as well as the sum of pulses per voltage applied during EE ($P = 0.06$). In rams accustomed to being brushed by the same person, brushing them before and during EE improved semen quality, with slight changes in the stress responses.

Upcoming events

Date	Event	Location
4 Sep 2024	Dry season spring – making the most of your pasture Agriculture Victoria	Webinar
5 Sep 2024	September Sheep Projections Meat & Livestock Australia	Webinar
9 Sep 2024	Optimising ewe lamb joining outcomes – PDS Field Day Meat & Livestock Australia, SheepMetriX & Productive Livestock Systems	Tallimba, NSW
10 Sep 2024	Livestock Advisor Essentials – Genetics and reproduction + Feedbase decision making Meat & Livestock Australia	Melbourne, Vic
11 Sep 2024	Dry season spring – water and dam management Agriculture Victoria	Webinar
12 Sep 2024	Worms are ready! Are you? AWI Extension NSW	Webinar
17 Sep 2024	Feed365 Spring Field Day DPIRD WA & MLA's SheepLinks Program	Katanning, WA
18 Sep 2024	Spring Field Day ASheep& Beef	Esperance, WA
25 Sep 2024	BredWell FedWell Sheep workshop Meat & Livestock Australia	Walcha, NSW

Funding calls

Program	Open	Close
MLA/GRDC Partnership PDS Project Call Meat & Livestock Australia & GRDC	August, 2024	25 September 2024