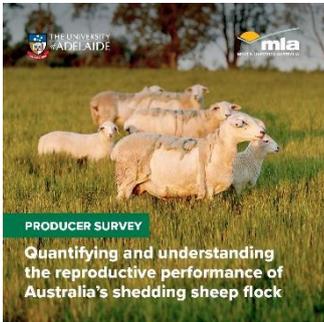


NOVEMBER 2023

Sheep reproduction RD&A alert

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

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.



Do you run shedding sheep and have more than 200 breeding ewes? Are you interested in being part of a national research project to quantify and understand the reproductive performance of shedding sheep? The project identify management options to improve the weaning rates of shedding sheep and demonstrates these strategies on-farm. [Click here](#) for more information on the project and to register your interest.

Program coordinator

Dr Sue Hatcher

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Feature project update

Managing Merino weaners to survive and thrive

Background

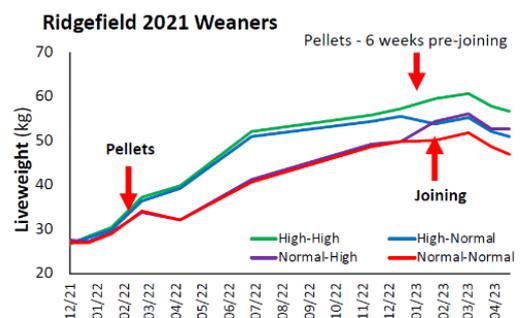
Merinos play a key role in the Australian sheep meat industry, representing approximately 70% of lambs born and 55% lambs slaughtered. Previous studies have reported that both Merino weaner survival and poor maiden reproductive performance remains an industry issue.

Aim

To identify opportunities for nutrition and management after weaning to deliver cost-effective improvements in weaner survival and lifetime reproductive performance across a range of Merino genotypes.

Early results

Field work is ongoing at six sites in WA and NSW to inform how growth path impacts weaner survival, wool production and lifetime reproductive performance. Preliminary analysis shows a strong relationship between joining weight and scanning data, with ewes achieving a range of joining weights via different growth paths.



National survey

A key component of this project is a national survey to better understand sheep producer's current practices related to weaner management and maiden reproductive performance. Click on this QR code to let the project team know your strategies for managing weaners.



Next steps

The project is currently recruiting demonstration sites to show cost-effective strategies for improving survival and lifetime productivity for different production systems and Merino genotypes.

For more information on the Managing merino weaners to survive and thrive project contact Caroline Jacobson (c.jacobson@murdoch.edu.au).

MLA Sheep and Goat Productivity Project Manager

MLA is currently seeking applications for the Project Manager – Sheep and Goat Productivity. This role involves identifying Research, Development & Adoption (RD&A) needs and opportunities to improve the profitability of on-farm lamb, sheepmeat and addressing those needs through the establishment, management and execution of appropriate RD&A.

You will liaise with key industry stakeholders and provide key support and linkage of the R&D programs to peak industry councils, government and research organisations, to ensure transparency and accountability against agreed program outcomes.

More information on this role can be found on the [MLA Careers website](#), Seek or LinkedIn.

Applications close on **16 December 2023**.

Review paper

Development programming: Stress during gestation alters offspring development in sheep

Mingji Wei, Qian Gao (gaoqian@lyu.edu.cn), Junjun Liu, Yan Yang, Jinyan Yang, Jingchang Fan, Shenjin Lv (lvshenjin@lyu.edu.cn) and Shengmei Yang (smyang@yzu.edu.cn)

Reproduction in Domestic Animals, Volume 58, Issue 11, November 2023

DOI <https://doi.org/10.1111/rda.14465>

Abstract

Inappropriate management practices of domestic animals during pregnancy can be potential stressors, resulting in complex behavioural, physiological and neurological consequences in the developing offspring. Some of these consequences can last into adulthood or propagate to subsequent generations. We systematically summarized the results of different experimental patterns using artificially increased maternal glucocorticoid levels or prenatal maternal physiological stress paradigms, mediators between prenatal maternal stress (PMS) and programming effects in the offspring and the effects of PMS on offspring phenotypes in sheep. PMS can impair birthweight, regulate the development of the hypothalamic–pituitary–adrenal axis, modify behavioural patterns and cognitive abilities and alter gene expression and brain morphology in offspring. Further research should focus on the effects of programming on gene expression, immune function, gut microbiome, sex-specific effects and maternal behaviour of offspring, especially comparative studies of gestational periods when PMS is applied, continual studies of programming effects on offspring and treatment strategies that effectively reverse the detrimental programming effects of prenatal stress.

Scientific papers

Are alpacas especially protective of lambs? An insight into alpaca guardian behaviour towards sheep using an arena preference test

Paige Matthews (pmatthe7@myune.edu.au), Amanda K. Doughty, Christine L. Morton, Jamie Barwick, Emma Doyle and Wendy Y. Brown

Applied Animal Behaviour Science, Volume 267, October 2023 **OPEN ACCESS**

DOI <https://doi.org/10.1016/j.applanim.2023.106057>

Highlights

- We examined alpacas' preference towards lambs and other novel stimuli in an arena test.
- Alpacas have a strong attraction and preference towards lambs compared to adult sheep and other novel stimuli.
- Both male and female alpacas responded positively towards lamb stimuli.
- The results from this study indicate why alpacas could make successful guardian animals.

Abstract

Alpacas are increasingly used as a guardian species in Australian sheep flocks in an effort to improve lamb survival rates. Yet little is documented about the role and mechanisms of alpaca guarding behaviours within this environment. The first phase of this study, evaluated the temperament of 44 alpacas by assessing their behaviour when individuals were separated from herd mates. Tests included agitation while in an isolation enclosure, flight speed and behaviour in observation arena tests. The second phase of the study evaluated alpaca responses to different auditory, olfactory and visual cues representative of young lambs, adult sheep (ewes) and other novel stimuli. Alpacas (n = 24) which had not previously been exposed to sheep were individually presented with stimuli in a test arena. Behavioural responses were recorded over 2 min and analysed to compare differences between stimuli type (lamb/ewe/other) and stimuli cue form (live animal/auditory only/olfactory only/visual only). In phase one of this study alpacas exhibited little agitation while retained in an isolation enclosure with 67% of animals demonstrating a low agitation score. Females appeared to have a more 'reactive' temperament than males, exhibiting significantly faster flight speeds ($P < 0.01$) and more frequent pacing behaviour ($P < 0.01$) in the observational pen. In the arena test both male (n = 12) and female (n = 12) alpacas consistently exhibited greater attraction towards the lamb stimuli type (for all cue forms) compared to the ewe and other atypical stimuli ($P < 0.05$ for all comparisons). Alpacas showed the greatest attraction towards the live lamb compared to visual ($P < 0.01$), auditory ($P < 0.01$) and olfactory lamb cues ($P < 0.001$). Both male and female alpacas demonstrated similar response times and there were no significant differences between alpaca sex in the total time spent reacting to the lamb and ewe stimuli. This study demonstrates that alpacas exhibit a greater attraction towards or interest in young vulnerable animals such as lambs and supports the available anecdotal evidence that the use of alpacas as livestock guardians may be useful in improving lamb survival rates.

Genetic associations of ewe body condition score and lamb rearing performance in extensively managed meat sheep

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Livestock Science, Volume 277, November 2023 **OPEN ACCESS**

DOI <https://doi.org/10.1016/j.livsci.2023.105336>

Highlights

- New traits for lifetime resilience in maternal sheep breeding programmes studied.

- BCS found to be heritable at certain points throughout the year and over time.
- Relationships with traits associated with ewe maternal performance complex.
- BCS and changes in condition can affect ability of ewes to conceive and rear lambs.

Abstract

Many small ruminant production systems are relatively low input and rely heavily on animals grazing pastures often in extensive and harsh environmental conditions, unsuitable for any other type of agriculture. New breeding goal traits for lifetime resilience for maternal sheep breeding programmes have been investigated, focusing on body tissue mobilisation phenotypes and their genetic relationships with maternal production traits. Performance records of 8,355 Scottish Blackface ewes, from 2 extensively reared hill sheep flocks, collected over a 20-year period, were used to quantify relationships between body condition score (BCS) and the ewe's ability to successfully rear lambs. Between 14,000 and 25,000 data records per trait were available, measured across the annual sheep reproductive cycle. The pedigree file used for the analyses included sire and dam information for 50,207 animals. Most heritability estimates for the BCS traits - measured at key time points within the annual production cycle, or considering BCS changes between time points - were low, but significantly different from zero, ranging between 0.07 and 0.17. The heritability estimate for the number of lambs at pregnancy scanning was 0.09. Heritabilities for foetal loss from pregnancy scanning to lambing, lamb loss from lambing to weaning and number of lambs weaned were 0.02, 0.02 and 0.06, respectively. These estimates indicate that genetic control over the reproductive and lamb survival traits (expressed as a trait of the dam), is lower than that for BCS (and BCS changes) over the reproductive cycle. The genetic relationships amongst the BCS of ewes at pre-mating, pregnancy scan and at pre-lambing, with litter size at pregnancy scan and number of lambs weaned, were consistent. They indicate that ewes of higher body condition score (potentially over-fat, within the range recorded in these flocks) conceive, and rear, fewer lambs, with genetic correlations ranging between -0.18 and -0.58. However, post-weaning, animals with genetic propensity for greater gain in BCS from weaning to pre-mating produce larger litters and rear more lambs. In addition, the selection of ewes that lose less condition during pregnancy will reduce foetal losses. The results from this study paint a complex picture that should be interpreted in the context of specific management practices for extensively managed hill sheep, at critical times in their reproductive cycle. The traits relating to body tissue mobilisation, as assessed using BCS, are mostly heritable and their inclusion in future breeding programmes, to aid future selection for resilience, should be considered.

Genetic and environmental parameters for early growth and yearling traits of the Elsenburg South African Mutton Merino resource flock

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Small Ruminant Research, Volume 228, November 2023

DOI <https://doi.org/10.1016/j.smallrumres.2023.107091>

Abstract

The Elsenburg South African Mutton Merino (SAMM) resource flock has been maintained at the Elsenburg Research Farm in the Western Cape, South Africa since 1955. Early growth and lamb survival data (record numbers from 9512 for weaning weight or WW to 13101 for lamb survival LS) over the 66-year period from 1955 to 2020 and yearling weight and wool data (record numbers from 1351 the coefficient of variation of fibre diameter or CVFD to 3505 for clean yield or CY) over a 38-year period from 1983 to 2020 were used to estimate genetic and environmental parameters for the flock. The ASREML package was used to estimate fixed effects and genetic parameters. Birth year, sex, birth type and age of dam significantly ($P < 0.001$) influenced the weight traits and LS. The interaction between birth year and sex was evident in most early growth traits. Direct single-trait heritability estimates amounted to 0.11 ± 0.02 for birth weight (BW), $0.04 \pm$

0.01 for WW, 0.03 ± 0.01 for LS, 0.28 ± 0.04 for yearling weight (YW), 0.62 ± 0.04 for CY, 0.36 ± 0.04 for clean fleece weight (CFW), 0.33 ± 0.05 for staple length (SL), 0.56 ± 0.06 for CVFD, and 0.65 ± 0.04 for fibre diameter (FD). Maternal heritability estimates were 0.17 ± 0.02 for BW, and 0.06 ± 0.01 for WW. Maternal permanent environmental effects amounted to 0.08 ± 0.02 for BW, 0.04 ± 0.01 for WW, 0.04 ± 0.01 , 0.07 ± 0.02 for YW and 0.05 ± 0.02 for CFW. Litter effects were 0.22 ± 0.01 for BW, 0.18 ± 0.02 for WW and 0.14 ± 0.01 for LS. Multi-trait heritability estimates compared well with the single-trait estimates. Genetic correlations for the weight traits in the three-trait analyses ranged from -0.23 ± 0.12 for BW and YW to 0.81 ± 0.09 for WW and YW. Genetic, environmental, and phenotypic correlations amongst yearling weight and wool traits in the six-trait analyses were low to moderate and mostly within the ranges from previous literature for wool breeds. It should be feasible to select for a balanced breeding objective based on economic considerations in the flock.

Contrast-enhanced ultrasound evaluation of the utero-placental perfusion in ewes

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Small Ruminant Research, Volume 228, November 2023

DOI <https://doi.org/10.1016/j.smallrumres.2023.107113>

Abstract

This study highlights the importance of blood circulation between mother and fetus for a healthy pregnancy and optimal lamb development. It addresses the challenges of studying blood flow in the utero-placental complex due to small vessel diameters and slow flow. To overcome these, the study utilized contrast-enhanced ultrasound technology (CEUS), which proved to be a safe and effective method for assessing blood flow in the uterus and placentomes of ewes. It reveals a distinct centrifugal and homogeneous perfusion pattern in the uterus and a homogeneous and centripetal pattern in placentomes, with no enhancement detected in the embryos or fetuses. The results, including Doppler and CEUS parameters, provide valuable insights into blood circulation during pregnancy and its developmental changes. It contributes to a better understanding of normal embryonic/fetal development in ewes throughout gestation.

Oral sugar and vasopressin: Possible alternative in the management of ovine pregnancy toxemia

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Small Ruminant Research, Volume 228, November 2023 **OPEN ACCESS**

DOI <https://doi.org/10.1016/j.smallrumres.2023.107087>

Highlights

- Ovine pregnancy toxemia is a metabolic disease that causes significant losses.
- Joint administration of commercial sugar + LVP is tested to treat this disease.
- This combination increases blood glucose and is maintained over time.
- It also improves the levels of β -hydroxybutyrate and non-esterified fatty acids.
- Therefore, oral commercial sugar could be used in the therapy of this disease.

Abstract

Ovine pregnancy toxemia, a disease that affects adult ewes in the final stages of pregnancy and which is caused by a negative energy imbalance, requires the usage of dextrose substances for treatment. It has been

proven that it is possible to induce reticular groove closure by means of an intravenous injection of lysine-vasopressin (LVP) at doses of 0.08 IU/kg B.W., which enables oral administration of glucose solutions that can be used in pregnancy toxemia therapy. The aim of this research is to compare the effectiveness of conventional treatment with i.v. glucose solution versus coadministration of LVP and a commercial sugar-water solution. This was administered orally to eight ewes to which we experimentally had provoked pregnancy toxemia by fasting. The use of commercial sugar, replacing other glucose solutions, could facilitate and cheapen the therapy for this disease significantly. The results obtained indicate that the joint administration of LVP and an oral solution of commercial sugar produce a noteworthy increase in glycaemia, which has a longer effect over time despite being less marked than with i.v. administration of glucose solution. Therefore, it could be used in the therapy of this disease. Besides, it is also able to normalize other parameters used to evaluate energy metabolism in ewes during the days of the trial.

Postprocedural clinical and laboratory evaluation of sheep submitted to different intrabdominal pressures during laparoscopy

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Small Ruminant Research, Volume 228, November 2023

DOI <https://doi.org/10.1016/j.smallrumres.2023.107092>

Abstract

The sheep experimental model is increasingly being used in laparoscopy, and there is a need to ensure animal welfare during and after the procedures. Therefore, the present study aims to evaluate postprocedural clinical and laboratory variables of sheep submitted to different intrabdominal pressures during laparoscopy. Ten female nonpregnant healthy adult Santa Ines ewes (48.8 ± 5.6 kg) were randomly submitted to a crossover study using different intrabdominal pressures (IAPs): 0 mmHg (G1), 10 mmHg (G2), 12 mmHg (G3), and 15 mmHg (G4). They were anesthetized and mechanically ventilated ($VT = 15 \text{ ml.kg}^{-1}$) with positive end-expiratory pressure (3 cmH₂O) and $FiO_2 = 1.0$. At the same time, pneumoperitoneum was induced and maintained by Hasson's trocar cannula attached to an insufflator with no invasive visceral intervention. Physical examination and malondialdehyde levels were gathered immediately before (T0), 24 h (T1), 72 h (T2), 7 days (T3), and 14 days (T4) after the procedure. Hematology variables and fibrinogen were gathered at T0, T2, and T3, while serum biochemistry at T0 and T2. In the group with 15 mmHg of IAP, fibrinogen concentration was above normal level suggesting a late inflammatory response that persisted for up to 7 days ($610 \pm 335 \text{ mg/dL}$); Malondialdehyde concentration persisted in ascending levels for up to 14 days (from 257.2 ± 136.5 – $369.7 \pm 201.4 \text{ nM/g Hb}$), and the opposite was observed in other groups. White blood cell (WBC), neutrophils, lymphocytes, and N:L ratios increased above normal levels in 72 h post-procedure and returned to normal within 7 days, except in the group of 15 mmHg of IAP which the highest value was reached 7 days post-procedure. Alterations in clinical parameters were mild and within normal values for the specie and breed in all groups. Biochemical analysis for all parameters was within the normal range in all groups. Still, monitoring aspartate aminotransferase (AST) up to 7 days after laparoscopic procedures is advisable due to its 72 h increase. Although no significant clinical and hematological alterations were observed, biochemical alterations and oxidative stress were greater up to 14 days after the procedure in the group with 15 mmHg IAP.

The ramifications of tail docking ewes on mating behavior and reproductive performance

Jocelyn M Woods and Sarah J J Adcock

Journal of Animal Science, Volume 101, Issue Supplement 3, November 2023

DOI <https://doi.org/10.1093/jas/skad281.006>

Abstract

Removing a portion of the tail, also known as tail docking, is a common husbandry practice in sheep because it is believed to reduce fecal and urine soiling of the wool. However, support for this claim is sparse, and there is evidence that females of several ungulate species use their tails to communicate in sexual contexts. The objective of this study was to test whether the tail status of a ewe affected the mating preferences of a ram, the responses of the ewe to mounting attempts, conception rate, and litter size. Within 18 Polypay female twin pairs, one lamb was docked by placing a constrictive rubber ring on the tail between 24 to 48 hours of age and the tail of the other lamb was left intact ($n = 18/\text{treatment}$). Between 7 to 8 months of age, the estrus cycles of the ewes were synchronized and 9 groups of 2 twin pairs were exposed to an unfamiliar virgin ram (7 to 8 months of age) for 48 hours. Video footage of the first 2 hours of behavioral interactions was analyzed to determine which ewe the ram first approached, the duration of contact with each ewe, and the count of headbutts and rejected and accepted mounts. Undocked ewes tended to accept twice as many mounts from the ram when compared with docked ewes ($X^2 = 3.50$, $P = 0.06$). Additionally, undocked ewes tended to reject fewer mounts ($X^2 = 0.3.72$, $P = 0.05$). Undocked ewes were the targets of twice as many headbutts from the ram when compared with docked ewes ($X^2 = 19.50$, $P < 0.001$). The analysis of which ewe the ram first approached and the duration of contact with each ewe is ongoing. Of the 36 ewes, 15 docked and 15 undocked ewes were bred, achieving an 83% conception rate. Based on ultrasounds 40 to 44 days post-breeding, tail status did not significantly influence prospective litter size (mean \pm SE; docked: 1.73 ± 0.13 ; undocked: 1.93 ± 0.15 ; $X^2 = 1.04$, $P = 0.31$). Our results show that tail docking did not influence the reproductive performance of ewes. However, the behavior of ewes and rams varied based on the tail status of the ewe, with rams targeting more aggression toward undocked ewes and undocked ewes showing greater sexual receptivity. Further research on the merits and pitfalls of tail docking is necessary to determine how this procedure holistically affects sheep welfare and performance.

Maternal restricted- and over- feeding during gestation perturb offspring sperm epigenome in sheep

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Reproduction, Volume 166, Issue 5 November 2023

DOI <https://doi.org/10.1530/REP-23-0074>

In brief

Inadequate maternal nutrition during gestation can have immediate and lifelong effects on offspring. This study shows that maternal restricted - and over- nutrition during gestation do not affect semen characteristics in F1 male offspring but alters offspring sperm sncRNA profiles and DNA methylome in sheep.

Abstract

There is a growing body of evidence that inadequate maternal nutrition during gestation can have immediate and lifelong effects on offspring. However, little is known about the effects of maternal nutrition during gestation on male offspring reproduction. Here, using a sheep model of maternal restricted - and over - nutrition (60 or 140% of the National Research Council requirements) during gestation, we found that maternal restricted - and over - nutrition do not affect semen characteristics (i.e. volume, sperm

concentration, pH, sperm motility, sperm morphology) or scrotal circumference in male F1 offspring. However, using small RNA sequencing analysis, we demonstrated that both restricted - and over - nutrition during gestation induced marked changes in composition and expression of sperm small noncoding RNAs (sncRNAs) subpopulations including in male F1 offspring. Whole-genome bisulfite sequencing analysis further identified specific genomic loci where poor maternal nutrition resulted in alterations in DNA methylation. These findings indicate that maternal restricted - and over - nutrition during gestation induce epigenetic modifications in sperm of F1 offspring sperm in sheep, which may contribute to environmentally influenced phenotypes in ruminants.

Seroprevalence and potential risk factors of brucellosis in sheep from America, Africa and Asia regions: A systematic review and meta-analysis

Lian-Min Li, Qi Wang, Jun-Feng Shi, Ting Li, Bo Zhao, Qing-Xia Ma, Hong-Ying Liu, Nuo Su, Ruo-Peng Cai, Fan-Li Zeng, Qing-Long Gong, Kun Shi, Jian-Ming Li (923202040@qq.com), Fei Liu (lf198903@sina.com) and Rui Du (durui197101@sina.com)

Research in Veterinary Science, Volume 165, December 2023

DOI <https://doi.org/10.1016/j.rvsc.2023.105048>

Abstract

Background

Brucellosis, a neglected and global zoonotic disease, infect a variety of mammals, among which sheep are one of the main hosts. This disease results in huge economic losses and is a widespread concern around the world.

Results

Based on the selection criteria, 40 articles from 2010 to 2021 of five databases (CNKI, Wanfang, VIP, PubMed and Science Direct) reported in America, Africa and Asia were included. The data showed that during this period, the overall seroprevalence of sheep brucellosis on these three continents was 6.2%. At the regional level, sheep brucellosis had the highest seroprevalence (8.5%) in Africa and the lowest seroprevalence (1.9%) in the Americas. With regard to the age of the sheep, the seroprevalence was significantly higher in adult sheep (15.5%) than in lambs (8.6%). Further, the seroprevalence was significantly higher in sheep that had abortion (44.3%) than in pregnant (13.0%) and non-pregnant sheep (9.5%). With regard to herd size, herds with >20 sheep (35.4%) had a significantly higher seroprevalence than herds with <20 sheep (16.8%). In terms of farming and grazing mode, free-range rearing (8.4%) was associated with a significantly higher seroprevalence than intensive farming (2.8%), and mixed grazing (37.0%) was associated with a significantly higher seroprevalence than single grazing (5.7%).

Conclusion

Sheep brucellosis is widely distributed in sheep-rearing regions of America, Africa and Asia, and sheep are susceptible to brucellosis by themselves or from other infectious sources. Therefore, timely monitoring of ovine brucellosis and improving farming and grazing patterns are critical to reducing the prevalence of brucellosis.

Estrous, ovulation and reproductive responses of ewes synchronized with a long interval prostaglandin-based protocol for timed AI

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Theriogenology, Volume 214, 15 January 2024

DOI <https://doi.org/10.1016/j.theriogenology.2023.10.027>

Abstract

The aim was to characterize and assess the reproductive performance of a long interval prostaglandin (PG)-based protocol for timed AI (TAI) at different times. During breeding season three experiments were done involving 622 Merino ewes, 11 rams, and five androgenized wethers per 100 ewes. All ewes were estrus synchronized with two PG injections 15-day apart (PG15): Day -15 and 0 (Hour 0). Estrous distribution respect to Hour 0, estrous response and synchrony after Hour 0, and interval from Hour 0 to estrus detection (PG-estrus) was evaluated (Experiment I; n = 105 ewes). Interval from estrus detection to ovulation (estrus-ovulation) and from Hour 0 to ovulation (PG-ovulation) was determined (Experiment II; n = 12 ewes). Visual-physical score of cervical mucus at TAI, non-return to service to Day 23 (NRR23), fertility, prolificacy, and fecundity to Day 60 in four cervical fresh semen TAI groups was evaluated (Experiment III; n = 505 ewes; 107 nulliparous-398 multiparous). Three groups with single service at 56 (Control), 44 or 68, and one with double service at 44 and 68 ± 1.5 h after Hour 0 (PG15-56, PG15-44, PG15-68, and PG15-44/68 groups, respectively) were tested. Ninety-eight-point one percent of the ewes showed estrus from Hour -48 up to 84 respects to Hour 0. Twenty percent of them showed estrus from Hour -48 up to 0, and 78.1 % from Hour 12 up to 84 (Experiment I). The largest proportion of ewes in estrus was observed between Hour 36 and 60 (80.5 %). PG-estrus interval was 54.1 ± 10 h (means ± SD). Estrus-ovulation interval was 32.4 ± 5.8 h, and PG-ovulation interval was 77.0 ± 16.6 h (Experiment II). Ewe parity did not affect any of the reproductive variables (P > 0.05; Experiment III). There were no significant differences (P > 0.05) between Control and different groups in mucus score (2.18 ± 0.08, 2.02 ± 0.07, 2.14 ± 0.09, 2.25 ± 0.10), NRR23 (76.0, 71.9, 78.6, 79.4 %) or fertility (66.4, 64.1, 66.7, 73.8 %; PG15-56, PG15-44, PG15-68 or PG15-44/68 groups, respectively). Prolificacy in PG15-44 group was lower (1.07 ± 0.03; P < 0.05) than other groups (1.27 ± 0.05, 1.23 ± 0.05, 1.20 ± 0.04), and fecundity than PG15-44/68 group (0.84, 0.69, 0.82, 0.89), without differences among other groups (PG15-56, PG15-44, PG15-68 or PG15-44/68 groups, respectively). We concluded that any time between 56 and 68 h after PG15 protocol could be used to perform cervical TAI using fresh semen, without benefits of a double TAI service at 44 and 68 h.

Melatonin promotes progesterone secretion in sheep luteal cells by regulating autophagy via the AMPK/mTOR pathway

Hongwei Duan, Shuai Yang, Longfei Xiao, Shanshan Yang, Zhenxing Yan, Fang Wang, Xiaofei Ma, Lihong Zhang, Yong Zhang, Junjie Hu (hujj@gsau.edu.cn) and Xingxu Zhao (zhaoux@gsau.edu.cn)

Theriogenology, Volume 214, 15 January 2024

DOI <https://doi.org/10.1016/j.theriogenology.2023.11.010>

Abstract

The corpus luteum is primarily responsible for the production and secretion of progesterone. Melatonin has been established to regulate autophagy and induce progesterone secretion in luteal cell. However, whether melatonin affects progesterone secretion by interfering with autophagy is yet to be reported. In the present study, the expression levels of melatonin receptors (MT1 and MT2), autophagy-related protein Beclin1 (Bec1), microtubule-associated protein light chain 3 B (LC3B), progesterone and steroidogenic acute regulatory protein (StAR), and cytochrome P450scc (CYP11A1) were analyzed in the corpus luteum of sheep at different stages (early, middle, and late); specifically, enzyme-linked immunosorbent assays, immunohistochemical staining, and western blotting were utilized for this expression analysis. In addition, to determine whether melatonin regulated progesterone secretion via the regulation of autophagy, luteal cells were cultured before being exposed to different concentrations of melatonin (0.01–100 nM) and the autophagy inhibitor chloroquine (50 µM). Next, luteal cells were treated with the melatonin receptor inhibitors 4-phenyl-2-propionamidotetralin (1 µM) and luzindole (1 µM) before detecting Bec1, LC3B2, AMPK/mTOR, and progesterone secretion levels to ascertain whether the effect of melatonin on autophagy

and progesterone secretion is mediated by its corresponding receptors in luteal cells. Finally, to determine the significance of the AMPK/mTOR pathway in this process, an AMPK inhibitor, Compound C (10 μ M), was added to luteal cells. Overall, the highest expression of melatonin receptors, autophagy and progesterone secretion was observed in the middle-phase corpus luteum; additionally, melatonin promoted autophagy, at least partially, through its receptor-mediated AMPK/mTOR pathway, which thereby promoting progesterone secretion in luteal cells in vitro. Ultimately, this study is the first to clarify the important role of autophagy in the melatonin-mediated regulation of progesterone secretion in the corpus luteum of sheep; it also lays a foundation for further exploration into the role of melatonin in regulating sheep's ovarian function.

Inhibition of phospholipase C reduces the capacitation of cryopreserved ovine sperm

Aline Matos Arrais, Angelo José Burla Dias, Cláudio Luiz Melo de Souza, Alinne Glória Curcio and Marco Roberto Bourg de Mello (mmrural@gmail.com)

Theriogenology, Volume 213, January 2023

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Abstract

This study aimed to evaluate the effect of phospholipase C (PLC) on the capacitation of cryopreserved ovine semen. Sixteen semen samples were cryopreserved with diluent added by 0, 10, or 20 μ M of U73122, a PLC inhibitor. The sperm kinetics of the thawed samples were evaluated using the “Computer-assisted Sperm Analysis” system, and the integrity of the plasma and mitochondrial membranes was evaluated using fluorescent probes. Additionally, sperm capacitation and the acrosome reaction with chlortetracycline hydrochloride were evaluated before and after capacitation induction. The results were analysed using analysis of variance and Tukey's test with a 95% probability. Concentrations of 10 or 20 μ M of U73122 did not affect the kinetics or number of sperm with intact plasma and mitochondrial membranes. However, after thawing, 10 and 20 μ M of the inhibitor reduced the percentage of capacitated and acrosome-reacted sperm. After induction of capacitation, there was a reduction in the number of non-capacitated sperm in all treatment groups, suggesting a reversible effect of U73122. In conclusion, U73122 at concentrations of 10 or 20 μ M prevents premature capacitation and acrosome reaction induced by the freezing procedure, without affecting the kinetics and integrity of the sperm membranes.

In vitro culture of sheep early-antral follicles: Milestones, challenges and future perspectives

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Abstract

Early antral follicles (EAFs) represent the transitional stage between pre-antral and antral follicles, containing oocytes that have completed most of their growth phase. Therefore, they offer an easily exploitable reserve for producing mature oocytes and preserving genetic resources, given their higher abundance compared to antral follicles (AFs) and shorter culture period than other pre-antral follicles (PAFs). Despite these advantages, the culture of EAFs remains challenging, and the success rates of in vitro embryo production (IVEP) from EAF-derived oocytes are still far below the standard achieved with fully grown oocytes in ruminant species.

The difficulty is related to developing suitable in vitro culture systems tailored with nutrients, growth factors, and other signaling molecules to support oocyte growth. In this review, we focus on the in vitro development

of sheep EAFs to provide an informative reference to current research progress. We also summarize the basic aspect of folliculogenesis in sheep and the main achievements and limitations of the current methods for EAF isolation, in vitro culture systems, and medium supplementation. Finally, we highlight future perspectives and challenges for improving EAF culture outcomes.

Upcoming events

Date	Event	Location
14 December 2023	Selection & Classing workshop AWI & Leading Sheep	Longreach, Qld