

MAY 2023

Sheep reproduction RD&A alert

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

The revamped SRSP website will be launched very soon. The SRSP has been working with MLA's Communication and Digital teams to create the Sheep Reproduction Strategic Partnership hub. The SRSP hub will be your one-stop-shop for sheep reproduction RD&A. You will find detailed information on key projects, links to sheep reproduction PDS projects, SRSP webinar recordings, sheep reproduction resources and all issues of the SRSP RD&A alert. The SRSP hub will be go live in early June – search for SRSP from the MLA website.

Program coordinator

Dr Sue Hatcher

M: 0407 006 454

E: sue@makinoutcomes.com.au

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

No more gaps with superior shrub systems

Background

Nutritional gaps present the largest production cost to grass-fed meat producers across Mediterranean and dry areas of Australia. Gaps lead to suboptimal ruminant production and conservative whole-farm stocking rates. Strategies to address key nutrient gaps are likely to give confidence to mixed farmers to increase whole-farm stocking rates and potentially lower the risk profile of their enterprises. Superior shrub systems have the potential to act as 'standing supplements' to fill these nutrient gaps and deliver environmental benefits. Further, drought-tolerant shrubs provide nutrients to complement, and thereby improve, the feed conversion ratio of crop and pasture residues during summer and autumn, which reduces supplementation requirements.

Aim

To develop high-value shrub systems to improve utilisation of the summer/autumn/early winter feed base in Mediterranean and low rainfall mixed farming systems and investigate the viability of developing an elite saltbush cultivar, which can be established via seed, rather than saplings.

Project objectives

- Collect paddock scale productivity and economic data demonstrating that sheep and/or cattle can utilise shrubs to improve productivity and utilisation of crop residues,
- Quantify benefits arising from using fertilisers and/or adapted annual legumes within systems, and
- Investigate opportunities to halve establishment costs through seed lines that can be planted in nurseries or direct seeded.

Key findings

Drought-tolerant native shrubs, grown on soils that are marginal for crop production, provide nutrients to complement, and thereby improve the feed conversion ratio of crop and pasture residues during summer/autumn. These shrubs lift farm profitability by reducing supplementation requirements, allow deferred grazing of regenerating pastures, and buffer between-season variation in forage supply. They provide vitamins and minerals that are limited in summer and assist animals to manage oxidative stress.

Barriers to adoption of shrubs include the high opportunity cost of using soils that are suited to cropping, the up-front cost of establishment, uncertainty about agronomic and grazing management and a lack of on-farm data quantifying benefits. Increased adoption of shrub systems by producers will congruently improve landscape function and reduce the impact of dryland salinity.

For more information on the superior shrubs project contact Dr Hayley Norman (hayley.norman@csiro.au).

Review paper

Shelter and shade for grazing sheep: implications for animal welfare and production and for landscape health

David G. Masters (david.masters@uwa.edu.au), Dominique Blache, Amy L. Lockwood, Shane K. Maloney, Hayley C. Norman, Gordon Refshauge and Serina N. Hancock

Animal Production Science, Volume 63(7), May 2023 **OPEN ACCESS**

DOI <https://doi.org/10.1071/AN22225>

Abstract

Shade and shelter may provide protection from cold and heat stress, a source of feed during prolonged or seasonal drought, specific essential nutrients, increased pasture and crop production and improved landscape health. Cold stress contributes to the average of 8% (single) and 24% (twin) of lambs that die within 3 days of birth in Australia and the estimated 0.7% of the Australian flock that die post-shearing during extreme or unseasonal weather. Shelter has resulted in an average reduction in mortality of 17.5% for twin-born lambs and 7% for single-born lambs according to Australian studies and decreases the susceptibility of ewes to metabolic disease and possibly dystocia. Because many of the published studies are from research areas where cold stress is expected, they are not indicative of industry-wide responses, a research priority is to determine the probability of lamb and ewe deaths from cold stress across different sheep production areas. Although shelter may improve lamb survival, ewes do not always choose to lamb in a sheltered location. For this reason, there is a requirement for research into the voluntary use of shelter in commercial-sized paddocks and the role that nutritive value of shelter plays in attracting and holding ewes to shelter, and to their lambs. Heat stress may also result in lamb deaths and influences feed conversion efficiency, appetite, reproduction, wool growth and disease susceptibility. The consequences of heat stress may go unnoticed over a yearly production cycle, although there is some evidence that shade may increase weaning rates and feed intake of grazing sheep. There are ancillary benefits from shade and shelter. Trees may improve crop production through reducing wind damage and evapotranspiration and provide timber. Shrubs provide feed during the summer–autumn feed gap or drought, are useful for the management of land degradation and provide habitat for native fauna. It is clear that shade and shelter in the correct locations provide a range of benefits to livestock and the landscape; nevertheless, adoption appears low. Research that focuses on defining the benefits on a farm or landscape scale is required to support extension programs.

MLA Project P.PSH.1316 *Design, establishment and benefits of edible shelter to improve lamb survival and whole-farm profitability*

MLA Project P.PSH.1292 *Investigating heat stress in ewes – reproductive performance*

Recent advances in treatments for resynchronization of ovulation in small ruminants: a review

Isabel Oliveira Cosentino (isabelcosentino@id.uff.br), Mário Felipe Alvarez Balaro, Alejo Menchaca, Raquel Perez-Clariget, Rodolfo Ungerfeld and Felipe Zandonadi Brandão

Animal Reproduction, Volume 20, May 2023

DOI <http://dx.doi.org/10.1590/1984-3143-AR-2022-011>

Abstract

Hormonal methodologies to control small ruminants' estrous cycle are worldwide used and evolved, adjusting the application to the precise female physiological moments to enhance reproductive performance. The estrous cycle can be induced and/or synchronized, aiming for fixed-time artificial insemination, or based on estrus behavior signs for insemination, natural or guided mating. Successive protocols can be performed to resynchronize ovulation and increase reproductive outcomes in females that failed to conceive. These recently developed treatments aim to resynchronize the ovulation as earlier as non-pregnancy is detected. The present review aimed to summarize the recent advances and main findings regarding resynchronization protocols used in small ruminants. Lastly, we present future perspectives and new paths to be studied in the subject. The resynchronization treatment is still a growing field in small ruminant reproduction, nevertheless, some enhancements are found in the reproductive outcome, showing that such protocols can be successfully used in sheep and goat production.

Scientific papers

New South Wales sheep producers' perceptions regarding lamb mortality and the adoption of pregnancy scanning

Jazmine Hobbs and Stuart Mounter (smounte2@une.edu.au)

Animal Production Science, Volume 63(7), May 2023 **OPEN ACCESS**

DOI <https://doi.org/10.1071/AN22339>

Abstract

Context: Proven strategies to address lamb mortality include pregnancy scanning and the differential management of single- and twin-bearing ewes. However, current adoption rates of this best-practice management by Australian producers remain low at ~20%.

Aims: We explored producer perceptions about lamb mortality and the adoption of pregnancy scanning, and analysed whether producer characteristics, demographics, beliefs or management practices have an influence on perceptions towards pregnancy scanning or lamb survival.

Methods: Data were collected through an on-line self-administered survey of lamb producers in New South Wales, Australia. Descriptive and inferential statistics were used to summarise the data and test for interdependence of variables.

Key results: The survey results revealed that New South Wales sheep producers have low participation rates in extension programs and low engagement in record-keeping practices. Only 4% of respondents considered current lamb mortality rates acceptable and the majority agreed that lamb mortality poses a threat to Australia's sheep industry. Findings identified numerous significant relationships between producer characteristics, demographics, beliefs, management practices, non-participation in extension programs, and perceptions towards pregnancy scanning, lamb mortality and sheep welfare. Survey participants were more likely to have adopted pregnancy scanning if they had participated in extension programs.

Conclusions: Further extension efforts should be focused on producers who have not adopted any record-keeping practices or previously participated in extension programs. Extension should be tailored to different

enterprises, owing to the influence of enterprise focus on beliefs, while also considering producer demographics.

Implications: A strong case exists for continued investment in future marketing, education, and research, development and extension to increase the capacity of Australia's sheep industry and, in particular, to increase the adoption of pregnancy scanning.

Are early-life lambs' characteristics and behavioural reactivity related to later survival and growth performance during artificial feeding?

Marie-Madeleine Mialon (marie-madeleine.richard@inrae.fr), Raymond Nowak, Patricia Falourd, Didier Marcon, Romain Lardy and Xavier Boivin

Applied Animal Behaviour Science, Volume 292, May 2023 **OPEN ACCESS**

DOI <https://doi.org/10.1016/j.applanim.2023.105918>

Highlights

- A rubber teat sucking score is a reliable predictor of lamb survival.
- Low birthweight, weak vigour, and being a female lamb, impairs growth rate.
- High affinity to humans is associated with growth retardation in artificially fed lambs.

Abstract

The use of prolific sheep breeds often leads farmers to rear some lambs with an automatic milk feeder to improve survival and growth. However, the success of these challenging situations could depend on lamb's early individual characteristics, and their behavioural reactivity in a stressful context. The study was performed on 567 Romane lambs. We tested the hypothesis that early-life characteristics, including behaviour and physiology, could predict survival and growth performances until weaning. In addition, on a random subsample of one third of these lambs we assessed whether behavioural reactivity to social isolation and unknown human presence was a further predictor of individual variability in growth rate. Lambs were characterised by birth weight, rectal temperature and scores for vigour, handling and sucking of first bottle milk on arrival at nursing. After three weeks of artificial rearing (i.e. halfway to weaning age), 202 randomly-chosen lambs were studied in a 2-phase test to record their reaction to social isolation in a novel arena test and presence of an unknown human. Test variables were summarised phase-wise by principal component analysis. The factor scores characterised lamb general activity in phase 1 and affinity to humans in phase 2. Data was examined using descriptive statistics, survival analysis and multivariate regression models to identify the key factors for survival and average daily gain (ADG) until weaning. Cumulative early death rate at one week was 5% and global death rate at the end of the rearing period was 11.6%. There was a higher hazard ratio for death for weak sucking at the first milk-bottle test ($P = 0.011$), low rectal temperature ($P < 0.05$), and dam age of 4–5 years versus 2–3 years ($P < 0.01$). A low ADG until weaning was associated with a low vigour score ($P < 0.01$), weak sucking ($P < 0.05$) and low birth weight ($P < 0.001$). Our data also supports the hypothesis of a relationship between growth and behavioural reactivity in artificially-reared lambs. A low growth rate until weaning was also associated with higher lamb affinity shown to humans ($P < 0.001$) and lower activity expressed in social isolation in a new arena ($P < 0.05$). Our study suggests that early-age characteristics but also reactivity to social isolation and affinity to humans could be valuable predictors of lamb survival and growth in artificial rearing. Our results possibly reveal an over-dependency on humans in some lambs in such a system.

Group-training of rams at puberty for artificial vagina-mediated semen collection and its influence on semen quality and sexual behavior

Majdi Ahmed Bahadi (malbadwied@gmail.com), Mohammed Abdo Al-Badwi, Emad Mohammed Samara, Khalid Ahmed Abdoun, Ibrahim Abdullah Alhidary and Ahmed Abraham Al-Haidary

Animal Reproduction, Volume 20, May 2023

DOI <http://dx.doi.org/10.1590/1984-3143-AR2022-0051>

Abstract

There is a paucity of information with respect to group-training for artificial vagina and its influence on semen characteristics and sexual behavior of young untrained rams. A total of 18 healthy Najdi rams (with an initial body weight of 40-45 Kg and 7-8 month-old) were consequently used herein to test the usefulness of group-training for artificial vagina-mediated semen collection during the breeding season. Rams were randomly segregated into three groups ($n = 6$ rams per protocol), and the whole experiment was lasted for 10 weeks. The 1st group was subjected to a training protocol where one untrained ram was placed for 20 min with a teaser ewe, while the 2nd group were subjected to a protocol where one untrained ram was placed for 20 min with one trained ram and a teaser ewe, whereas the 3rd group were subjected to a protocol where three untrained rams were placed for 20 min with one trained ram and a teaser ewe. The obtained results clearly ($P < 0.05$) showed that training young rams in group has increased their sperm concentration and sexual stimulation, shortened the period of their training time, and descriptively had a complete training efficiency. The sexual stimulation of young untrained rams was intensified by the competition between rams in the co-presence of a trained ram. Collectively, these data may suggest that group-training of rams at puberty is a better protocol for AV-mediated semen collection compared to individual training. Some shortcomings were noted herein, but research dealing with this subject may very well improve the reproductive performance of young untrained rams.

Post-thaw quality of ram sperm frozen with different concentrations of low-density lipoproteins associated with non-enzymatic antioxidants

Paola Pereira das Neves Snoeck (paolasnoeck@uesc.br), Diogo Ribeiro Câmara, Luís Cláudio de Oliveira Moura, Maíra Corona da Silva, Mariana Machado-Neves, Milton Rezende Teixeira-Neto and Marc Henry

Animal Reproduction, Volume 20, May 2023

DOI <http://dx.doi.org/10.1590/1984-3143-AR2022-0068>

Abstract

The cryopreservation reduces ram sperm quality, decreasing the pregnancy rate of ewes inseminated with thawed sperm. Hence, we aimed to improve the post-thaw quality of ram sperm replacing egg yolk on Tris-Glucose extender with different concentrations of LDL (2 or 8%), associated with the addition of 10 mM non-enzymatic antioxidants (ascorbic acid, hydroxytoluene butylate, ascorbyl palmitate, and trehalose). Semen samples were collected from six rams, split into different treatments, and frozen. After thawing, kinematic (CASA), structural (propidium iodide and carboxyfluorescein diacetate) and functional (hypoosmotic test) sperm membrane integrity was assessed. Total motility, VCL, and LIN were also assessed in thawed samples during 3 h of incubation (38 °C). The results showed that hydroxytoluene butylate at 10 mM in Tris-Glucose extender with 8% LDL improved velocity parameters immediately post-thaw compared with Tris-Glucose egg yolk extender, as well as prevented the reduction of total motility and VCL after incubation. There was no benefit of adding ascorbic acid and trehalose. Moreover, for the first time, it was shown the motility impairment promoted by ascorbyl palmitate to ram sperm.

Inclusion of *Spirulina platensis* and *Salvia verbenaca* extracts to boost semen quality and fertilization ability in sheep

Anass Ben Moula, Abdellatif Rahim, Mouad Chentouf, Marianne Raes, Nathalie Kirschvink and Bouchra El Amiri (bouchra.elamiri@inra.ma)

Reproduction in Domestic Animals, Volume 58 (Issue 5) May 2023

DOI <https://doi.org/10.1111/rda.14332>

Abstract

The aim of this study was to investigate the effect of *Spirulina platensis* (SP) and *Salvia verbenaca* (SV) extracts added to skimmed milk (SM) extender on ram sperm quality and fertility. Semen was collected using an artificial vagina, extended in SM to reach a final concentration of 0.8×10^9 spermatozoa/mL, stored at 4°C and evaluated at 0, 5 H and 24 H. The experiment has been performed in three steps. Firstly, from four extracts (methanol: MeOH, acetone: Ac, ethyl acetate: EtOAc and hexane: Hex) of SP and SV, only acetic and hexanoic extracts of SP and acetic and methanolic extracts of SV showed the highest in vitro antioxidant activities and were then selected for the following step. Thereafter, the effects of four concentrations (1.25, 3.75, 6.25, and 8.75 µg/mL) of each selected extract on stored sperm motility were evaluated. The output of this trial led to select the best concentrations having beneficial effects on sperm quality parameters (viability, abnormalities, membrane integrity, and lipid peroxidation) and fertility after insemination. The results showed that the same concentration (1.25 µg/mL) of both Ac-SP and Hex-SP, as well as 3.75 µg/mL of Ac-SV and 6.25 µg/mL of MeOH-SV, maintain all sperm quality parameters at 4°C during 24 H of storage. Besides, no difference was found in fertility between the selected extracts and the control. In conclusion, SP and SV extracts were shown to improve the quality of ram sperm and to maintain fertility rate after insemination as similar or competitive to many previous studies published in the field.

Vitality in newborn farm animals: Adverse factors, physiological responses, pharmacological therapies, and physical methods to increase neonate vigor

Cécile Bienboire-Frosini, Ramon Muns, Míriam Marcet-Rius, Angelo Gazzano, Dina Villanueva-García, Julio Martínez-Burnes, Adriana Domínguez-Oliva, Karina Lezama-García, Alejandro Casas-Alvarado and Daniel Mota-Rojas (dmota100@yahoo.com.mx)

animals, Volume 13 (Issue 9) May-1 2023 **OPEN ACCESS**

DOI <https://doi.org/10.3390/ani13091542>

Simple Summary

Vitality is a characteristic that in newborn animals demonstrates their vigor and their general state of health (heart rate, respiratory rate, skin color, time that they take to stand up) during the first hours of life. It can be measured by numerical scores based on some scales made for babies and then adapted for various animals. Vitality can be affected by several factors. The objective of this review is to analyze pharmacological and physical therapies used to increase vitality in newborn farm animals, as well as understand the factors affecting their vitality, such as hypoxia, depletion of glycogen, birth weight, dystocia, neurodevelopment, hypothermia, and finally, the physiological mechanism to achieve thermostability. It is essential to evaluate vitality in newborns because it can contribute to implementing interventions to reduce newborn mortality.

Abstract

Vitality is the vigor newborn animals exhibit during the first hours of life. It can be assessed by a numerical score, in which variables, such as heart rate, respiratory rate, mucous membranes' coloration, time the offspring took to stand up, and meconium staining, are monitored. Vitality can be affected by several factors, and therapies are used to increase it. This manuscript aims to review and analyze pharmacological and

physical therapies used to increase vitality in newborn farm animals, as well as to understand the factors affecting this vitality, such as hypoxia, depletion of glycogen, birth weight, dystocia, neurodevelopment, hypothermia, and finally, the physiological mechanism to achieve thermostability. It has been concluded that assessing vitality immediately after birth is essential to determine the newborn's health and identify those that need medical intervention to minimize the deleterious effect of intrapartum asphyxia. Vitality assessment should be conducted by trained personnel and adequate equipment. Evaluating vitality could reduce long-term neonatal morbidity and mortality in domestic animals, even if it is sometimes difficult with the current organization of some farms. This review highlights the importance of increasing the number of stock people during the expected days of parturitions to reduce long-term neonatal morbidity and mortality, and thus, improve the farm's performance.

Lambing event detection using deep learning from accelerometer data

Kirk E. Turner, Ferdous Sohel (F.Sohel@murdoch.edu.au), Ian Harris, Mark Ferguson and Andrew Thompson
Computer and Electronics in Agriculture, Volume 208, May 2023 **OPEN ACCESS**

DOI <https://doi.org/10.1016/j.compag.2023.107787>

Highlights

- Deep learning based study of lambing behaviour recognition from accelerometer data.
- Data was collected from 101 lambing ewes and 29 grazing sheep.
- High lambing event detection performance in normal grazing conditions.
- Fine-tuning on individual sheep improves performance of labour and birth recognition.
- The models achieve strong performance for detecting labour and birth times.

Abstract

Newborn lamb mortality is a major economic and welfare concern for the sheep industry globally, which can potentially be reduced through automated monitoring of lambing difficulties and quantifying time of birth. This study investigated the identification of lambing ewes' behaviours during labour and post-partum licking, by applying deep learning algorithms to halter-mounted accelerometer sensor data. 101 lambing ewes from two experiments and 29 non-pregnant ewes from three other experiments, were fitted with the sensors. Ground truth behaviour labels, 5 s long, were obtained based on video recordings of the study sheep. Classification using a Long Short-Term Memory (LSTM) model, was performed for different ethograms: labour behaviours, phases of labour, licking only, and labour and licking in the context of broader grazing behaviours. The model was fine-tuned with data of six sheep where the first birth fell within the observation period. A combined grazing and lambing behaviour ethogram achieved the best performance (accuracy: 81%) with recall of 0.85 for the licking behaviour. Fine-tuning increased performance further (average accuracy: 86.3%), with a best case recall of 0.88 for labour and 0.94 for licking. The licking only ethogram demonstrated strong recall for licking (0.9) when the epoch length was increased to 60 s. Isolation of the labour and licking behaviours achieved 84.8% accuracy, with a weighted F1-score of 0.85, demonstrating the ability to separate the labour phases. The study presents a strong foundation for the development of systems to detect lambing events and prolonged labour.

Effect of prolific breed type and silage type on ewe performance during late pregnancy

J.T. Higgins (Jonathan.higgins@ucdconnect.ie), S. Lott, M. Markiewicz-Keszycska, M.B. Lynch, M. McEvoy, F. McGovern and T.M. Boland

Small Ruminant Research, Volume 223, June 2023

DOI <https://doi.org/10.1016/j.smallrumres.2023.106981>

Highlights

- Mule ewes consumed less absolute DM and ME compared to Belclare X ewes.
- Mule ewes produced lower colostrum yields postpartum compared to Belclare X ewes.
- Silage type had no effect on ewe absolute DM intake or DM intake for concentrate supplementation.
- Silage type had minimal effects on rumen fermentation data.

Abstract

Multiple-bearing ewes undergo significant increases in energy and protein requirements during late pregnancy and high-quality forages are essential to meet these requirements in forage-based production systems. Three prolific breed types (Belclare X, Lleyn X, and Mule (Blue-faced Leicester ram and a Black-faced mountain ewe)) were offered one of two silage types: Italian ryegrass and red clover silage (IRGRCS) or perennial ryegrass silage (PRGS) in a 3 × 2 factorial experiment. No breed type effects were observed for ewe body weight (BW), body condition score (BCS), and combined litter weight (CLW; $P > 0.05$) but Mule ewes had lower dry matter (DM) and metabolisable energy intakes compared to Belclare X ewes which subsequently lead to lower colostrum yield over the first 18 h postpartum compared to Belclare X ewes with less colostrum available for their progeny per kg of birth weight ($P < 0.05$). Silage type had no effect on ewe DM intake, BW, BCS, colostrum yield and composition, CLW, and subsequent lamb performance ($P > 0.05$). When IRGRCS was offered to ewes, higher apparent efficiency of energy utilisation was achieved ($P < 0.0001$) with higher ruminal pH and ammonium concentrations. Overall, the nutrient composition of both silage types was similar and silage type had minimal effect on ewe and lamb performance. Prolific breed type can affect forage and nutrient intake and colostrum yield.

Effect of birth rank, and placentome subtype on expression of genes involved in placental nutrient transport in sheep

Susan McCoard (sue.mccoard@agresearch.co.nz), Neville Haack, Axel Heiser, Paul Maclean

Theriogenology, Volume 203, June 2023 **OPEN ACCESS**

DOI <https://doi.org/10.1016/j.theriogenology.2023.03.009>

Abstract

Placental function is a key determinant of fetal growth and development that can be influenced by maternal and fetal environmental factors. The molecular mechanisms by which the placenta senses and responds to environmental cues are poorly understood. This exploratory study aimed to characterize the effect of birth rank (single vs. twin) and placentome morphologic subtype on expression of genes involved in nutrient transport, angiogenesis, immunity and stress response. Cotyledonary tissue was collected from type A, B and C placentomes from five single and six twin fetuses at 140 days of gestation. GLUT1 and GLUT3 were the most highly expressed genes consistent with the high demand for glucose to support fetal growth. Expression of BCKDH β and IGF-2 was 1.3- and 1.5-fold higher, respectively, and PCYT1A was 3-fold lower in singles compared to twins ($P < 0.05$) while no other differences in gene expression were observed between birth ranks. Expression of EAAT2 and LAT2 was higher while PCYT1A was lower in A compared to B type cotyledons. Expression of GUCY1B1/3 and IGF-1 was higher while CD98 and LAT2 were lower in type B compared to C cotyledons ($P < 0.05$). Compared to type C cotyledons, expression of EAAT2, IGF-1, IGF-2, LAT1 was higher, while TEK was lower in type A cotyledons. The effects of birth rank on placental gene expression in this study indicated that placental nutrient transport and/or function differs between single and twin pregnancies in sheep. Differences in gene expression between the placentome subtypes suggests that changes in placentome morphology are associated with shifts in amino acid transport and metabolism, oxidative stress and angiogenesis and/or blood flow. This study highlights that placental gene expression differs in response to birth rank and placentome morphologic subtype which suggests that both maternal and fetal factors may

influence placental function in sheep. These associations provide insights into gene pathways for more targeted future investigations as well as potential adaptations to improve placental efficiency to support fetal growth in twin pregnancies.

Proteomic analysis reveals the potential positive effects of Mito-TEMPO on ram sperm motility and fertility during cryopreservation

Lei Shi, Juanjuan Shi, Jingjuan Feng, Pengcheng Zhang and Youshe Ren (rys925@126.com)

Theriogenology, Volume 205, July 2023

DOI <https://doi.org/10.1016/j.theriogenology.2023.04.015>

Abstract

The aim of this study was to investigate the effects of mitochondria-targeted antioxidant Mito-TEMPO on the protein profile of ram sperm during cryopreservation and evaluate the cryoprotective roles of Mito-TEMPO on ram sperm quality and fertilization capacity. Semen collected from 8 Dorper rams was cryopreserved in TCG-egg yolk extender supplemented with various concentrations of Mito-TEMPO (0, 20, 40 and 60 μ M). After thawing, sperm characteristics, antioxidant status and the abundance of hexose transporters (GLUT 3 and 8) were analyzed. The cervical artificial insemination (AI) was performed to evaluate the fertilization ability of cryopreserved ram sperm. The alterations of sperm proteomic profile between the control and MT40 groups were determined using iTRAQ-coupled LC-MS. Supplementation with 40 μ M of Mito-TEMPO resulted in the highest post-thaw sperm motility and kinematics. Sperm quality, antioxidant capacity and glucose transporter abundance of frozen-thawed ram sperm were elevated in the MT40 group. The inclusion of 40 μ M Mito-TEMPO in freezing extender also resulted in the higher pregnancy rate of ewes. A total of 457 proteins including 179 upregulated proteins and 278 downregulated proteins were defined as differentially expressed proteins (DEPs) using fold change (FC) > 1.2 with P < 0.05. Sixty-one DEPs with (FC > 1.5) were dramatically regulated by Mito-TEMPO. These DEPs are mainly involved in sperm motility, energy metabolism and capacitation. Our data suggest that the beneficial effects of Mito-TEMPO on sperm motility and fertility potential of cryopreserved ram semen are achieved by regulating sperm antioxidant capacity and sperm proteins related to energy metabolism and fertility.

Zinc supplementation promotes oocyte maturation and subsequent embryonic development in sheep

Yupei Yao, Yujie Tang, Haoqiang Qin, Ru Meng, Chengtu Zhang, Yingbing Zhang, Ying Yang, Peipei Qiao, Jun Liu (liujun2013@nwsuaf.edu.cn) and Jianmin Su

Theriogenology, Volume 206, August 2023

DOI <https://doi.org/10.1016/j.theriogenology.2023.04.025>

Abstract

Zinc plays a crucial role in the growth and reproductive functions of animals. Despite the positive effects of zinc that have been reported in oocytes of cows, pigs, yaks, and other animals, the influence of zinc on sheep is little known. To investigate the effect of zinc on the in vitro maturation of sheep oocytes and subsequent parthenogenesis-activated embryonic development, we added different concentrations of zinc sulfate to the in vitro maturation (IVM) culture medium. The IVM culture medium with zinc improved the maturation of sheep oocytes and the subsequent blastocyst rate after parthenogenesis activation. Notably, it also enhanced the level of glutathione and mitochondrial activity while reducing levels of reactive oxygen species. Thus, zinc addition to the IVM medium improved the quality of oocytes with a positive effect on the subsequent development of oocytes and embryos.

Upcoming events

Date	Event	Location
2 June 2023	Improving lamb survival Agriculture Victoria	Mansfield, Vic
16 June 2023	Resilient Breeders Field Day Macintyre Ag & Karbullah Poll Merinos	Billa Billa, Qld
19 June 2023	BestWool/BestLamb industry dinner and conference Agriculture Victoria	Bendigo, Vic
Jun to Nov 2023	Livestock Advisor Essentials Meat & Livestock Australia	Various locations, Qld
26 July 2023	AAABG 25th conference AAABG	Crawley, WA