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## Sheep reproduction RD&A alert

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

[Non-photoperiodic actions of melatonin](https://doi.org/10.1071/RD26027) a Special Collection of Reproduction, Fertility and Development (DOI <https://doi.org/10.1071/RD26027>). Historically, melatonin has been seen as a pineal hormone that plays one essential role – the synchronisation of reproductive and other brain-controlled functions with changes in photoperiod.



Often driven by the detection of melatonin receptors in non-brain tissues, it has become clear that melatonin plays a much wider variety of roles in the function of the testis, sperm, ovary, follicles, oocyte, embryo, placenta, fetus, and mammary gland. This collection presents this broader view of melatonin biology, and how the new concepts can be applied to livestock production.

The articles included in this collection present recent updates on this broader view of melatonin biology and indicate how an understanding of these processes might be used to improve livestock production.

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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.

### Scientific papers

#### **The effect of seminal plasma on the mass motility of epididymal ram spermatozoa**

Madeleine Van de Hoek ([Madeleine.vandehoek@sydney.edu.au](mailto:Madeleine.vandehoek@sydney.edu.au)), Jessica P. Rickard and Simon P. de Graaf  
Reproduction, Fertility and Development, Volume 38, Issue 4 March 2026 **OPEN ACCESS**

DOI <https://doi.org/10.1071/RD25174>

#### **Abstract**

**Context.** Mass motility assessment is widely used to evaluate semen quality in the sheep breeding industry, yet the biological factors influencing motility duration remain poorly characterised. At ejaculation, spermatozoa are combined with seminal plasma (SP), which initially supports motility and function but may compromise long-term metabolic endurance.

**Aims.** This study aimed to investigate the effects of SP on mass motility duration and pH regulation of epididymal ram spermatozoa.

**Methods.** Epididymal sperm were incubated with whole SP, saline, or left undiluted to assess motility duration. Subsequently, sperm were incubated with varying SP concentrations and molecular weight-separated fractions (protein-free <3 kDa; protein-enriched >3 kDa) and assessed for motility and pH over 24 h. Metabolomic and lipidomic profiling via targeted mass spectrometry characterised the biochemical composition of each SP fraction.

**Key results.** SP exposure significantly reduced mass motility duration ( $195 \pm 11$  min) compared with undiluted sperm ( $1797 \pm 185$  min;  $P = 0.0123$ ) and saline dilution ( $2667 \pm 134$  min;  $P < 0.0001$ ). All SP-treated groups exhibited a progressive pH decline, consistent with increased glycolytic flux, whereas SP-naïve sperm showed stable or increasing pH, indicating a more regulated metabolic state and greater metabolic flexibility. The protein-free SP fraction was most detrimental to motility, which was likely to be the result of the depletion of key proteins, lipids, and metabolites associated with energy production.

**Conclusions.** Prolonged exposure to SP impairs ram sperm motility longevity by promoting a glycolysis-biased metabolic state and reducing metabolic endurance.

**Implications.** Understanding how seminal plasma composition influences sperm metabolic regulation may inform strategies to better preserve sperm motility during semen handling and storage.

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## Progestogen priming is not essential to trigger ovulation in seasonal anoestrus ewes injected twice with a synthetic kisspeptin analogue

D. Lomet, V. Robert, C. Decourt, F. Derouin-Tochon, E. Hommet, V. Hellier, K. Poissenot, M. Georgelin, V. Aucagne, L. Vandries, Q. Terwagne, C.A. Cornil and M. Beltramo ([massimiliano.beltramo@inrae.fr](mailto:massimiliano.beltramo@inrae.fr))

Animal, Volume 20, Issue 3, March 2026 **OPEN ACCESS**

DOI <https://doi.org/10.1016/j.animal.2026.101779>

### Highlights

- Hormones are used for livestock reproduction control.
- Hormone use poses health and animal well-being concerns.
- We test whether an endogenous neurotransmitter analogue (C6) could replace hormones.
- Two C6 injections induced ovulation and a luteal phase in > 60% of treated ewes.
- Further optimisation of the method is required to match benchmark efficacy.

### Abstract

A key aspect of husbandry is reproduction management, and current methods often rely on the use of hormonal treatments. In the ewe, which is a seasonal breeder, a combination of progestogen and equine Chorionic Gonadotropin is the benchmark method for reproduction control. However, for different reasons, these hormones are leading to an increase in societal aversion. In order to find an alternative to their use, we have designed a synthetic analogue (C6) of kisspeptin, a key neurotransmitter in reproduction control. In the present study, we evaluated whether C6 could be used to replace hormones to induce ovulation and a luteal phase in ewes during the non-breeding season. Previous knowledge indicates that a single injection of C6 is unable to trigger ovulation unless preceded by progesterone priming; therefore, we tested a combination of two injections. We spaced injections at 24, 36 or 48 h. For the first injection, we used either 2.5 or 15 nmol, whereas the dose of the second injection was 15 nmol for all experimental groups. The combination of 15+15 nmol doses injected 48 h apart proved the most efficacious. It induced ovulation and a luteal phase in more than 60% of treated ewes as established by progesterone blood concentration. To assess if a specific hormonal footprint could be associated with ewes that ovulated, we analysed the time course of LH, FSH and estradiol plasma concentrations. However, no specific hormonal signature indicative of treatment success could be pinpointed. This study shows that it is possible to induce ovulation and a luteal phase in ewes during the non-breeding season by replacing hormonal treatment with a double injection of

C6. Nonetheless, further optimisation of the method is required to reach the efficacy of benchmark treatment.

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## Impacts of targeted selective treatment on performance, nematode faecal egg counts and anthelmintic use in sheep: A meta-analysis

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Veterinary Parasitology, Volume 343, April 2026 **OPEN ACCESS**

DOI <https://doi.org/10.1016/j.vetpar.2026.110696>

### Highlights

- Meta-analysis of 20 studies shows benefits of targeted selective treatment (TST).
- TST associated with 50 % reduction in wormer use compared to other strategies.
- TST associated with small production penalty but no increase in worm FEC.
- Benefits of TST seen in comparison to both “suppressive” and “strategic” treatment.
- TST based on body condition score less effective than other methods.

### Abstract

Gastrointestinal nematode (GIN) infections of ruminant livestock have traditionally been controlled through regular, “suppressive”, treatment with anthelmintic drugs, but this has resulted in the evolution of anthelmintic resistance and reduced efficacy. There is now a critical need to reduce anthelmintic use to maintain anthelmintic efficacy by creating refugia where susceptible GIN reside. Targeted selective treatment (TST) strategies only treat animals that need it, ensuring animals affected by GIN maintain their performance, while animals unaffected by GIN are not treated unnecessarily. TST is generally agreed to reduce anthelmintic use without drastically reducing animal performance or increasing GIN faecal egg count (FEC), but there is considerable variation in results reported by studies comparing TST with other strategies. To explore the effectiveness of TST and identify factors affecting previous results, we applied meta-analysis to data collected from 20 studies comparing TST to other strategies. Overall, TST was associated with a statistically significant, but small, reduction in animal performance, no effect on worm FEC, and 50 % lower anthelmintic use. Experimental design affected study outcome: basing treatment decisions on body condition scores resulted in less favourable outcomes compared to other methods. Meanwhile, TST was associated with negligible reductions in performance compared to “suppressive” treatment, and although FEC was increased slightly in the TST group, anthelmintic use was reduced by around two-thirds. Differences between TST and “strategic” treatments were smaller, but TST still reduced anthelmintic use by 25 %. Overall, the results support the use of TST to reduce anthelmintic use while maintaining efficacy and animal performance.

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## Extension of bio-economic models towards the derivation of economic values of health and welfare traits in Merinoland sheep

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Small Ruminant Research, Volume 257, April 2026 **OPEN ACCESS**

DOI <https://doi.org/10.1016/j.smallrumres.2026.107725>

### Highlights

- Development of a new program to derive economic values for breeding goal traits in sheep additionally considering health and welfare traits.
- Sensitivity analyses enabled the derivation of economic values for breeding goal traits for different scenarios reflecting the tail length status in the flock.
- Marginal and relative economic values were largest for ewe fertility traits and survival rates of lambs.

- Marginal and relative economic values for disease resistance traits and tail length as a welfare indicator trait declined with improved herd health and welfare status.

### Abstract

The aim of the present study was to derive economic weights for 15 breeding goal traits of a Merinoland sheep population. The specific focus on novel traits including health (endo- and ectoparasite resistances) and welfare (tail length) implied the enhancement of a bio-economic modelling approach as implemented in the ECOWEIGHT software package. The newly developed subroutine enabled the consideration of disease incidences and treatment costs for health traits and consideration of the herd tail-length status. Economic evaluation criteria from the breeding goal perspective were marginal economic values (MEVs) expressed in Euro per trait unit per ewe and year, and relative economic values (REVs) standardizing the MEV to the respective genetic standard deviation and related to the sum in Euro of all 15 breeding goal traits. Highest MEVs and REVs were derived for ewe fertility traits and survival rates of lambs. In a scenario assuming 100 % sheep with long tails (sheep tail below the hock), REVs comprised 27 % for litter size, 24 % for the survival rate of lambs until weaning, 18 % for the survival rate of lambs till 24 h after birth, and 18 % for ewe conception rate. The REVs of health traits including endo- and ectoparasite resistance traits, tail length and production traits (lamb weights, wool weight) were close to zero in a range from 0 % to 2 %. In sensitivity analyses, we increased the percentage of short-tailed sheep in the flock by increments of 25 % up to a 100 % short-tailed population, but only minor effects on MEVs and REVs of all breeding goal traits were observed. The MEVs and REVs for disease resistance traits were low due to the very high health status in the research herd considered for input data generation. The newly developed software to derive economic weights for sheep breeding goal traits revealed great flexibility regarding trait pattern and sensitivity analyses in the context of environmental particularities and market conditions.

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## A mild increase in viscosity of extender using carboxymethyl cellulose improves mitochondrial membrane potential and functional membrane integrity of ram sperm after liquid preservation

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Small Ruminant Research, Volume 257, April 2026

DOI <https://doi.org/10.1016/j.smallrumres.2026.107726>

### Highlights

- Viscosity enhancement using 0.2 % carboxymethyl cellulose (CMC) improves ram semen preservation during cold storage.
- 0.2 % CMC also improved sperm viability, mitochondrial membrane potential, and functional membrane integrity.
- CMC at 0.2 % maintained a higher proportion of non-capacitated spermatozoa, beneficial for fertility potential.
- No adverse effects on sperm motility, cholesterol content, oxidative stress markers, or lipid peroxidation were observed.

### Abstract

Poor conception rates of liquid-preserved ram semen beyond 24 h remain a significant barrier to effective artificial insemination, particularly at distant locations. This study evaluated the impact of increasing extender viscosity using carboxymethyl cellulose (CMC) on the liquid preservation of ram spermatozoa in an egg yolk–citrate–glucose (EYCG) extender. Semen was diluted with extender containing 0, 0.1, 0.2, 0.3, 0.4, or 0.5 % (w/v) CMC and stored at 3–5 °C for 96 h. Sperm motility, viability, acrosomal integrity, and functional membrane integrity (FMI) were assessed every 24 h, whereas total antioxidant capacity (TAC), total oxidative stress (TOS), and lipid peroxidation (LPO) were evaluated every 48 h. Sperm membrane cholesterol (CHO),

mitochondrial membrane potential (MMP), and sperm capacitation were analyzed at 72 h. The inclusion of 0.2 % CMC significantly enhanced sperm viability, FMI, and the proportion of sperm with high MMP compared to the control, while also maintaining a higher percentage of non-capacitated spermatozoa. No significant differences were observed among groups for sperm motility, CHO, TAC, or LPO. These findings suggest that 0.2 % CMC effectively improves the functional preservation of ram spermatozoa during cold storage, offering a potential strategy to enhance the utility of liquid-preserved semen for AI in sheep.

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### Effects of maternal feed restriction on placental lactogen and its correlation with pregnancy-associated glycoproteins in pregnant ewes

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Theriogenology, Volume 256, May 2026 **OPEN ACCESS**

DOI <https://doi.org/10.1016/j.theriogenology.2026.117851>

#### Highlights

- Moderate maternal undernutrition during early gestation does not compromise oPL secretion.
- The unchanged oPL concentrations reflect a robust placental endocrine function during nutritional challenge.
- oPL and PAGs are secreted by BNCs and display similar gestational patterns.
- The absence of correlation between oPL and PAGs supports the concept of functional specialization of the BNCs.
- Both hormones (oPL and PAGs) act protectively to ensure fetal well-being.

#### Abstract

Placental lactogen (PL) and pregnancy-associated glycoproteins (PAGs), secreted by trophoblast binucleate cells, are central to fetal development in ruminants. While nutritional effects on PAGs are documented, impacts on maternal PL and its relationship with PAGs remain unclear. This study examined the effects of maternal feed restriction on ovine placental lactogen (oPL) concentrations and their correlation with PAGs in pregnant ewes. Fifty-nine ewes (singletons or multiples) were pair-matched to a control group (100 % energy requirements) or a feed-restricted group (50 % requirements) from day 24–100 of gestation. Blood was collected on Days 24 (T1), 50 (T2), 80 (T3), 110 (T4), and 140 (T5) to measure oPL, PAGs, and metabolic indicators (NEFA, glucose, total protein). Feed restriction did not significantly affect oPL ( $p > 0.1$ ). oPL varied with time and litter size ( $p < 0.001$ ), showing a nadir at T3 and a peak at T5; ewes with multiples had consistently higher levels. In singleton pregnancies, oPL at T5 positively predicted lamb birth weight ( $p = 0.05$ ). Although oPL and PAGs displayed similar biphasic patterns (decline at T3, peak at T5), no significant correlation was found between them. oPL showed a weak, negative correlation with NEFA at T1 and moderate, negative correlation with total protein at T5; no association was observed with glucose. In conclusion, moderate maternal undernutrition during early gestation does not compromise oPL secretion, highlighting its resilience and role in supporting fetal growth. The similar temporal pattern but absence of correlation between oPL and PAGs suggest distinct regulatory mechanisms, with both hormones acting protectively to ensure fetal well-being.

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### Differences in expression of growth, immune activity and adaptation related genes in heat stressed Dorper and second cross lambs

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### Highlights

- LEPR, IGF1, IL2, IL6 and EIF2AK4 expression was assessed in liver; HSPA1A, HSPA8 and TGFBR2 IN WBC; HSBP1 in kidney; and PRLR in liver, kidney and WBC.
- Heat stress in lambs affected genes related to immune function, adaptation and heat shock response.
- Heat stress inflicted less severe physiological compromise in Dorpers than second cross lambs.
- Dorpers' superior thermotolerance might be explicated by higher expression of IL2, IL6, HSPA1A, HSPA8 and PRLR.

### Upcoming events

Date	Event	Location
16 April 2026	<a href="#">Maximising livestock profitability and herd performance</a> Agriculture Victoria	Leongatha, Vic
21 April 2026	<a href="#">Sensible sheep supplementation and nutrition workshop</a> NSW Local Land Services	Bourke, NSW
22 April 2026	<a href="#">Sensible sheep supplementation and nutrition workshop</a> NSW Local Land Services	Cobar, NSW
28 April 2026	<a href="#">Unlocking containment success – Practical tools for higher production</a> MLA PDS Updates	Webinar
14 May 2026	<a href="#">Three's a crowd – Practical tips for triplet success</a> MLA PDS Updates	Webinar