FACT SHEET

RURAL INDUSTRIES
Research & Development Corporation

Advancing Artificial Insemination in Camelids, Particularly the Alpaca

The issue

Cryopreservation of sperm (freezing for later use) is an important technique in many species, as it permits long-term storage for artificial insemination (AI). Despite over a decade of research focus, cryopreservation of camelid sperm still cannot be satisfactorily achieved. This means that the alpaca industry cannot take advantage of the many benefits of AI, such as decreased animal shipping costs, increased revenue from stud fees, and most importantly, rapid genetic gains leading to improvement in traits such as fleece quality and quantity.

Background

Previous research has identified that viscosity of alpaca seminal plasma is the principal reason that semen cannot satisfactorily undergo cryopreservation. Typically, a semen extender that contains cryoprotectants is added before freezing, and it is believed the plasma thickness prevents these cryoprotectants from interacting with, and protecting, the sperm cell. Thus, an essential step to successful cryopreservation is reducing the viscous component of the seminal plasma without impairing sperm function.

The Project

This project aimed to:

- Identify the cause and source of the viscosity of alpaca seminal plasma
- Investigate ways to reduce the viscosity without impairing sperm function
- Determine the effect of viscosity reduction on the success of sperm cryopreservation.

Results

In an important breakthrough, a protein Mucin 5B was revealed as the cause of the high viscosity of alpaca seminal plasma. The source of this protein was identified as the bulbourethral gland.

A literature review, and investigations into the use of numerous enzymes, indicated the protease papain as the most suitable enzyme to degrade Mucin 5B. A reliable and cost-effective protocol was developed for the use of papain to reduce alpaca seminal plasma viscosity.

Through adapting and validating sperm analysis methods used in other species, it was confirmed that this protocol does not affect the viability, acrosome integrity, or DNA integrity of the sperm.

Australian Government
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Pub. no. 12/085

Recommendations

To maximise the success of camelid sperm cryopreservation:

- Semen should be diluted 1:1 in a suitable semen extender, then treated with 0.1mg/ml papain (final concentration) for 20 minutes at 37°C to completely eliminate viscosity. The effect of papain should then be halted by adding 10μM E-64 (final concentration) at 37°C for 5 minutes
- A final seminal plasma concentration of 10% should be used to maximise sperm function. This can be achieved by diluting the semen prior to freezing, or by removing all seminal plasma and returning 10% post-thawing.

Following these recommendations leads to a significant improvement in post-thaw sperm motility rates, however, unfortunately they still do not reach commercially viable levels.

Where To From Here

To benefit fully from the findings of this project, further research is essential. This should focus on:

- Developing an industry standard semen extender for alpaca sperm cryopreservation
- Investigating the effect of sperm storage (pellets or straws) on sperm function
- Determining optimal freeze/thaw rates
- Improving knowledge of alpaca reproductive physiology and optimal AI protocols.

Implications

These findings provide a platform on which to develop successful cryopreservation and a subsequent AI protocol that can be used commercially within the alpaca industry. This would place the Australian alpaca industry at the forefront of the development of AI in camelids bringing, among previously noted benefits, the reputation of being a world leader in this area.

For more information

• Dr Simon de Graaf, The University of Sydney. Email: simon.degraaf@sydney.edu.au

• Julie Bird, Senior Research Manager, Rural Industries R&D Corporation. Phone: 02 6271 4140 Email: julie.bird@rirdc.gov.au

• RIRDC publication 12/016: "Advancing Artificial Insemination in Camelids, Particularly the Alpaca" is available from the RIRDC website www.rirdc.gov.au or by phoning 1300 634 313.