Commentary
Volume 13:10, 2022

Journal of Veterinary Science & Technology

ISSN: 2157-7579 Open Access

Quality of Red Deer Epididymal Spermatozoa Stored in a Liquid State

Anteneh Wondimu*

Department of Veterinary Medicine, Stanford University, California, USA

Introduction

The use of postmortem spermatozoa and oocytes for reproduction opens up new avenues for assisted reproductive technology (ART) and advances animal breeding. When ejaculated sperm cannot be collected, the preservation of epididymal spermatozoa may be the only option for genetically valuable farm animals or endangered species. The majority of sperm used for animal reproduction is preserved in a liquid or frozen state, as well as sperm that have just been ejaculated. However, obtaining sperm can be challenging, particularly in free-living animals and numerous farmed species, such as cervids. Due to these animals behavioral responses, it is difficult or even impossible to collect ejaculated sperm. As a result, epididymal spermatozoa are an important and frequently the only source of genetic material for reproduction [1].

Description

Preserved sperm from free-living and farm animals, such as red deer, has rarely been used for artificial insemination. In the cited studies, both fresh and cryopreserved sperm were examined. Long-term storage of viable sperm cells is made possible by cryopreservation. However, this procedure is expensive, time-consuming, and lowers the sperm's potential for fertilization. The quality of the sperm and their ability to fertilize must be maintained during transport to breeding centers. Red deer epididymal spermatozoa that have been stored in a liquid state have been found to remain functional for a reasonable amount of time. Iberian red deer sperm can be stored for several days, while European red deer sperm can be stored for up to 25 days. The hypothesis that red deer sperm could be kept in a liquid state for up to 10 to 11 days without affecting their quality or ability to fertilize was used as the basis for the current study. As a result, the purpose of this study was to determine whether red deer epididymal spermatozoa were suitable for in vitro and in vivo fertilization and how good they were. There were two experiments in the study. By examining sperm motility (using the CASSA system), morphology, plasma membrane and acrosome integrity (using fluorescent staining), mitochondrial membrane potential, DNA fragmentation, and apoptotic changes in the first experiment, the quality of sperm that had been stored in a liquid state was assessed. In the second experiment, IVF and artificial insemination procedures were carried out with sperm taken from five stags and kept in liquid form for one, seven, and ten days, respectively.

The majority of studies examined both freshly ejaculated and cryopreserved red deer epididymal spermatozoa for use in IVF and artificial insemination. It has never been investigated whether long liquid-stored epididymal spermatozoa are suitable for either procedure. As a result, this is the first study to examine whether liquid-stored sperm can be used for reproduction. Since it is challenging to obtain and cryopreserve ejaculated sperm from farm-raised animals, liquid storage of epididymal spermatozoa can solve numerous technical and financial issues. Our previous observations of red deer sperm stored in Salomon's extender were confirmed by the analyses that evaluated the quality of red deer epididymal spermatozoa, which included motility and plasma membrane integrity, and were stored in the Bovidyl extender at a temperature of 5 °C for 11 days. The above extenders share a similar structure and provide comparable storage conditions for sperm. Red deer sperm stored in Salomon's extenders and Bovidyl were examined for significant differences in motility and viability prior to the use of Bovidyl in this study. The fact that the proportion of sperm with normal plasma membranes and normal apical ridge acrosomes (NAR) decreased very slowly in this study may suggest that these structures are quite resistant to various storage conditions. Other authors reported findings that were comparable. However, there were differences in acrosome integrity between the applied analytical techniques, with Giemsa staining being more sensitive than fluorescent staining.

On the fifth day of storage, the morphological analysis revealed a significant decrease in the proportion of sperm with normal morphology, primarily as a result of significant tail damage. Cytoplastic droplets, which are frequently observed in epididymal spermatozoa, were not taken into consideration in the morphological analysis. The morphological changes in sperm may indicate that epididymal spermatozoa's tails are more sensitive to cooling than their heads. Glycolysis and oxidative phosphorylation are the processes that produce the energy needed for sperm motility, and disruptions in either of these processes can have an impact on sperm motility characteristics. For sperm motility, oxidative phosphorylation produces the most energy, and a decrease in MMP can disrupt this process.

The IVF procedure showed that sperm stored for one day, seven days, and ten days could still fertilize mature oocytes in vitro. This meant that the sperm's potential to fertilize was still there. However, the number of harvested and cultured mature oocytes that were suitable for IVF differed between experimental hind groups, which may be due to individual differences among female deer. However, regardless of the experimental group, the oocytes successfully matured (90–94%).About 92% of oocytes in cows and 69.4% in deer matured after 24 hours, respectively. Our finding demonstrates that the culture's conditions were optimally adjusted. However, compared to the number of fertilized oocytes in our study, the rate of cleaved embryos and blastocysts decreased. According to our previous research, blastocyst rates ranged from 12.3% to 21.8% depending on the reproductive stage of the hind, which served as the oocyte donor. There is no doubt that the pharmacological method of synchronizing the estrus cycle has an effect on the number of retrieved oocytes and the development of the embryo. As previously mentioned, a decrease in the sperm's ability to fertilize could also be the cause of these differences. Apoptotic changes have been shown to reduce bull sperm's potential for fertilization in previous research. Human embryos can also die in the early stages of development when apoptotic sperm are present [2-5].

Conclusion

The aftereffects of this study demonstrate that the quality and treating limit of red deer epididymal spermatozoa are really protected during fluid capacity (for up to 10-11 days) and could be utilized in Craftsmanship. However, these findings need to be confirmed by additional research, including in additional

***Address for Correspondence:** Anteneh Wondimu, Department of Veterinary Medicine, Stanford University, California, USA, E-mail: wondimua@gmail.com*

Date of Submission: 03 October, 2022, Manuscript No. jvst-22-81523; **Editor assigned:** 05 October, 2022, PreQC No. P-81523; **Reviewed:** 18 October, 2022, QC No. Q-81523; **Revised:** 24 October, 2022, Manuscript No. R-81523; **Published:** 31 October, 2022, DOI: 10.37421/2157-7579.2022.13.149

animals. The study's findings may point to practical applications for liquid-stored epididymal sperm, which could help cervid farms advance breeding. Because liquid storage is less labor-intensive than cryopreservation, it is practical for use in cervid farms and can facilitate the exchange of genetic material.

Acknowledgement

None.

Conflict of Interest

The authors declare that there is no conflict of interest associated with this manuscript.

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How to cite this article: Wondimu, Anteneh. "Quality of Red Deer Epididymal Spermatozoa Stored in a Liquid State." J Vet Sci Techno 13 (2022): 149.