

Extracellular Vesicles in the Female Reproductive Tract: Insights for Assisted Reproductive Techniques in Veterinary Species

Introduction

EVs are essential for successful reproduction (gametogenesis, fertilization, implantation, early embryo development, oocyte maturation) as intercellular communication is crucial. EVs carry complex bioactive molecules often absent *in vitro* and enhance ART.

Objectives

Summarize current research of:

- The role of EVs in the female reproductive tract
- Evaluation of potential applications to improve ART in veterinary species

Methods and materials: research was made on PubMed, Google Scholar and other portals using key words, such as: “extracellular vesicles”, “oocyte quality”, and “in vitro fertilization”

EVs in the ovarian follicle

- Essential for folliculogenesis oocyte maturation
- Facilitate communication between granulosa cells, theca cells, and oocyte
- Improve developmental and cummulus cell expansion, as well as, reduce apoptosis

EVs in the oviduct

- EVs aid fertilization and early embryo development
- Isthmus derived EVs enhance embryo cryotolerance
- Ampulla derived EVs enhance blastocyst yield and quality

EVs in the embryo-maternal cross-talk in the uterus

- Crucial from embryo implantation and pregnancy maintenance.
- Enhance embryo attachment and recude apoptosis.
- Support endometrium preparation and immune response modulation.

EVs in the vaginal environment

- Regulate sperm function, capacitation, motility, acrosomal reaction
- Protective roles against infections, biomarkers for diseases like HPV16

Endometrial Diseases

- EVs are involved in endometritis pathology and have an impact on infertility
- EVs mediate inflammatory responses and serve as biomarkers

Conclusion

In the field of ART, EVs represent a transformative tool enhancing oocyte quality, assisting embryo development and increasing implantation success rates. Thus, making them key in tackling infertility and advancement genetic improvement initiatives in livestock. Future developments will lead to more efficient ART protocols, aiding in the long term sustainability and efficiency of animal farming.