SPERM MORPHOLOGY AND TRANSPORT IN THE DAIRY COW AS RELATED TO FERTILIZATION

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Reducing average services per conception of dairy cows from 2.0 to 1.5 has been estimated to be worth 20 million dollars a year to U.S. dairymen. While 60% of cows conceive to a service under optimum conditions, about 13% experience fertilization failure. When fertilization failure occurs, inadequate sperm transport has been indicated by the absence of sperm in the zona pellucida of unfertilized oocytes and at the site of fertilization around the time of ovulation. Increasing sperm numbers in the oviduct increases fertilization rates of rabbits, sheep and pigs. Extending these concepts to reduce fertilization failure in cattle requires methods of studying sperm transport and knowledge of the transport mechanisms, especially in relation to artificial insemination.

Bulls that produce poor quality semen have lower conception rates due mostly to greater fertilization failure. Efforts to improve semen evaluation criteria and the functional quality of sperm inseminated can only enhance the reproductive efficiency of dairy cattle.

The objective of the first experiment is to characterize sperm distribution within and expulsion from the cow reproductive tract after artificial insemination. Dairy cows will be inseminated with 40×10^6 sperm and the discharged mucus and urine recovered for the next 12 hours. At the end of this period, the cow will be sacrificed and sperm remaining in the tract will be flushed from the vagina, cervix, uterus and oviducts. Relationships between sperm numbers discharged and in different tract regions will be examined.

The objective of the second experiment is to evaluate the effect of the smooth muscle stimulant, oxytocin, on sperm transport and expulsion from the cow reproductive tract. Oxytocin has been shown to improve fertility, potentially through improved sperm transport. Zero, 1, 4 or 16 iu of oxytocin will be given at the time of insemination. Sperm distribution will be determined as for experiment 1.

Experiment 3 is designed to evaluate methodology for inducing anterior acrosomal swelling on ejaculated bull sperm in relation to cryopreservation. This is a unique acrosomal change with undescribed significance to the fertility of bull sperm. It could be an undescribed form of deterioration or a beneficial change that would inhance the fertility of bull sperm. The experiment would determine if such altered sperm could occur due to mistakes at certain steps of commercial semen processing. It would also develop procedures by which sperm with swollen anterior acrosomes could be cryopreserved. Such a step is essential to conducting fertility trials which would describe the practical significance of this acrosomal change.

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