SUPPLEMENTING FATTY ACIDS TO IMPROVE SPERM CHARACTERISTICS

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INTRODUCTION

Artificial insemination via cooled or frozen-shipped semen allows more mares to be bred to a single stallion, but not all stallions produce semen capable of withstanding the cooling and freezing procedures. Aurich et al. (1996) estimated that cooled or frozen-shipped semen achieves < 75% of the pregnancy rates achieved with fresh semen. Some factors affecting the fertility rates of thawed semen are (a) differences in individual seminal plasma composition, (b) concentration of seminal plasma present in the sample and (c) changes in plasma membrane integrity during the freezing/thawing processes.

This study was conducted to determine whether the supplementation of omega-3 fatty acids would improve the post-thaw progressive motility and viability of stallion spermatozoa.

MATERIALS AND METHODS

Semen was collected from each of nine miniature horse stallions every two weeks for three consecutive days using an artificial vagina (Figure 2). The first two collections were discarded to ensure that the tract was clear of any organic debris. The third ejaculate was assessed for spermatozoal concentration using a densimeter and divided into aliquots for processing and analysis. Aliquot 1 was raw semen collected for immediate analysis of spermatozoal motility and membrane integrity. Aliquot 2 was prepared for cryopreservation according to the current practices. Aliquot 3 was extended and placed in an Equitainer™ for cooled-storage. At 24 and 48 hours of storage, aliquots 2 and 3 were analyzed for spermatozoal motility and membrane integrity.

Spermatozoal progressive motility was analyzed using computer-assisted semen analysis (CASA). Membrane integrity of sperm samples was determined using SYBR-14 and propidium iodide (Garner and Johnson, 1995; Love et al., 2003). SYBR-14 is a nucleic acid stain that binds to DNA and fluoresces green (Figure 2), indicating progressively motile sperm with intact membranes. Propidium iodide passes through the plasma membranes of sperm that have been damaged and fluoresces red to indicate nonviable cells.

Each of the stallions were fed an isocaloric amount of concentrate twice per day and enough hay to maintain body weight. Once a baseline for spermatozoal parameters had been established for each stallion, they were divided into two groups and fed one of two fatty acid supplements. Group 1 was fed a pelleted, fish-based omega-3 supplement (Figure 3) and group 2 was fed a flake, algae-based omega-3 supplement. Both supplements were obtained from JBS United, Sheridan, Indiana.

Figure 1. Collection of semen from a stallion using a Missouri-style artificial vagina (inset).

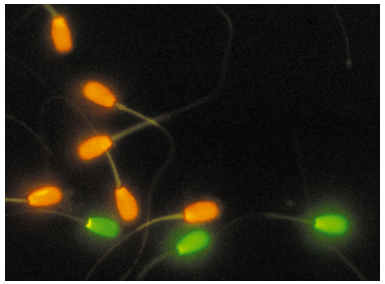

Figure 2. Enlarged image of sperm stained with SYBR-14 (green) and propidium iodide (red) under fluorescent microscopy (Garner and Johnson, 1995).

Figure 3. Pelleted omega-3 fatty acid supplement

RESULTS

At present, results are inconclusive due to some difficulty with statistical analysis. This could be due to the small number of stallions includes.

Numerically, there appears to have been a higher progressive motility following cooling for the supplemented diets, although they are not statistically different. Neither source of omega-3 fatty acid seems to be more beneficial than the other.

CONCLUSION

It appears that the supplementation of omega-3 fatty acids may be beneficial in increasing the post-thaw progressive motility of equine spermatozoa. Other studies in boars (Rooke et al.,2001) and humans (Nissen and Kreysel, 1983) have found a positive correlation between the level of omega-3 fatty acid and an increase in spermatozoal progressive motility and the numbers of morphologically normal sperm. More research should be done with a larger test group of stallions to confirm the results of this study.

Literature Cited

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