Effect of Different Mucolytic Agents on Viscosity and Physical Characteristics of Dromedary Camel Semen

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ABSTRACT

Elimination of viscosity in camel semen is necessary to improve assessment of its raw physical characteristics and to provide a homogeneous dilution. Five different mucolytic agents were tested for removal of viscosity; namely: α-amylase (25%), α-chymotrypsin (0.5%), trypsin (25%), sodium hydroxide (0.1 N) and bromhexine hydrochloride (0.2%). Thirty semen ejaculates were analyzed during the rutting season. The raw semen samples used in this study had an average of 13.4 ± 1.7 ml ejaculate volume, 296.3 ± 41.7 x 10^6/ml sperm concentration, 64.2 ± 4.3 % mass motility, 23.0 ± 2.3 % individual motility, 96.6 ± 0.57% intact acrosomes, 5.2 ± 0.4 % primary abnormalities and 8.1 ± 1.7 % secondary abnormalities. After collection, and raw semen analysis each ejaculate was divided into six equal portions and were diluted in a Tris-Lactose extender at 1:3. Each of the five portions was subjected separately to one of the five selected mucolytic agents at a concentration of 50 µl/ml of extender, and the remaining portion was diluted in an extender free from the mucolytic agents (control).

Seminal viscosity, sperm motility and acrosomal integrity were assessed post-dilution after incubation for 15 min at 37°C and after 240 min of equilibration at 5°C. Amylase superiorly eliminated seminal viscosity in all samples and improved individual sperm motility (46.0 ± 9.12) post-dilution compared to control (27.5± 5.57) and to samples treated with the other mucolytic agents (31.2 ± 5.42 to 37.0 ± 6.55%). However, amylase had a significant ($p< 0.05$) deleterious effect on sperm acrosomal integrity after 240 min of equilibration (11.8± 1.95% detached acrosomes). Although α-chymotrypsin partially liquefied about 60% of samples post-equilibration, it significantly ($p< 0.05$) improved individual sperm motility (46.0 ± 6.35%) and significantly ($p< 0.05$) minimized acrosomal detachment after 240 min of equilibration (7.4± 0.67%). In conclusion, α-amylase totally eliminated viscosity in camel semen, and significantly improved sperm forward motility as compared with untreated semen. However, these mucolytic agents may have deleterious effects on acrosomal integrity after equilibration.

Key Words: camel semen; mucolytic; viscosity; sperm; intact acrosome.

INTRODUCTION

The interest in applying modern reproductive technologies in new and old world camelids has increased dramatically over the last decade. This is due in part to their unique reproductive aspects and to utilize their productive potential for commercial application (Faye, 2008). Because of the features of reproduction in camelids, establishing and developing techniques for freezing and storing semen from these species have obvious advantages for prolongation of the female breeding season, cross-breeding to improve productivity (Al-Eknah, 2000), as well as production and transfer of camelid embryos by IVM and IVF (Khatir *et al.*, 2004). The mucoid nature of camelid semen is considered one of the major problems that delay the application of artificial insemination and semen processing (Skidmore, 2003). Ejaculate viscosity makes it difficult to handle semen, to determine sperm concentration and motility as well as to dilute semen in extender (Adler et al., 1997; El-Zanaty *et al.*, 2004) thus causing technical problems during filling straws. Zavos *et al.* (2006) recommended that viscous semen specimens should be liquefied prior to performance of routine semen analysis to avoid inaccurate assessment of semen characteristics. Freshly ejaculated camelid sperms mostly exhibit poor mass motility and low progressive motility comparable to that of domestic ruminants which exhibit wave and swirl movement. The high viscosity in camelid semen results in oscillatory movement of sperms (most sperms move back and forth) and only 5 to 10% of sperm actively progress forward (Agarwal *et al.*, 1995; Bravo *et al.*, 2000). This is due to entrapment of spermatozoa in mucus and sperm can develop motility only after its liquefaction. Deen *et al.* (2003) noted that when camel semen is in gel form, 35.9% of samples exhibit