Effect of Artificial Vagina Lubricants on Stallion Sperm Quality

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Introduction

Commercially available lubricants, labeled as non-spermicidal, are used to lubricate artificial vaginas prior to semen collection in stallions (Figure 1).

Improper type or amount of lubricant may affect stallion sperm quality, either after short exposure time or following cooled storage of extended semen.

Experimental Aim

Evaluate the effects of different commercial lubricants on an assortment of measures of sperm quality in stallions following:

1) Short-term exposure - 1 h (T1h) or
2) Long-term exposure - 24 h (T24h) of cooled storage.

Materials and Methods

Three ejaculates were collected from each of four stallions for the study using a Missouri model artificial vagina (AV, Nasco, Ft. Atkinson, WI, USA), which was lubricated with water-insoluble petroleum jelly (Vaseline™).

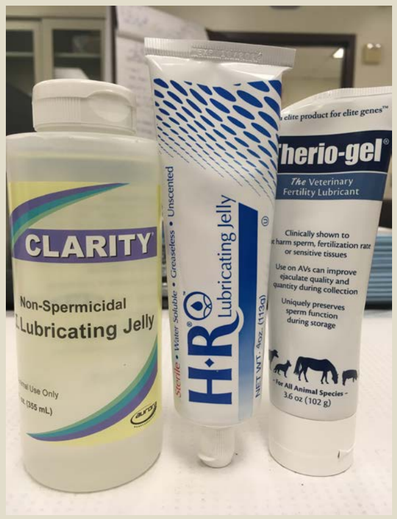

Figure 1: Three commercially available artificial vagina lubricants used prior to semen collection in stallions.

Prior to semen collection, semen extender (EquiPRO® Coolguard®) was aliquoted into capped tubes, with extender containing no lubricant (Control), or 1% or 5% (w/v) of each of the following lubricants:

- HR® Lubricating Jelly (HR1, HR5; HR Pharmaceuticals Inc., York, PA, USA);
- K-Y™ Jelly (KY1, KY5; Johnson and Johnson, New Brunswick, NJ, USA);
- Therio-gel® (TG1, TG5; Agtech Inc., Manhattan, KS, USA);
- Priority Care® (PC1, PC5; First Priority Inc., Elgin, IL. USA); and
- Clarity® (CL1, CL5; Aurora Pharmaceutical, LLC, Northfield, MN, USA).

Each tube was then placed on a mixer plate at 37 °C and gently inverted for 2 h prior to semen collection.

Gel-free semen (containing 30 x 10^6 sperm/mL) was added to each tube, then samples were rotated gently at 37 °C for 1 h. Each treatment was then divided in two aliquots. One aliquot was subjected to immediate analysis (T1h), and one aliquot was placed in an Equitainer (Equitainer II™, Hamilton Research, Inc., South Hamilton, MA, USA) and evaluated after 24 h of cooled storage (T24h). Experimental endpoints were:

- Percent total sperm motility (TMOT);
- Percent viable acrosome intact sperm (VAI);
- Percent of sperm with abnormal DNA (COMP-α_t);
- Percent viable lipid peroxidation negative sperm (VLPN); and
- Percent of sperm with no or minimal DNA oxidative injury [8OHdG(-)]

Samples evaluated for abnormal DNA, lipid peroxidation and DNA oxidative injury were exposed to acid (HCl), ultraviolet light, or iron sulfate/hydrogen peroxide, respectively, as test perturbations.

Statistical Analysis

Data were subjected to rank transformation, then analyzed using an ANOVA procedure within time (T1h, T24h). Means were compared using the Tukey's studentized range test. Significance was set at $P < 0.05$.

Results*

TMOT

T1h:

LUBRICANT	MEAN
HR1	70
CONTROL	70
CL1	70
TG1	68
HR5	68
CL5	68
KY1	67
PC1	66
TG5	56
PC5	55
KY5	55

T24h:

LUBRICANT	MEAN
CL1	60
HR1	60
TG1	60
CL5	58
CONTROL	59
PC1	57
HR5	56
KY1	54
TG5	53
PC5	49
KY5	15

VAI

LUBRICANT	MEAN
HR1	72
CL1	71
TG5	70
HR5	70
TG1	70
CL5	70
CONTROL	69
PC1	68
PC5	65
KY1	63
KY5	46

LUBRICANT	MEAN
HR1	71
CONTROL	70
TG1	70
CL1	70
PC1	70
TG5	69
HR5	69
CL5	68
PC5	66
KY1	62
KY5	40

COMP-α_t

LUBRICANT	MEAN
KY5	28
KY1	25
HR5	25
TG5	25
CONTROL	24
TG1	24
CL1	23
PC1	24
CL5	23
PC5	24
HR1	22

LUBRICANT	MEAN
KY5	42
KY1	31
HR5	28
PC5	29
TG1	27
TG5	27
PC1	28
CONTROL	27
CL5	26
CL1	26
HR1	25

VLPN

LUBRICANT	MEAN
TG5	20
CL1	21
TG1	15
CONTROL	10
KY1	14
CL5	13
PC5	7
HR5	10
PC1	8
KY5	4
HR1	7

LUBRICANT	MEAN
CL1	16
TG5	14
TG1	14
CL5	9
PC1	9
KY1	6
CONTROL	7
PC5	5
HR5	7
HR1	5
KY5	1

8OHdG (-)

LUBRICANT	MEAN
CL1	55
KY5	52
KY1	49
HR1	48
CONTROL	47
CL5	47
HR5	42
PC5	32
TG1	23
PC1	18
TG5	16

LUBRICANT	MEAN
KY1	60
KY5	56
HR5	52
CL1	51
HR1	48
CL5	45
CONTROL	41
TG1	31
TG5	24
PC1	22
PC5	22

*In each table, means with different colored bar differ ($P < 0.05$).
A treatment-by-stallion interaction was detected for TMOT and COMP-α_t ($P < 0.05$).
At T1h, TMOT was lower in KY5, PC5, and TG5 than in all other treatments in 3 of 4 stallions ($P < 0.05$).
At T24h, TMOT was lower in KY5 than in all other treatments in 3 of 4 stallions ($P < 0.05$).
At T1h, there was no effect of treatment on COMP-α_t for all stallions ($P > 0.05$).
At T24h, COMP-α_t was higher in KY5 than in all other treatments in 2 of 4 stallions ($P < 0.05$).

Conclusions

Exposure of sperm to KY was detrimental to all sperm quality measures, except for 8OHdG. This may be due to the high non-viable sperm population that would not respond to the perturbation.

In general, exposure to 5% KY, PC, or TG lubricants yielded lower sperm quality, and the effect was most profound in KY. Most sperm quality measures were unaffected by different concentrations (1 or 5%) of HR and CL lubricants with values similar to control. Lubricant TG tended to yield lower values for sperm lipid peroxidation; however, TG increased sperm susceptibility to oxidative injury.

This study highlights the importance of using caution when selecting an artificial vagina lubricant for semen collection from stallions, even if lubricants are marketed as being safe for this purpose. Lubricants CL yielded high values for all 5 endpoints, whereas HR yielded high values for 4 endpoints; therefore, these lubricants might be the safest among those tested for collection of stallion semen.

Acknowledgments

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