Semen Parameters of the American Miniature Horse Stallion

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Semen parameters of normal American Miniature Horse stallions will aid veterinarians in their ability to predict fertility in stallions of this breed. Authors' addresses: Honahlee, PC, 14005 Southwest Tooze Rd, Sherwood, OR 97140 (Metcalf); Virginia-Maryland Regional College of Veterinary Medicine, Blacksburg, VA 24061 (Ley); and Gainesway Farm, Lexington, KY 40517 (Love). © 1997 AAEP.

1. Introduction

Interest in the American Miniature Horse has markedly grown and become widespread during the past 10 years. Unfortunately, very little published data, specific to this breed, exist in the literature, so that when presented with a miniature horse stallion, we extrapolate information from published studies of other breeds to investigate the case. This study was designed to determine normal parameters of semen quality and testicular size as well as to establish normal criteria for evaluating and predicting potential fertility in the American Miniature Horse stallion.

2. Materials and Methods

Twenty-three registered American Miniature Horse (AMHA) stallions with a seasonal pregnancy rate of >40% had semen collected daily with a modified Colorado-model artificial vagina or were bred daily for a minimum of 5 consecutive days in order to flush extragonadal sperm reserves. Following the 5 days, the stallions' ejaculates were collected on the next 2 consecutive days. The values obtained from these ejaculates were averaged to determine mean semen parameters.

Semen concentration was determined with a Densimeter. The total number of sperm per ejaculate was calculated by multiplying the concentration times (×) the gel-free volume of semen. Total motility, progressive motility, and various components of motility were obtained by objective motility analysis, using the HTM-2000 Motility Analyzer. Parameters were set as previously described by Jasco et al. Sperm morphology was subjectively determined by evaluating a wet mount of 100 cells preserved in buffered formalin with an Olympus CH-2 phase-contrast microscope.

A student's t test was used for the statistical analysis of semen parameters. A Pearson product moment correlation and a linear regression analysis were used to determine the relationship between testicular volume and daily sperm output (DSO). Testicular volume was calculated by measuring the length, height, and width of each testicle, using a.
5-MHz linear array ultrasound probe and the following formula:

\[
testicular\text{\hspace{0.1cm}volume} = \frac{4}{3}\pi abc,
\]

where

\[
a = \text{testicular height}/2,
b = \text{testicular width}/2,
c = \text{testicular length}/2.
\]

3. Results

From forty-five ejaculates, the following results were obtained. Mean left and right testicular volume were 30.61 cm³ (SD ± 10.8) and 31.91 cm³ (SD ± 16.2), respectively. The mean seminal volume was found to be 17 ml (SD ± 12.6), with the gel-free portion averaging 13.5 ml (SD ± 7.6) Sper concentration ranged 20–700 × 10⁶ sperm/ml, with the average being 177.2 × 10⁶ (SD ± 139). The average total number of spermatozoa per ejaculate was 2.008 × 10⁹. An objective motility analysis of the ejaculates yielded average values for total motility, progressive motility, velocity anterior progressi, rapid velocity, mean curvilinear velocity, mean straight linear velocity, mean linearity, and mean straightness of 75.6% (SD ± 10.5), 48.8% (SD ± 12.9), 86 µm/s (SD ± 17.2), 73.4% (SD ± 11.4), 132 µm/s (SD ± 16.7), 65.2 µm/s (SD ± 15.9), 50% (SD ± 8.35), and 73.9% (SD ± 6.14).

In comparison with the same parameters in 7-year-old large breed stallions, the total semen volume, gel volume, gel-free volume, and total number of sperm per ejaculate were statistically different (p ≤ 0.05), and yet semen concentration and subjective motility estimates were not different. The calculation of DSO for a miniature horse stallion, based on testicular volume, cannot be performed by using the same formula used for predicting the DSO of larger breeds.2

Interestingly, miniature horses often express many dwarflike characteristics; their bodies often appear disproportionate to their appendages or heads. Their testicles may be no exception, thereby offering a possible explanation for the discrepancy between the AMHA stallion and other breeds as well as the variability in testicular size with respect to the total number of sperm per ejaculate within the breed.

Finally, with the incidence of exposure to equine arteritis virus increasing, this study supports current recommendations made by the AAEP to test the status of all breeding stallions within North America. All breeds are susceptible to this disease and its ramifications.

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References and Footnotes


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