PEREGRINE FALCON SEMEN: A QUANTITATIVE AND QUALITATIVE EXAMINATION

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ABSTRACT — Collection frequencies and certain characteristics of Peregrine Falcon (*Falco peregrinus*) semen were investigated using semen from a falcon trained to copulate on a specially designed hat. Semen volume increased significantly when collections were increased from two to three times/day, but cells/ejaculate decreased. No significant difference in number cells/ejaculate or cells/microliter was detected between morning and evening samples with two collections/day. Three collections/day resulted in decreasing total cell numbers/collections and numbers/microliter with the most cells collected during the initial morning collection. Semen showed a high motility, with estimated 80 - 100% of sperm cells alive.

The Peregrine Falcon (*Falco peregrinus*) continues to be a focal point of captive propagation efforts (Cade and Dague 1981). An important technique used in captive propagation is artificial insemination, since many captive falcons do not copulate (Boyd 1978). The technique of artificial insemination has been described by Boyd et al. (1977), but little attention has been directed toward quantitative or qualitative examination of falcon semen. We report here the affect of increasing frequency of semen collection upon semen volume and upon certain characteristics of peregrine semen, including concentration of sperm cells, total cells/ejaculate, motility and percent of viable sperm cells.

MATERIALS AND METHODS

We wished to know if daily semen volume could be increased significantly by collecting semen 3 times/d vs 2 times/d. Two periods were designated near the midpoint of the semen production cycle (Table 1). Period I comprised 9 d when semen was collected 2 times/d, between 0800 H and 1015 H, and between 1715 H and 1745 H. A third collection was accomplished between 1300 H and 1345 H in Period II. Three days separated the two 9-day collection periods.

All semen in this study was collected from a 10-year-old peregrine. The falcon was behaviorally imprinted to humans and copulated on a specially constructed hat (Cade and Dague 1981). The falcon was handled and raised as described by Boyd and Schwartz (1981). The falcon was given the opportunity to copulate on the hat only during the period when semen was needed for artifi-

Table 1. Means (ranges in parentheses) of semen volume and sperm counts of a 10-year-old Peregrine Falcon.

TIME	VOL/DAY	CELLS/μl x 10^3	CELLS/EJACULATE x 10^6
Period I	150 (116 - 185) (n=9)	52.86 (38.12 - 81.12) (n=8)	4.46 (2.55 - 5.84) (n=8)
0800 - 1015 H		59.06 (45.62 - 81.12) (n=4)	4.97 (3.51 - 5.84) (n=4)
1715 - 1745 H		46.66 (38.12 - 55.88) (n=4)	3.95 (2.55 - 4.97) (n=4)
Period II	192 (175 - 208) (n=11)	37.12 (26.25 - 60.62) (n=15)	2.46 (1.27 - 3.88) (n=15)
0800 - 1015 H		47.54 (40.00 - 60.62) (n=3)	3.32 (2.76 - 3.88) (n=3)
1300 - 1345 H		36.47 (30.38 - 39.88) (n=7)	2.61 (1.77 - 3.23) (n=7)
1715 - 1745 H		31.78 (26.25 - 37.38) (n=5)	1.72 (1.27 - 1.90) (n=5)

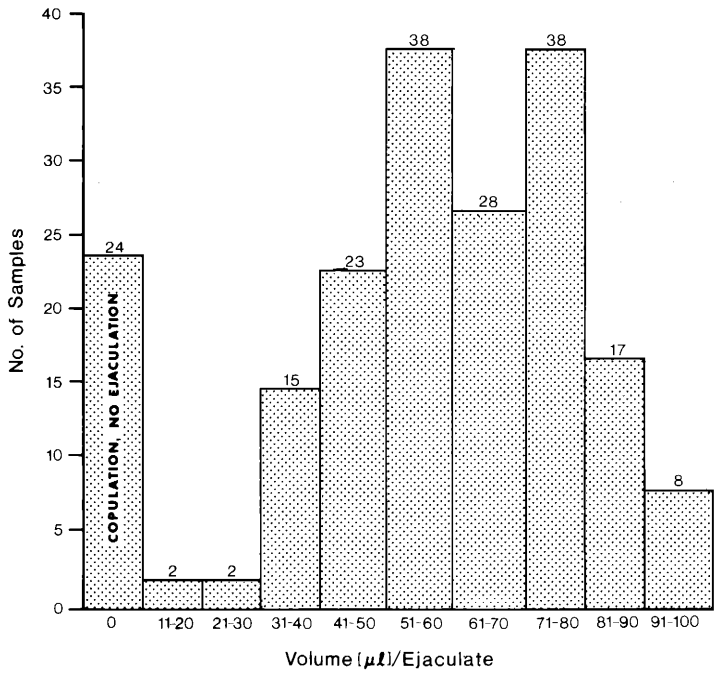

Figure 1. Semen production of a 10-year-old Peregrine Falcon.

cial insemination. The semen was retrieved from the hat by use of blood capillary tubes. The capillary tubes were initially calibrated for volume by using a micropipette. Each millimeter (mm) of tube length represented 1 microliter (μl) of semen. Volume was therefore easily calculated by measuring the length of semen in the tube with a metric rule.

Concentration of spermatazoa per sample was calculated by the use of a phase contrast hemocytometer. Separate means were calculated for the morning and evening collections since the collections were not evenly spaced over each 24 hr period.

Standard poultry science methods for determining the percent of viable sperm were inadequate for peregrine semen quantification. Use of a live-dead stain was not helpful in determining fertilization capacity. The nigrosin, eosin blue stain (Ernst 1970) which is intended to darken only dead cells, permeated both live and dead cells of the falcon semen. This technique needs to be perfected for falcons.

Motility score of the semen was judged qualitatively. Samples were taken immediately to the laboratory once collected and mixed thoroughly in small vials pre-warmed to 37° C. Semen samples were then placed on pre-warmed slides which were kept at 37° C in a microscope stage incubator and viewed through a phase contrast microscope. Motility was judged qualitatively by the progressive motion and speed of the sperm cells, as well as the estimated percent of moving cells.

RESULTS AND DISCUSSION

The 10-year-old male peregrine commenced copulation on 5 March and continued on a daily basis through 1 June when the opportunity to copulate was no longer made available to him, thus representing a semen production period of 95 d. Semen produced per copulation ranged from 0 (copulation, but no ejaculation) to 93 ml. Figure 1 compares the volume produced/ejaculate with frequency of ejaculation for periods of both 2 and 3 collections/d. Semen volume rose significantly (28%, $P < 0.001$, Mann-Whitney U-test) when collections were increased from 2 to 3 times/d, but cells/ejaculate decreased significantly ($P < 0.01$) when collection frequency was increased (Table 1).

During Period I, no significant difference ($P = 0.20$) in number of cells/μl or cells/ejaculate between morning or evening samples was observed (Table 1). In contrast, in Period II a significant difference ($P < 0.025$) existed in number of cells/μl and cells/ejaculate between the 3 collection times. The mean number of cells/μl for the morning collection of Period II of 47.54×10^3 shows a decrease of 19% compared

with the same time in Period I (Table 1). The midday and evening collections for Period II had mean values of 36.47 x 10^3 and 31.78 x 10^3 cells/μl, respectively, the latter showing a decrease for the evening collection times. Total sperm cells/ejaculate (in the morning collections of Period I) averaged 4.97 x 10^6 (Table 1), and evening collections averaged 3.95 x 10^6 cells/ejaculate. Together, these figures represent a daily total average of 4.46 x 10^6 spermatazoa/ejaculate for Period I. In contrast, the mean for the morning, midday and evening collections of Period II were 3.32 x 10^6, 2.61 x 10^6 and 1.72 x 10^6, respectively (Table 1). We initially presumed that Period II would show a decrease in spermatazoa/ejaculate and an overall daily total greater than Period I. However, fewer total cells were produced in Period II.

The semen collected showed a high motility value for more than 92% of the samples (n = 41) analyzed with an estimated 80 - 100% of the sperm cells alive and moving in a progressive motion. The speed with which the sperm cells move is difficult to evaluate with respect to their apparent fitness. It should be possible to correct this problem through the examination of samples from other captive and wild falcons. In this way, comparisons could be made and the normal speed could be ascertained. Semen from the peregrine tested fertilized eggs at a level equal to other donors of varying ages.

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