



Modified collection methods and quality of semen in Nigerian local turkeys (*Meleagris gallopavo*)

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Abstract

Semen collection in birds was initially achieved either via post-mortem drainage of the vas deferens or by cloacal retrieval after natural mating. Current techniques do not exclude stress and risk of injury during restraint or milking, especially in domestic turkeys. The present study was designed to develop more convenient methods of semen collection in turkeys. It involved five ($n = 5$) matured turkey toms weighing approximately 12 – 15 kg and two ($n = 2$) turkey hens. In the improved collection method, toms were stimulated by exposing them to hens, covered using a locally constructed wooden box. They were allowed to mount until there was evidence of ejaculatory response, demonstrated by increased abdominal pressure and cloacal contraction. After mounting, the tail feathers were lifted, and a collection vial was placed immediately below the cloaca to collect the ejaculates. In the modified abdominal massage, the turkey toms were restrained on sterna recumbency while the ejaculatory response was initiated by gently massaging the soft part of the abdomen and backward massage of the tail feathers. This is continued by rubbing either side of the cloaca till erection is achieved and semen is milked into a collection vial by gently squeezing the cloaca. Collections were made twice a week for four weeks using each method independently. The mean semen volume in the improved collection method was significantly ($p < 0.05$) higher than the modified abdominal massage. There was no significant ($p > 0.05$) difference in motility, abnormalities and concentration between both methods. The results from this study suggest that both collection methods were satisfactory for practical use and may offset some challenges associated with the most widely used abdominal massage technique of semen collection in turkeys.

Introduction

Over the years, intricacies in obtaining spermatozoa from birds compared to mammals have limited the practical use of avian semen, especially in field conditions. This is compounded in turkeys (*Meleagris gallopavo*), where natural mating is difficult due to

the considerable disparity in sizes between the matured turkey toms and hens (Donoghue & Wishart, 2000). Back in the early 1900s, semen collection in birds was achieved either through post-mortem drainage of the vas deferens (Ivanov, 1913) or by

cloacal retrieval after natural mating (Jull & Quinn, 1931). Burrows & Quinn (1937) have also described the abdominal massage method of semen collection, which has remained the only most widely used technique in all poultry species. This technique involves rapid and gentle massage of the hind part of the abdomen beneath the pelvic bones to stimulate an ejaculatory response, and thereafter, semen is obtained in a glass container by applying gentle pressure behind the phallus. Although the method of Burrows & Quinn (1937) is efficient; it requires more than one person to provide effective restraint for the birds. There is a risk of injury to the birds during restraint, and training of toms for semen collection is a prerequisite for successful collection (Gills *et al.*, 1999; Yahaya *et al.*, 2013). In addition, the risk of faecal contamination of the semen is not ruled out (Alkali *et al.*, 2020). Consequently, various attempts have been made to explore other methods with varying degrees of success. These include collection without milking the vent (Kamar, 1958), the use of artificial cloaca and dummy females during natural mating (Rybnik *et al.*, 2007) and the recent adoption of electro-stimulation (Frediani *et al.*, 2019). Utilization of electrostimulation is further limited by welfare concerns (Abril-Sánchez *et al.*, 2019), while other techniques mentioned earlier do not exclude stress and risk of injury during restraint and milking, especially in domestic turkeys.

Currently, there is a need to develop methods that are safer and more efficient in terms of restraints and semen collection; thus, this research work aimed to develop a convenient method of semen collection in domestic turkeys.

Materials and Methods

Management and feeding of experimental animal

Five (n = 5) matured turkey toms that weighed between 12 – 15 kg and two (n = 2) turkey hens that weighed 6 – 8 kg were used for the study. They were purchased from poultry breeders in Maiduguri, Nigeria and housed in individual cages at the Faculty of Veterinary Medicine Large Animal Clinic Complex, University of Maiduguri, Nigeria. The birds were fed with commercial poultry feed, supplemented with onion leaves, and clean water was provided for them *ad libitum*.

Two semen collection methods (The Improved Collection Method and the Modified Abdominal Massage Method) were compared.

The improved collection method: Turkey tom and hen are brought together to initiate the mating process. The tom consequently puffs up its body and spreads

the tail feathers while the hen is immediately covered using a locally constructed wooden box (wooden box wrapped with foam and a thick-coloured greyish cloth). The tom was allowed to mount independently until there was evidence of ejaculatory response. This is demonstrated by increased abdominal pressure and cloacal contraction. Thereafter, the tail feathers were lifted, and a collection vial was placed immediately below the tips of the cloaca to collect the ejaculates (Plate I). The ejaculate was seen flowing within the ventral midline dividing the two copulatory organs, and with a collection vial placed beneath the furrow, the semen was collected carefully.

The modified abdominal massage method: The technique originally described by Burrows & Quinn (1937) was slightly modified. Briefly, it involved a collector and a milker; the semen collector restrains the turkey tom on sterna recumbency while the milker helps to raise and hold the two legs of the tom together. The semen collector does not put on a hand glove because of the friction required to stimulate the ejaculatory response. The semen collector gently massages the soft part of the abdomen for a few minutes and immediately continues the massage on the tail feathers, which is done backwardly and consistently. This is maintained by rubbing either side of the cloaca till erection is achieved (Plate II). After penile protrusion, cloacal squeezing is instituted, and the semen is milked from the vas deferens into a graduated collection tube.

Data collection

In this study, both methods were used independently for the semen collection. The first sets of collections were made twice a week for four weeks using the modified abdominal massage technique. Thereafter, the birds were rested and managed for two weeks, and the second sets of collections were made using the improved collection method for additional four weeks.

Preliminary evaluation of semen

Immediately after collection, the semen is taken to the Artificial Insemination and Andrology Laboratory, Faculty of Veterinary Medicine, University of Maiduguri, for evaluation. Macroscopic parameters such as volume (ml), colour and consistency were determined immediately via physical observation of the calibrated collection tube, while the microscopic qualities such as individual progressive motility (%), morphological abnormalities (%) and concentration (cells x 10⁹/ml) were all determined as described by Yahaya *et al.* (2013).



Plate I: Semen collection using the improved collection method



Plate II: Semen collection using the modified abdominal massage method

Table 1: Immediate assessment of fresh turkey semen obtained using improved collection method and modified abdominal massage techniques

Parameters	Improved collection method	Modified abdominal massage
Semen volume (ml)	0.25 ± 0.03 ^a	0.21 ± 0.04 ^b
Individual motility (%)	92.9 ± 2.6 ^a	94.3 ± 2.8 ^a
Abnormalities (%)	4.7 ± 1.2 ^a	6.2 ± 2.3 ^a
Concentration (cells x 10 ⁹ /ml)	5.6 ± 2.7 ^a	5.9 ± 1.3 ^a

Mean values on the same column showing different superscripts differ significantly at $p < 0.05$

Statistical analysis

Data were analyzed using the independent sample *t*-test and expressed in Mean ± Standard Deviation (SD). Mean values at a significance level of $p < 0.05$ were considered statistically significant.

Results and Discussion

In this study, the result of semen evaluation obtained for the improved collection method was 0.25 ± 0.03mls, 92.9 ± 2.6%, 4.7 ± 1.2% and 5.6 ± 2.7/10⁹/ml for volume, progressive motility, abnormalities and concentration respectively while the results obtained in the modified abdominal massage method for same parameters was 0.21 ± 0.04mls, 94.3 ± 2.8%, 6.2 ± 2.3% and 5.9 ± 1.3 respectively. All the parameters obtained in the modified abdominal massage method did not differ statistically from those obtained in the improved collection method; except, for significantly higher semen volume ($p < 0.05$) in the improved collection technique compared to the modified abdominal massage method (Table 1). The study suggests that the two semen collection techniques may serve as low-stress and alternative methods to the widely used abdominal massage method. The significantly higher volume obtained is particularly important for indigenous turkey found in Nigeria due to their pronounced low ejaculate volume when compared to exotic breeds (Zahradden *et al.*, 2005;

Ngu *et al.*, 2014). Similarly, the improved collection method could also serve for toms that are not responsive to the massage technique. The method is not time-consuming and is observed to last for 5 – 10 minutes. This would be of practical benefit to poultry industries due to the significant nature of Artificial Insemination in turkey breeding (Dumpala *et al.*, 2006).

The abnormalities in this study are similar to the report of Alkan *et al.* (2002), where a coiled and looped sperm tail, as well as swollen and bent mid-pieces were observed. They were not statistically significant ($p > 0.05$) in both techniques described herein. Similarly, the risk of injuries obtained in the abdominal massage technique appeared to be minimized in the improved collection method by the barrier used the locally constructed wooden box. The good semen quality obtained in the improved collection method concord with previous reports of Burrows & Quinn (1937), who reported that the independency in the bird's desire to mate helps in obtaining good quality semen for artificial insemination. During ejaculation, the continuous contraction and relaxation of the cloaca may be an inclusive factor responsible for the significant semen volume obtained using the improved collection method as compared with the modified abdominal collection method. Burrows & Quinn (1937) also

observed a similar trend in the relaxation of the anal sphincter during ejaculation in their study. Furthermore, abdominal pressure appeared to have contributed significantly to propelling the semen from the vas deferentia into the ducts, similar to the reports by Burrows and Quinn (1937). The abdominal massage method requires more than one individual in a workable condition, but the improved collection method is quite convenient and could be carried out successfully by an individual collector. It was also observed that the use of different collectors triggers apprehension in the toms, which could upset them for a possible attack and eventually affect the whole collection process. Conclusively, two convenient collection methods of semen in local turkeys (*Meleagris gallopavo*) are now described, and semen quality obtained from the study suggests that both methods are satisfactory for both experimental and practical use. The improved collection method may serve to offset the challenges associated with the most widely used abdominal massage method in turkeys (*Meleagris gallopavo*).

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Conflict of Interest

The authors declare that there is no conflict of interest.

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