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Review Article

Semen collection from small breed birds and some parameters related to passerine bird semen

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Abstract

It is much more difficult to collect semen from small breed birds than large breed birds. The biggest reason for this situation is that small breed birds are very active and their cloaca is smaller. To receive semen from passerine birds, the birds must be in the breeding season. Having active females around during this period will increase libido due to male competition. Trimming the hair around the cloaca to collect semen both prevents the risk of contamination and provides adequate viewing angles. The most commonly used method of obtaining semen is cloacal massage. Massage should be done cranially from the abdomen towards the cloaca. When the bird ejaculates, it is seen that the semen comes out of the cloaca from the seminal glomera with the pressure applied laterally on the cloaca. It collects the exiting semen with the help of a sterile hematocrit capillary tube. Sperm contaminated with feces should not be taken as it will be contaminated. In bird semen, motility examination is important in the direction of movement, speed of movement, and rate of movement of the spermatozoa. Due to this situation, it is seen that there is a relationship between motility and the morphological structure of spermatozoa in passerine birds. This study aims to give information about semen collection by a cloacal method in small breed canaries and some motility and morphological examination methods in passerine bird semen.

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Morphology, Motility, Passerine bird, Semen

1. Introduction

It is thought that anatomical differences in the reproductive tract in birds may be related to semen values. The importance of knowing the male reproductive system has been emphasized (Briske, 1993). Different semen collection methods have been developed, such as semen expelled from passerine birds, using a female mannequin, or a cloacal massage technique. It has been reported that semen collection by cloacal massage method is more advantageous in

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small breed birds (Girndt et al., 2017). The rate of motile cells and the swimming speed of spermatozoa seem to be important factors in fertilization success (Cramer et al., 2019). It is also thought that there may be a relationship between the morphological structure of the sperm and its motility (Cramer et al., 2021).

2. Male Reproductive System in Passerine Birds

It has been stated that the semen produced in the testicles of birds are transmitted from the epididymis to the vas deferens. It has been emphasized that there is no seminal gland on the vas deferens in birds (Blesbois and Brillard, 2007). In birds, the semen produced in the testicles is stored in a special structure called the glomera, which is located around the cloaca, until the time of mating. It has been observed that the cloacas of polygamous birds are larger than those of monogamous ones. However, it has been reported that the number of spermatozoa stored compared to semen varies according to bird species (Briskie, 1993). In a study conducted in passerine birds, it was observed that there was not much difference in total sperm count between the 2 seminal glomera (Birkhead et al., 2006). It has been emphasized that the seminal glomera in passerine birds can be of different sizes during the breeding period and out of season. It is known that the seminal glomera, which is active during the mating season, can be larger than its size outside the breeding season. In direct proportion to this situation, the amount of sperm in the ductus ejaculate may change (Chiba et al., 2011). The male reproductive system in the passerine birds is shown in Figure 1.

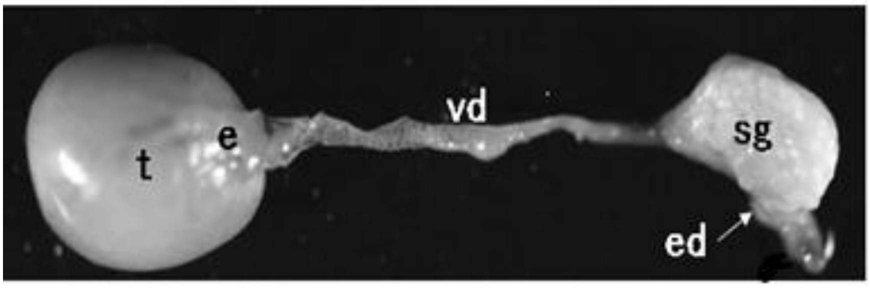

Figure 1. Male reproductive system in passerine bird (Chiba et al., 2011). T, testis; e, epididymis; vd, vas deferens; sg, seminal glomera, ed, ductus ejaculate

3. Semen Collection Method

It has been emphasized that male competition in birds will increase success (Grndt et al., 2017). Semen retrieval in passerine birds is usually obtained from dissected seminal glomera of birds that have undergone colossal massage or euthanasia (Birkhead et al., 2006; Yang et al., 2019). In the cloacal massage method in passerine birds, semen can be collected with the help of pressure applied to the right and left sides of the cloaca. It has been emphasized that the seminal glomera, which stores sperm in birds, is associated with the left and right ductus ejaculate (Samour, 2004). The seminal glomera and cloaca view are shown Figure 2. Before semen is collected by cloacal massage, it is important to clean the ventral periphery of the cloaca with 0.9% isotonic NaCl solution for the study to be carried out properly. Capillary tubes are used to collect sperm from the cloaca (O'Brien et al., 1999). In the modified cloacal massage method, the bird is stimulated by stroking the ventral root of the tail. After the accumulation of semen in the ductus ejaculate, semen can be taken with the help of gentle pressure applied to the cloaca by massaging the cloaca from the base of the abdomen with the thumb and index fingers (Brock, 1991). In addition, it has been reported that semen can also be obtained from sparrows by using a female bird dummy in addition to the cloacal massage method (Girndt et al., 2017). To determine the sperm parameters, the semen taken is diluted with the appropriate extender. Although PBS (phosphate buffer saline) is preferred as the diluent, it has been stated that Dulbecco's modified Eagle Medium is widely used (Cramer et al., 2019).

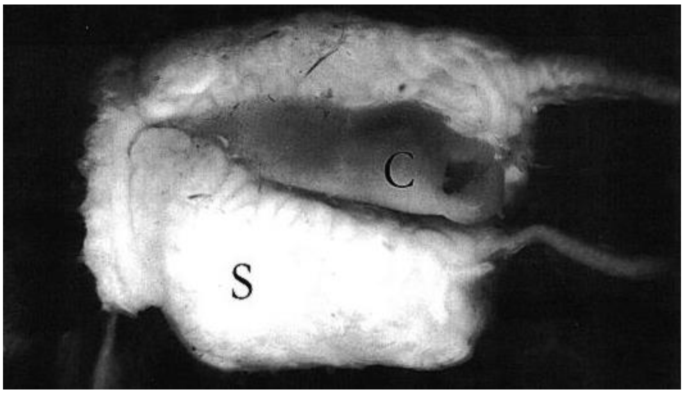

Figure 2. Seminal glomera (S) and cloaca (C) view (Briske, 1993)

4. Sperm Morphological Evaluation

In the morphological examination, the length of the spermatozoon can be evaluated as well as the length of the head and middle part (Lüpold et al., 2009). Morphological examination in semen collected from passerine birds is necessary to determine the abnormal spermatozoa rate (Hermosell et al., 2013). After the semen sample taken for morphometric examination is fixed in 5% formalin solution, it is observed under the light microscope at 160X-320X magnification and evaluated as head length, midpiece length, flagellum length, and spermatozoa length (Rowe et al., 2012). It has been emphasized that there is a supportive relationship between the competitiveness of spermatozoa and their morphological structure. When the semen samples were taken by using cloacal massage, female bird dummy and spermatozoa in feces were compared morphologically, it was stated that the head and middle part length of the spermatozoa decreased in the semen sample taken from feces, and it could be concluded that the spermatozoa developed less morphologically from this situation (Girndt et al., 2017). The speed of spermatozoa is thought to affect their competitive ability. Therefore, it was emphasized that morphological structures such as the enlarged middle part (energy component) or the length of the flagellum, or the ratio between the head size and the flagellum may depend on the interaction (Lüpond et al., 2009). It has been reported that the energy amount is proportional to the length of the spermatozoa. However, it has been stated that the increase in energy level is not related to swimming speed (Rowe et al., 2012). In a study conducted on passerine birds, it was mentioned that there may be an inverse correlation between the total length of spermatozoa and sperm competition (Kleven et al., 2008). Figure 3 show the morphological appearance of sparrow spermatozoa.

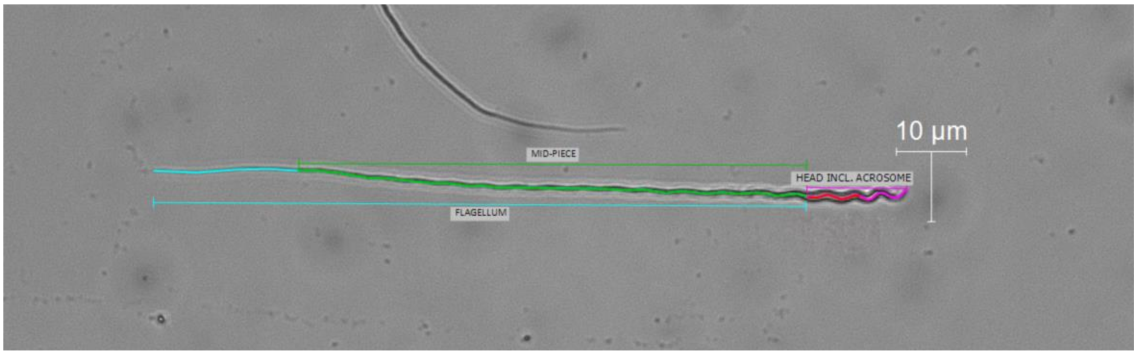

Figure 3. Morphological appearance of sparrow spermatozoa: head, acrosome, mid piece, flagellum (Grndt et al., 2017)

5. Sperm Motility Assessment

It has been reported that sperm motility evaluation in passerine birds is based on sperm motility, sperm motility rate and direction of spermatozoa. The importance of temperature was also revealed in the study. 38°C-40°C temperature was found to be ideal in terms of motility parameters. A decrease in the motility of spermatozoa was noted at 42°C. However, the motility values at 38°C were found to be compatible with 40°C (Yang et al., 2019). It has been reported that the body temperature of passerine birds is around 40°C (Birkhead et al., 2006). It has been stated that pH values between 7 and 8 are positive for passerine birds (Yang et al., 2019). In the motility examination, 5 µl of the semen diluted at a suitable rate is taken on a slide and evaluated under a heated light microscope at 400X magnification, and then expressed as a percentage value (Fischer et al., 2014). In a study conducted on sparrows, the temperature of the waterer used was predicted to be around 40°C (Helfenstein et al., 2010). Motility movement is evaluated by monitoring 30 s (Cramer et al., 2021).

5. Conclusion

The success of studies on semen in birds depends on the provision of conditions for obtaining healthy semen. It is difficult and laborious to obtain semen from small breed birds. Because small birds are very mobile and have a small cloaca, the choice of manipulation is very limited. During semen collection, the bird may be injured or even die. Or the required number of spermatozoa may not be obtained. Therefore, it is necessary to adopt the appropriate semen collection technique and gain sufficient experience. Morphological differences are key in the formation of important parameters affecting success in storage conditions such as viability rate and motility in the external environment. To improve the storage conditions of semen in passerine birds, it may be of great advantage to determine the motility values and morphological structure of spermatozoa according to species, and to reveal the relationship between these parameters. In this review study, information about semen collection techniques and some semen examination methods in small breed birds is given. It seems that more work to be done in this area is needed.

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