Mini Review

Electro ejaculation of two species of agouti (*dasyprocta* spp.) in Brazil and Trinidad and Tobago

Abstract

The meat of Neo-tropical fauna is savoured in parts of the Caribbean, Central and South America. *Dasyprocta* species is one animal hunted for its meat and this activity may eventually threaten their survival. However, efforts made to domesticate these wild animals lead to the development of farming systems. Reproduction has been a valuable tool in the process of domestication. Therefore, part of this effort included research directed at understanding the reproductive attributes of the male agouti. Electro-ejaculation was used to collect semen from *Dasyprocta leporina* and *Dasyprocta azarae*. This mini review compared three electro-ejaculation protocols developed for *Dasyprocta* species in Brazil and the Republic of Trinidad and Tobago. These procedures were applied after the animals were anaesthetized. Collected ejaculates that contained spermatozoa were expressed as percentages of the total number of ejaculated collected and used as a measure of the effectiveness for the respective three Protocols. The most effective was Protocol 3(100%). However, this was achieved with the administering of 5 different anaesthetics which may cause some potential damage to the agouti. Conversely, 75% successes were obtained then Xylazine 20mg/kg (Protocol 1, T4) and Ketamine 20mg/kg and Xylazine 40mg/kg (Protocol 2, T8) were administered, respectively. The ejaculates with the largest concentration of spermatozoa (431±180×106/ml) were collected for Protocol 1, T4. Furthermore, no such specifics were listed for ejaculates collected from Protocol 3. In conclusion, the three Protocols should be reviewed to develop a procedure which utilizes resources efficiently and produces results that are quantitatively and qualitatively desirable.

Keywords: *dasyprocta leporine*, *dasyprocta azarae*, electro-ejaculation, ejaculation, ejaculate

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William Mollineau,[1] Betty Anna Noreiga Mollineau[2]

[1]University of Trinidad and Tobago, Trinidad and Tobago
[2]University of the West Indies, Trinidad and Tobago

Correspondence: William Mollineau, The University of Trinidad and Tobago, Corinth Ste. Madeline, San Fernando, Republic of Trinidad and Tobago, Trinidad and Tobago, Tel 18686428888,
Email william.mollineau@gmail.com, william.mollineau@utt.edu.tt

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Introduction

Figure 1 shows the agouti (*Dasyprocta leporine*) which is on the verge of domestication. The meat of this edible rodent is very popular as exotic dishes in the Republic of Trinidad and Tobago. As such these animals are heavily hunted. The mounting pressures on forest extractions and the depletion of the species' natural habitat may soon threaten its survival.[1] Efforts made to domesticate the species for meat production lead to an increased number of registered wildlife farmers from 115 in 2000[2] to 362 in 2012.[3] The agouti was the most popular species farmed.[3] Domestication efforts encouraged research directed at understanding the reproductive attributes of the male agouti. Such works included the anatomy,[1,4,5] physiology of the male reproductive system,[6] and courtship behavior.[7]

This line of research also included semen collection by electro-ejaculation (EE) from *Dasyprocta leporina* and *Dasyprocta azarae* in the Republic of Trinidad and Tobago and Brazil, respectively.[8–11] These procedures were applied while the animals under anaesthesia. Such unconscious or semiconscious states were necessitated due to the very flighty nature of these specific fauna.[8,10,11] Collection of ejaculates were accomplished by the sequential application of low voltages using an anal probe. The probe has electrodes which act as the conductors. The probe is lubricated and inserted into the anal with electrodes dorsally positioned. This stimulated the accessory sex glands smooth muscles and mimicked the reactions needed for ejaculation.[9] Collected ejaculates that contained spermatozoa were expressed as percentages of the total number of ejaculates collected and used as a measure of the effectiveness of the three EE Protocols.

The EE stimuli centered on the sequential application of low voltages immediately followed by a rest period. The stimulus plus the rest period is equivalent to one sequence. The sequence was repeated with various modifications until the animal ejaculated. Such adjustments included incrementally increased voltages (IIV), increased application times of the applied voltages, increased time for the rest period, number of sequences in a set, or dosages of various anaesthetics.[8,11] In all instances the drugs were administered intramuscularly. The primary focus of this mini review compared the three EE Protocols (Table 1) developed for *Dasyprocta* species in Brazil and the Republic of Trinidad and Tobago.

Figure 1 The agouti (*Dasyprocta leporina*).

Table 1 Electro-ejaculation of *Dasyprocta leporina* and *Dasyprocta azarae* under anaesthetics

Source	Species	Anaesthetic variations	Mean ejaculation time (minutes)	Mean ejaculate volume ml	Mean spermatozoa concentration×106	%Ejaculates with spermatozoa
Mollineau et al.[10] (Protocol 1)	D. leporina	10mg/kg Ketamine – IM- wait 5 mins	5.48±0.31	0.47±0.112	106.7±31.1	30
Mollineau et al.[11] (Protocol 2)	D. leporina	T2-20mg/kg Ketamine and 10mg xylazine	13.07±1.14	0.22±0.02	142.3±90.0	66.66
		T3-30mg/kg Ketamine and 5mg xylazine	9.03±2.40	0.28±0.08	22.0±15.3	25
		T4-20mg/kg xylazine	4.53±0.52	0.43±0.07	110.8±75.7	33.33
		T6-40mg/kg xylazine	11.23±2.18	0.35±0.06	431±180	75
		T7-40mg/kg xylazine	10.43±1.39	0.23±0.03	306.6±64.9	75
		T8-20mg/kg Ketamine and 40mg xylazine	10.87±1.53	0.23±0.03	162.6±53.0	40
		T9-15mg/kg Ketamine and 40mg xylazine	7.80±1.08	0.25±0.02	145.8±50.3	50
		T10-10mg/kg Ketamine and 40mg xylazine	7.68±0.54	0.22±0.03	216.5±81.3	60
		T11-5mg/kg Ketamine and 40mg xylazine	8.40±1.20	0.27±0.03	146.4±59.6	25
Martinez et al.[7] (Protocol 3)	D.Azarae	Azaperone 4mg/kg and Meperidine 0.4mg/kg(waited 10 mins), then Xylazine hydrochloride 20mg/kg and Ketamine hydrochloride 5mg/kg (waited 5mins), then lidocaine lumbosaccharide 5mg/kg	NDR	NDR	NDR	100

NDR, no data reported

Discussion

The implications of these EE Protocols for semen collection from *D. leporina*[8,9] and *D. azarae*[5] may provide some primary information necessary for research in developing further reproductive techniques such as artificial insemination. The three Protocols compared depended on the application of incremental stimuli via voltage ranging from 2 to 12 volts and application periods from 2 to 5seconds.[8,10,11] More variations were observed during the rest periods for these protocols, 2 to 4seconds for Protocols 1 and 2, and up to 2minutes between the applications of sequences for Protocol 3. The latter EE Protocol recorded a success rate of 100%. Seventy-five percent successes were reported for T6 and T7 for Protocol 2 (Table 1). Motility percentages were similar between Protocols 1 and 3 at 50.44±4.44% and 50±5%, respectively. Protocol 3 also obtain ejaculates at a lower IIV of 6 V compared to the 9 9.33±0.69 V for Protocol 1.[10] This difference was attributed to species characteristics, EE protocols or anesthetic variations.[8] This lower voltage would represent a more humane treatment of the animals.

Protocol 3 used five chemical restraints prior to EE of the agouti. These restraints included ketamine and Xylazine which were the only anaesthetics used for the other Protocols. The heavy anaesthesia applied for Protocol 3 may raise questions about potential risks to the animals.[12] However, it is unfortunate that the results published for Protocol 3 did not report values for ejaculation time, ejaculate volume and spermatozoa concentration as these values are critical in assessing the integrity of semen samples.[13] These results and discussions suggest that more research is required in this ground-breaking frontier. Furthermore, reporting for key data is needed to better inform other scientist and encourage interest.

Conclusion

The EE Protocols discussed had their specific positives results and a review and combination of such may develop a procedure which utilizes resources more efficiently while collecting ejaculates that are quantitatively and qualitatively desirable.

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Conflict of interest

Author declares that there is no conflict of interest.

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