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Observations on the Electroejaculation in Red Deer*

[With 1 Table]

Semen was collected by electroejaculation from a eight years old red deer stag in September, without administration of a tranquilizing drug. Two parts of semen were collected. The first one was 23.5 ml of volume, sperm concentration was 70,000/cmm. The second one was 19 ml of volume, sperm concentration was 50,000/cmm. The same method was applied twice in a five years old red deer stag in March. On account of the timidity of this animal before the electroejaculation a tranquilizer was administered. On March 7th two parts of semen were collected. The first one was 2 ml of volume, sperm concentration was 205,000/cmm. The second one was 3.5 ml of volume, sperm concentration was 140,000/cmm. On March 21st using the same method no semen was obtained from this stag at all. The electroejaculations procedures applied in March caused in this stag some retardation in the casting of antlers.

I. INTRODUCTION

In a previous work (Jaczewski & Morstin, 1973) the collection of semen in a red deer (*Cervus elaphus* L.) stag by electroejaculation was described. The semen then obtained was 4 ml of volume and sperm concentration was 130,000/cmm. This rather poor semen quality was claimed to be caused either by not appropriate season of the year or by trunkwiline administration. Trankwiline administered before the electroejaculation decreased strongly the semen value in rams (Bielanski, Tischner & Zapletal, 1966). It was also observed that the red deer stag »Jasio« used in the previous work (Jaczewski & Morstin, 1973) cast its antlers on March 16th and 17th, 1972. In

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1971 »Jasio« cast its antlers on March 3—4th, and in 1973 on March 11th. It is clearly very difficult to answer if this small retardation in antlers casting in 1972 could be connected with the electroejaculation performed on January 4, 1972.

According to the authors knowledge there are only three papers (Bierschwal *et al.*, 1968, 1970; Lambiase *et al.*, 1972) describing the electroejaculation in deer. All these works were performed on the white-tailed deer (*Odocoileus virginianus* Boddaert). In experiments of Bierschwal *et al.* (1970) the sperm concentration was from 60,000 to 5,600,000/cmm and semen volume from 0.5 to 1.5 ml. In the work of Lambiase *et al.* (1972) the semen volume and sperm concentration was fluctuating according to the season of the year because these authors applied electroejaculation biweekly in five bucks from August 1970, through March 1971. The semen volume was varying during this time from about 0.2 ml to about 1.7 ml and the sperm concentration from 0 to about 3,000,000/cmm. In all these works there is no mention about any influence of electroejaculation on the antler cycle.

Bierschwal *et al.* (1970) describes a case of a deer ejaculated 3 times in a period of 20 minutes resulting in the death of the animal. They are of the opinion that electroejaculation (connected with a forceful restraint) is rather a severe shock to undomesticated deer. On the contrary Lambiase *et al.* (1972) did not observe detrimental effects of electrostimulation on bucks raised in captivity. They described even a case of one buck so conditioned to the procedure that it was possible to electroejaculate it unrestrained in an upright position.

Electroejaculation could be perhaps applied to investigations on hybridization among *Cervidae*. Interesting data on comparative morphology of spermatozoa in *Cervidae* family were presented recently (Steklenev, 1972). To investigate not much explored field of male reproductive physiology of *Cervidae* some further experiments on electroejaculation in red deer are here described. These preliminary observations were designed to study the influence of electroejaculation on the antler cycle and also the influence of the season of the year and trunk-wiline administration on the quality of the semen obtained.

II. MATERIAL AND METHODS

The experiments were performed on two red deer stags kept in separate enclosures on the red deer farm at Popielno. Stag »Amor«, born 1964 was not very timid, whereas stag »Arkan«, born 1968 was very timid. Immobilization of animals and collection of semen was performed similarly to the method described before

(Jaczewski & Morstin, 1973). The only difference was that a battery fed electroejaculator was used and the whole procedure was conducted on the farm without any transportation of animals.

During the experiments on white-tailed deer the legs were manually restrained to avoid possible injuries of the rear legs (Lambiase *et al.*, 1972). In the experiments on red deer the bigger size of the animals makes impossible the manual control. The front and hind legs were tied separately to enable the extension of the hind legs during the stimulation. Nevertheless, the legs of the experimental stags were not injured in spite of long and sometimes strong stimulations.

III. COURSE OF THE EXPERIMENTS

On September 22, 1972 at 9:37 »Amor« received 8.75 mg of succinylcholine intramuscularly. It fell down at 9:41, then it was tied and weighed — 180 kg. The electrostimulation was started at 9:52. At the beginning the stimulation was equal to 4.5 V and 0.2 A, but at intervals it was increased to 31.5 V and 0.7 A. The stimulations were finished about 10:03. During the stimulations lordosis and extension of the hind legs was observed. »Amor« was released at 10:08 and rised immediately. During the subsequent 4 minutes it remained in standing position showing strong intermittent contractions of the muscles of its back (lordosis), erection, and from its penis a fluid resembling semen was dropping. Nevertheless, in the subsequent days the behaviour of this stag was normal and typical for the rutting season.

The ejaculation of semen started about 9:59 and was going on with some intervals till about 10:03. Two parts of semen, yellow in colour were collected. The first one was 23.5 ml of volume, sperm concentration 70,000/cmm, pH — 6.8, lack of motility, 6.2% of spermatozoa had primary abnormalities and 7.57% — secondary abnormalities. The second part was 19 ml of volume, sperm concentration 50,000/cmm, pH — 7.0, lack of motility. Total sperm obtained during the electroejaculation was $1645 \times 10^6 + 950 \times 10^6 = 2595 \times 10^6$.

»Amor« cast its antlers in 1972 on March 7th and 8th, the right one weighed 1660 g, the left one — 1502 g. In 1973 the antlers were cast on March 5th, the right one weighed 1760 g, the left one — 1679 g. It must therefore be concluded that the procedure of electroejaculation performed in September 1972 did not affect the antler cycle of the stag »Amor«.

On March 7, 1973 at 9:55 »Arkan« received 8.75 mg of succinylcholine intramuscularly without success. At 10:58 it received again 9.75 mg of succinylcholine and fell down at 11:03. Subsequently it was tied and at 11:09 it received 15 ml of trunkwiline (0.375 g of chlorpromazine)

intramuscularly. The electrostimulation was started at 11:24. At the beginning the voltage was 4.5 and with intervals it was increased to 22.5 V. During every stimulation strong extension of the hind limbs and lordosis were observed. The stimulations caused also several erections of the penis. During the whole procedure »Arkan« roared several times similarly to the normal rutting roar. The stimulations were finished at 11:52. The stag was released at 11:56 and it rised immediately but the effect of trunkwiline was still distinct. During subsequent few hours »Arkan« was not very timid and even sometimes a little aggressive toward men, it was often lying down.

The ejaculation of semen started about 11:30 and was going on with some intervals till 11:51. Two parts of semen pale yellow in colour were collected. The first one was 2 ml of volume, sperm concentration 205,000/cmm, pH — 7.8, about 50 % of spermatozoa showed general motility and about 20—40% forward motility, 2.45 % of spermatozoa had primary abnormalities and 10.24 % — secondary abnormalities. The second part was 3.5 ml of volume, sperm concentration 140,000/cmm, pH — 7.4, about 60% of spermatozoa showed general motility and about 40—60% forward motility. Total sperm obtained during the electroejaculation was $410 \times 10^6 + 490 \times 10^6 = 9 \times 10^8$.

On March 20, 1973 »Arkan« was given two injections of succinylcholine (10 mg at 12:12 and 10.25 mg at 13:52) without results. On March 21, 1973 at 10:00 »Arkan« received 10.25 mg of succinylcholine without result, at 11:39 10.75 mg without result and at 13:24 11 mg again without success. At 14:24 it received 11.50 mg of succinylcholine and fell down at 14:27. It was tied and at 14:42 it received 14 ml of trunkwiline (0.350 mg of chlorpromazine) intramuscularly. The electrostimulation was started at 14:55; at the beginning the voltage was 4.5 and with some intervals it was increased to 22.5 V. Hind limbs extension, lordosis and roaring were observed similarly as on March 7, however in this case the semen was not obtained. The electrostimulation was finished at 15:25 and after releasing »Arkan« rised immediately at 15:28.

»Arkan« cast antlers in 1972 on March 24—25th, the right one weighed 957 g, the left one — 915 g. In 1973 the antlers were cast on March 28—29th, the right one weighed 1286 g, the left one — 1358 g. It may be concluded that the procedures of electroejaculation performed twice in March 1973 caused the retardation of antlers casting. A red deer stag born in 1968 should cast its antlers in 1973 considerably earlier than in 1972. On the contrary »Arkan« cast its antlers in 1973 four days later than in 1972 as a result of electroejaculation procedures performed in March, 1973.

IV. DISCUSSION

The quality of the semen of »Arkan« collected on March 7, after trankwiline administration was not worse than the quality of the semen of »Amor« collected on September 22, during the rutting season without trankwiline. These observations seem to testify that trankwiline in the dose applied does not decrease noticeably the semen value of red deer stag.

The experiments performed in March on stag »Arkan« seems to prove that in March a red deer stag has a valuable semen in its accessory genital organs without any noticeable spermatogenic activity in the testes. »Arkan« yielded very good semen on March 7, but on the next electroejaculation on March 21, it yielded no semen at all. This result correspond with the work of Lincoln (1971). He stated in red deer stags shot in March almost no spermatogenic activity in testes but large quantities of spermatozoa in epididymides. It is also interesting that

Table 1

Characteristics of electroejaculations in red deer stags.
In two cases the number of ejaculates was not estimated exactly.

Animal	Age, yrs	Date of electroejaculation	Total dose of trankwiline in ml	Ejaculate number	Sperm concentration in cmm	Ejaculate volume in ml
Jasio ¹	14	4.01.72	25	2	130 000+few	4+4.5
Amor	8	22.09.72	0	? (2)	70 000+50 000	23.5+19
Arkan	5	7.03.73	15	? (2)	205 000+140 000	2+3.5
Arkan	5	21.03.73	14	0	—	—

¹ Data from Jaczewski & Morstin, 1973

the semen collected during the mating season (»Amor«) had lower sperm concentration and much larger volume than semen collected after the rut is over, e.g. »Arkan« (Table 1). This observation also correspond with the work of Lincoln (1971). He found in red deer stags that the accessory organs of reproduction undergo very distinct year cycle and their maximal activity occur during the rut. As is generally known (Mann, 1959) the seminal plasma is produced by male accessory organs and so in March on account of their inactivity the semen is very much concentrated.

It should be mentioned here that the reproductive activity of the experimental stags could not have any influence on the electroejaculation. »Jasio« sired in 1972 only one doe on November 18. »Amor« in

1972 sired 7 does but this mating was started in October, after the experiment. »Arkan« in 1972 and 1973 had not an occasion to mate at all.

It is difficult to decide if there could be any connection between the electroejaculation performed in January 1972 on stag »Jasio« and the retardation in its antlers casting in 1972. Electroejaculation performed in September on stag »Amor« does not influenced its antler cycle. However, the electroejaculations performed in March 1973 on stag »Arkan« caused a distinct delay in the casting of its antlers. »Arkan« was born in 1968 and therefore it should cast its antlers in 1973 considerably earlier than in 1972. On the contrary »Arkan« cast its antlers in 1973 four days later than in 1972 as a result of the electroejaculations procedures performed in March 1973.

Topiński (1974) has observed in several species of deer that the stress inducing factors are sometimes responsible for some delay in antlers casting. Therefore it can be assumed that the procedure of electroejaculation caused some sort of stress in a very timid stag »Arkan« in spite of tranquilizer administration. It is also possible that electroejaculation could influence the antler cycle in some other way. During the electroejaculation a red deer stag very often roars similarly as during the rut. So, the influence of the whole procedure on the central nervous system seems doubtless. The very distinct connections between antler cycle and neuroendocrine system have been recently proved by Bubenik (1972).

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OBSERWACJE NAD STOSOWANIEM ELEKTROEJAKULACJI U JELENIA
SZLACHETNEGO

Streszczenie

Metodą elektroejakulacji pobrano nasienie od ośmioletniego samca jelenia szlachetnego we wrześniu, bez stosowania trankwiliny. Uzyskano dwie porcje nasienia. Objętość pierwszej wynosiła 23,5 ml, koncentracja plemników 70 000/mm³. Objętość drugiej wynosiła 19 ml, koncentracja plemników 50 000/mm³.

Tę samą metodę stosowano dwukrotnie u pięcioletniego samca jelenia szlachetnego w marcu. Z uwagi na większą płochliwość osobnika przed elektroejakulacją podawano trankwilinę. W dniu 7 marca uzyskano dwie porcje nasienia. Objętość pierwszej wynosiła 2 ml, koncentracja plemników 205 000/mm³. Objętość drugiej wynosiła 3,5 ml, koncentracja plemników 140 000/mm³. W dniu 21 marca przy użyciu tej samej metody nie dało się uzyskać nasienia od tego samca. Zabiegi elektroejakulacji stosowane w marcu spowodowały u tego byka opóźnienie w terminie zrzucania poroża.