Animal welfare, etológia és tartástechnológia

Animal welfare, ethology and housing systems

Volume 7 Issue 4

Különszám/Special Issue

Gödöllő
2011

THE EVALUATION OF SEMEN COLLECTION AND EJACULATE QUALITY OF HUNTING DOGS

Vágenknechtová Marie, Hošek Martin, Filipčík Radek, , Máchal Ladislav

Mendel University Brno, Faculty of Agronomy
Department of Animal Breeding
613 00 Brno (CZ), Zemedelska 1
hosek@mendelu.cz

Abstract

Hunting dogs work with humans for thousands of years. Bringing down the game without well trained dogs is not possible according to legalisation. To get a good hunting dog is long proces, cause the puppies have to be born, after careful breeding and kennel management, then have to be trained, and as its base, it also requires ability for successful reproduction.

The aim of this work was to evaluate the semen quality of ten hunting dogs from six different breeds, analysing also the possible effect of the FCI breed groups these breeds belong to. We've analysed the time of semen collection, the semen quality and sperm morphology. Highest semen volume, motility and sperm concentration was found in FCI group 3 – Terriers, on the opposite, dogs from group FCI 7 – Pointers and Setters had the worst semen parameters. Evaluating the pathomorphological changes on sperms the best parameters were observed in FCI group 4 – Dachshund.

Keywords: dog semen collection, ejaculate quality, sperm morphology, FCI breed groups

Introduction

There're approximately 1 million dogs from different breeds in the Czech Republic. The most important prerequisite of breeding work is the successful reproduction. An important part of reproduction studies is collecting and evaluating canine ejaculate. Breeders are greatly interested in the results of qualitative canine semen analysis, because a lot of male dogs can to be subfertile (*Veznik et al., 2004*). *Gunay et al., (2003)* collected the spermatic fraction of ejaculates from 7 German shepherds for 5 weeks, twice a week, with 60 minutes break between the collections. Between the first and second ejaculate they've found a significant difference in volume and semen concentration, sperm motility, and number of living sperms and there wasn't difference in the ratio of morphological changes. Similar results were

published by *England (1999)*, but he found a breed effect as well: German shepherds having greater volume of ejaculate and total sperm number then other breeds he investigated. *England (1999)* also evaluated the effect of frequent semen collections. He concluded, that two ejaculates, collected 60 minutes after each other can result in more than 70% lower sperm volume than gathered from one semen collection. *Schaffer et al., (1997)* collected semen from Beagle dogs twice a week for six month. In the studied period the libido and qualitative ejaculate parameters were not affected, but the volume of spermatic fraction decreased from 1,2 (January) on 0,5 ml (June). *Gamcik et al., (1992)* present that fro succesful insemination the minimal motility dog semen can't be fewer than 70% and the percentage of morphologically normal sperms must to be at least 80%. *Veznik et al. (2004)* suggest that the sufficient number of morphologically normal sperms in the ejaculate for successful insemination is 70 %.

Material and methods

The ejaculates were collected from 10 dogs belonging to six different breeds (3 Wire-haired Dachshunds, a German Jagdterrier, a Bullterrier, a Foxterrier, 2 German Shorthaired Pointers and 2 Irish Setters). Dogs were also divided based on their FCI breed groups (FCI 3 – Terriers, FCI 4 – Dachshunds, FCI 7 – Setters) for analysis.

Whole ejaculates (all three fractions) were collected for a three-month period of time with 30 days frequency by manual stimulation in presence of bitch in oestrus. Prepare time for collection and the time of ejaculate collection were measured. Immediately after semen collection macroscopical and microscopical analyses of semen quality were done: semen volume, motility and concentration. Semen volume was measured in calibration container (ml), motility subjectively in native preparation on microscope (%) and concentration hemocytometricaly in Bürker cells (10^3 x mm^{-3}).

For the morphological evaluation of semen colouring method by Farelly was used (in *Veznik et. al. 2004*). Percents of morphologically normal, abnormal and immature sperms were determined.

Results and discussion

The start, the process and time of collection

As shown in *Table 1*, preparation time for collection was longest in dogs belonging to FCI 4 breed group, 370 seconds. Dogs belonging to FCI groups 3 and 7 had a distinctly shorter (63.3 s in FCI 3 and 67.5 s in FCI 7) preparation time. There was significant difference ($P \leq 0.01$) between groups FCI 4 and FCI 3 and between groups FCI 4 and FCI 7as well. *Vagenknechtova (2010)* reports average preparation time for canine semen collection being 3,7 minutes and time ranged from 0.5 to 23.7 minutes. Our measurements are in concordance with this, belonging to a similar interval.

Table 1. **Preparation and of semen collection time (s) in dogs from three FCI breed groups**

Factor		n	Prepare time (s)			Time of collection (s)		
			$\bar{x}$	±	s_x	$\bar{x}$	±	s_x
Total		30	157.0	±	316.3	282.0	±	192.2
FCI group	FCI 3	9	63.3^{A}	±	22.5	120.0^{AB}	±	57.6
	FCI 4	9	370.0^{AB}	±	523.2	313.3^{A}	±	254.2
	FCI 7	12	67.5^{B}	±	25.2	380.0^{B}	±	112.0

A,B – there are significant differences (P≤ 0,01) between the numbers in those columns

FCI group 3 - Terriers, FCI group 4 -Dachshunds, FCI group 7 – Pointers and Setters

Collection time was the longest in dogs belonging to FCI group 7 – 380 s, while the semen collection time for dogs from FCI group 4 was slightly shorter (313.3 s). Shortest collection time was measured in dogs of FCI 3, only 120 s. Highly significant statistical differences (P≤ 0.01) were found between FCI group 3 and FCI group 4, and between FCI group 3 and FCI group 7. According to *Vagenknechtova (2010)* that average time of canine semen collection is 6.4 minutes. In our study results ranged from 2.0 to 6.3 minutes, average collection time being only 4.7 minutes, which is slightly shorter. The explanation of this difference can be, that we've collected all of the semen in home, while *Vagenknechtova (2010)* in her study collected it in different environments (home vs. laboratory).

Semen volume, motility and concentration

The highest volume of whole ejaculate - 7.0 ml - was found in dogs belonging to FCI group 3. Relatively higher semen volume was collected from dogs belonging to FCI group 4 (6.4 ml). We've found the lowest volume of whole ejaculate in dogs from FCI group 7 – 4.9 ml. There was a significant difference (P≤ 0.01) between the breed groups FCI 3 and FCI 7, and between FCI group 4 and FCI group 7 (P≤ 0.05) as well. *Gamcik et al. (1992)* publicated average dog semen volume being 7.0 ml, *Jelinek et al. (2003)* 6.0 ml and *Veznik et al. (2004)* stated average volume of canine semen being only 2.0 ml. According to our measures whole canine ejaculate volume depends on FCI group, and is in average 6.0± 2.3 ml.

Best results in motility we've found in dogs belonging to FCI groups 3 and 4 (76.7 % in FCI 3 and 74.4 % in FCI 4, respectively). Worst motility was found in dogs from FCI group 7 (57.5 %). Highly significant difference (P≤ 0,01) was between dogs from FCI groups 3 and 7 and between FCI groups 4 and 7, too. *Svoboda et al. (2001)* and *Veznik et al. (2004)* suggest minimal dog sperm motility for a

normal healthy dog being 70%. In our study dogs from FCI group 3 (Terriers) and FCI group 4 (Dachshunds) reach this limit. The dogs from FCI group 7 (Setters) had only 57.5% motility, therefore in the following studies attention have to focus on this group of dogs.

Table 2 shows that dogs from FCI group 3 had the highest sperm concentration (186.7 x 10^3 x mm^{-3}). In dogs from FCI group 4 the concentration was highly similar (177.4 x 10^3 x mm^{-3}) to the previous group. The lowest sperm concentration was in dogs from FCI group 7 (147.1 x 10^3 x mm^{-3}). There were no significant differences between breed groups in sperm concentration. The average sperm concentration for all dogs of FCI groups was (168,1 x 10^3 mm^{-3}). *Jelinek et al. (2003)* presents average sperm concentration for dog populations being 120.1 x 10^3 mm^{-3}. On the other end, according to *Veznik et. al. (2004)* average canine sperm concentration is 200,1 x 10^3 mm^{-3}. Our results are between the ones given by the cited authors.

Table 2. **Volume, motility and concentration**

Factor		n	Semen volume (ml)			Motility (%)			Concentration (in ths)		
			$\bar{x}$	±	s_x	$\bar{x}$	±	s_x	$\bar{x}$	±	s_x
Total		30	6.0	±	2.3	68.3	±	20.1	168.1	±	97.3
FCI group	FCI 3	9	7.0^{A}	±	0.6	76.7^{A}	±	11.8	186.7	±	19.2
	FCI 4	9	6.4^{a}	±	3.0	74.4^{B}	±	8.5	177.4	±	75.1
	FCI 7	12	4.9^{Aa}	±	2.1	57.5^{AB}	±	25.8	147.1	±	137.3

A,B – there are significant differences (P≤ 0,01) between the numbers in those columns

a,b – there are significant differences (P≤ 0,05) between the numbers in those columns

FCI group 3 - Terriers, FCI group 4 -Dachshunds, FCI group 7 – Pointers and Setters

Evaluation of morphologically normal, immature and abnormal sperms

It is shown in *Table 3,* that highest percentage of morphologically normal sperms (64.4 %) we've found in the ejaculate of dogs from FCI group 4, followed by FCI group 3 with 58.4 % of sperms being morphologically normal. Dogs from FCI group 7 (54.4%) had the lowest percent of morphologically normal sperms. However, these differences between breed groups are low, not significant. The standard value of morphologically normal sperm cells is 70% for dogs (*Veznik et. al., 2004*). *Vagenknechtova et al. (2011)* in a previous study found normal sperm morphology in average being 64.3%. In our study the average of morphologically normal sperms was 58.6%, of immature sperms 7.9% and morphologically abnormal sperms 41.3%.

Table 3. **Morphologically normal, immature and abnormal sperms**

Factor		n	Morphologically normal (%)			Immature sperms (%)			Morphologically abnormal (%)		
			$\bar{x}$	±	s_x	$\bar{x}$	±	s_x	$\bar{x}$	±	s_x
Total		30	58.6	±	15.9	7.9	±	8.5	41.3	±	15.9
FCI group	FCI 3	9	58.4	±	9.3	10.0	±	13.2	41.6	±	9.3
	FCI 4	9	64.4	±	5.9	8.0	±	6.4	35.5[a]	±	5.9
	FCI 7	12	54.4	±	22.5	6.4	±	4.3	45.6[a]	±	22.5

a,b – there are significant differences (P≤ 0,05) between the numbers in those columns

FCI group 3 - Terriers, FCI group 4 -Dachshunds, FCI group 7 – Pointers and Setters

Conclusion

The aim of this study was collecting and evaluating the ejaculates three groups of hunting dogs (FCI 3 – Terriers, FCI 4 – Dachshunds, FCI 7 – Pointers and Setters). The ejaculates were collected from ten dogs belonging to six breeds (3 Wire-haired Dachshunds, a German Jagdterrier, a Bullterrier, a Foxterrier, 2 German Shorthaired Pointers and 2 Irish Setters).

The dogs belonging to FCI group 3 (Terriers) had shortest time of preparation for collection (63.3 s) and time of collection - ejaculation (120 s), but greatest whole semen volume (7.0 ml), highest sperm motility (76.7%) and sperm concentration (186.7 x 10^3 x mm^{-3}) as well. Only in the percent of morphologically normal sperms among the parameters we've studied got the Terriers the second position (58.4%) in the rank of breed groups investigated here. The highest percent of immature sperms in ejaculate was found also in this group (10.0 %).

The dogs from group FCI 4 (Dachshunds) needed the longest time (370 s) for preparation before semen collection (start of sexual reflexes), the average time of ejaculation was in 313.3 s in this group. Volume of the whole ejaculate was 6.4 ml, motility and sperm concentration were very good (74.4 %, 177.4 x 10^3 x mm^{-3}). In morphological sperm evaluation this group of dogs had the best result with 64.4% of sperm cells being morphologically normal.

The dogs belonging to the FCI group 7 (Pointers and Setters) had the longest time of semen collection (380 s), the lowest whole semen volume (4.9 ml), sperm motility 57.7 % and concentration 147.1 x 10^3 x mm^{-3}. Dogs from this group had the highest percent of morphologically abnormal sperms, too.

Dog breeders can increase their productivity by evaluating dogs based on reproduction functions. We can recommend the complete screening of the qualitative parameters of the ejaculate before mating a given sire.

References

England, G. C. W., 1999: Semen quality in dogs and the influence of short-interval second ejaculation. *Theriogenology*, 52, 6, 981-986.

Gamčík, P., Kozumplík, J., et al., 1992: Andrológia a umelá inseminícia hospodářských zvierat, Príroda, 290s, ISBN 80-07-00540-4

Gunay, U., Polat, U., Gunes, N., Soylu, M., K., Kil, F., 2003:The effects of short-interval ejaculation on semen quality and some biochemical parameters in dogs.,Revue de Medicine Vetrinaire, 154, 7, 459-462p.

Jelínek, P., Koudela, K., et al., 2003: Fyziologie hospodářských zvířat, MZLU v Brně, 351s, ISBN-80-7157-644-1

Schafer, S., Holzmann, A., Arbiter, K. 1997: The influence of frequent semen collection on the semen quality of beagle-dogs. Deutsche tierarztliche wochenschrift, 104, 1, 26-29.

Svoboda, M., Senior, D., 2001: Nemoci psa a kočky II. díl, Brno, Noviko.

Vágenknechtová, M., et al., 2010: Vliv vybraných faktorů na odběr semene a kvalitu ejakulátu psů. In Animal Physiology 2010: Proceedings of International Conference. brno: Mendelova univerzita, 2010.

Vágenknechtová, M., Hošek, M., Máchal, L., 2011: Vliv věku na kvalitu spermatu u psů. In Animal Bredeeding, Brno Mendelova univerzita, 2011, ISBN 978-80-7375-446-4.

Věžník, Z., Švecová, D., et al., 2004: Repetitorium spermatologie a andrologie a metodiky spermatoanalýzy, Brno, ISBN 80-86895-01-7

Acknowledgements

This work was supported by IGA AF MENDELU IP 15/2011.