

THE INFLUENCE OF THE LIBIDO OF POLISH LARGE WHITE BOARS ON THEIR EJACULATES

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Abstract

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In the paper the influence of the sexual behaviour of Polish Large White boars on the features of their ejaculates was defined. The boars taking part in the study were divided into three groups: I – high-libido boars (mounting the dummy within 3 min), II – medium-libido boars (peaceful mounting within 5 min) and III – low-libido boars (mounting the dummy within 10 min).

The study found that ejaculate parameters of boars expressing various sexual behaviors were significantly diversified. The boars expressing the highest level of sexual behavior (group I) were characterized by the greatest amount of ejaculate, the greatest number of spermatozoa with progressive motility and the biggest number of insemination doses from one ejaculate.

The biggest total number of defective spermatozoa was produced by the gonads of boars expressing the lowest level of sexual behavior – 10.9%, making this group significantly different from groups I and II.

Key words: boars, libido, ejaculates, quality

Introduction

Profit from economic activity in swine insemination centres depends above all on the productivity of insemination boars, which is significantly influenced by, among other things, the physical state of boars, the size of their testicles and also their libido that is sex drive (Robinson and Buhr, 2005). According to Knecht et al. (2004) about 40% of boars to be used for breeding are culled because of the weakening or disappearance of libido, low quality of semen or physical insufficiency. Inciting sexual reflexes and sexual behaviour are inborn, but some sexual reflexes are conditioned, so they can be stirred up or hampered by, among other things, feeding, living conditions, race, age, frequency of copulation, etc. (Łyczyński, 1984; Frangez et al., 2005; Hemsworth and Tilbrook, 2007; Szostak and Przykaza, 2011). Sexual functions of a boar are activated by androgenic hormones, mainly

testosterone, produced in testicles. However, the endocrine activity of gonads varies, which causes changes in the sexual behaviour of boars. It has been found that there is a relation between the sexual activity of boars and the length of the day, so the season influences libido (Nowicki and Zwolińska-Bartczak, 1983). Race (Ciereszko et al., 2000; Kawęcka, 2002; Oh et al., 2003) and age (Dubiel et al., 1985) may also influence the sexual behaviour of boars.

Sexual activity of boars is one of the features which determine the usefulness of a boar for insemination. Many authors (Cameron, 1985; Thiengtham, 1992; Levis et al., 1997; Frangez et al., 2005; Okere et al., 2005) studied the sexual behaviour of boars of different races and their usefulness for insemination; however the results of their research were often inconsistent, which encourages further research of the matter. The reaction of a boar to the dummy may vary. When it is measured by the time necessary for a boar to mount the

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dummy and the total time of ejaculation, it may partially, but importantly, characterize a boar's sexual behaviour.

The objective of this paper was to determine the influence of the libido of Polish Large White boars on the amount and quality of ejaculates.

Materials and Methods

The object of the research was Polish Large White boars aged 24–36 months. The level of the boars' sexual behaviour was defined after observing their behaviour while taking semen. To define a boar's libido the following parameters were observed: the time passed from introducing the boar to the place with the dummy to the moment of mounting, the time passed from introducing the boar to the place with the dummy to the moment of starting ejaculation, and the total time from introducing the boar to the place with the dummy to the moment of dismounting the dummy. The boars under research were divided into three groups: I – high-libido boars (mounting the dummy within 3 minutes), II – medium-libido boars (peaceful mounting within 5 minutes) and III – low-libido boars (mounting the dummy within 10 minutes). Mounting the dummy had to finish with ejaculation. Ejaculates were collected twice a week.

The collected ejaculates were assessed taking the following parameters into account: the amount of the ejaculate (ml), the concentration of spermatozoa ($\text{cm}^3 \times 10^6$), the percentage of spermatozoa with progressive motility, the number of insemination doses obtained from one ejaculate and the frequency of occurrence of selected morphological defects in spermatozoa (a distal tail loop, free normal head, the "pseudodroplet" defect, the diadem defect, stricture of the head base and the total number of spermatozoa defects). The preparations for the morphological examination of spermatozoa were stained with nigrosine and eosine produced in England. The classification and counting of normal spermatozoa and morphologically changed spermatozoa was performed using the method put forward by Bennett and O'Hagan (1967) and by Bielański (1977). In each specimen, 500 spermatozoa were examined under immersion at 1000x with a light microscope.

From samples of analysed ejaculates preparations were made to be examined under a microscope. The preparations were stained using the 'bydgoska' method: a thin sperm smear was applied to a microscope slide and fixed in a 96% ethanol solution for 5 min. Then, the preparations were rinsed in distilled water and stained with a 10% eosin aqueous solution for 20–60 s. The stained preparations were rinsed in distilled water and stained with gentian-violet dye for 3–5 min. After staining the preparations were rinsed, dried and examined under a microscope.

Immediately after the collection, semen features in the ejaculates were determined; using the method used in swine fertilisation centres. The influence a boar's sexual behaviour on the examined features of semen was assessed by the one-way analysis of variance, using Tukey's *post hoc* test.

Results

Table 1 presents the results, defining the ejaculate volume and spermatozoa concentration in relation to a boar's sexual behaviour. It was observed that ejaculates of high-libido boars (mounting the dummy within 3 minutes) were characterized by a significantly larger volume of ejaculates in comparison to boars with lower libido (groups II and III). A substantial difference in the volume of ejaculates was also found between the group of medium-libido boars (mounting the dummy within 5 minutes – group II) and low-libido boars (mounting the dummy within 10 minutes – group III).

The concentration of spermatozoa in ejaculates of high and medium-libido boars (groups I and II) was similar and it was: 411.1 and 412.6 $\text{cm}^3 \times 10^6$, respectively, so there was not much difference. The greatest concentration of spermatozoa was found in the semen of low-libido boars (group III). Ejaculates of high-libido boars had on average 79.81% of spermatozoa of normal motility (Table 2). In the group of medium-libido boars (group II) the ratio was a bit lower – 78.97%. The lowest value was observed in the boars expressing the lowest level of sexual behaviour (group III), differing significantly ($P \leq 0,001$) from groups I and II. The number of live spermatozoa in ejaculates of high-libido boars (group I) and medium-libido boars (group II) was similar and it was 70.12×10^9 and 70.31×10^9 , respectively. This number was significantly different ($P \leq 0.001$) from the number of live spermatozoa in ejaculates of low-libido boars.

Table 1

The influence of the libido boar on the volume of ejaculate and concentration of spermatozoa in the sperm

Group	Volume of ejaculate, ml		Concentration of spermatozoa, $\text{cm}^3 \times 10^6$	
	LSM	SE	LSM	SE
I	221.03	1.09	411.13	2.31
II	218.09	1.28	412.58	1.98
III	211.58	1.35	428.19	2.75

The significance of differences between the groups for the volume of ejaculate:

I – II** I – III*** II – III***

The significance of differences between the groups for the concentration of spermatozoa:

I – III*** II – III***

*** $P \leq 0,001$ ** $P \leq 0,01$

Table 2

The effect of libido boar on the percentage and the number of a live spermatozoa and the number of the insemination doses per ejaculate

Group	Percentage of a spermatozoa with progressive motility		Number of a live spermatozoa in ejaculate, mld		Number of insemination doses, n	
	LSM	SE	LSM	SE	LSM	SE
I	79.81	0.11	70.12	0.41	20.31	0.08
II	78.97	0.09	70.31	0.59	20.48	0.15
III	77.83	0.14	68.17	0.37	18.33	0.19

The significance of differences between the groups for the percentage of a spermatozoa with progressive motility:

I – III*** II – III***

The significance of differences between the groups for the number of a live spermatozoa in ejaculate:

I – III*** II – III***

The significance of differences between the groups for the number of insemination doses:

I – III*** II – III***

*** $P \leq 0.001$

From the data presented in Table 2 it is clear that from one ejaculate of high and medium-libido boars (groups I and II) on average 20 insemination doses were made, whereas from one ejaculate of low-libido boars (group III) on average 18.3 insemination doses were made. Differences in the number of insemination doses prepared from ejaculates of boars from groups I and II as compared to the ejaculates of boars from group III turned out to be very significant ($P \leq 0.001$).

The research found that ejaculate parameters of boars expressing different sexual behaviour were substantially diversified. The greatest ejaculate volume, the highest percentage of progressive motility spermatozoa and the greatest number of insemination doses from one ejaculate characterized boars expressing the strongest sexual behaviour (group I).

Table 3 presents the percentage of sperm morphological defects such as: the distal tail loop, free normal head and the “pseudo-droplet” defect in the semen of Polish Large White boars in relation to their sexual behaviour. The greatest number of spermatozoa with a distal tail loop was found in low-libido boars (group III). The smallest number was found in high-libido boars (group I). However, differences between the groups have not been statistically confirmed. The great-

est number of spermatozoa characterized by a free normal head was produced by boars from groups III and II, and the smallest number by boars from group I. Also with regard to this feature no significant differences between the analysed groups of boars were found. The semen of high-libido boars (group I) was characterized by the smallest number of spermatozoa with the “pseudo-droplet” defect and differed significantly from the semen of boars with lower libido, from groups II ($P \leq 0.001$) and III ($P \leq 0.01$).

Table 4 shows differences in the number of spermatozoa with the diadem defect and a stricture of the head base and the total number of spermatozoa with a morphological defect in the semen of Polish Large White boars of various libidos. Regarding the first two features mentioned above a tendency can be noticed for a greater number of defective spermatozoa in the semen of boars expressing the lowest level of sexual behaviour (group III). The smallest number of spermatozoa with a stricture of the head base was produced by high-libido boars (group I). On the basis of conducted research it can be stated that the greatest total number of defective spermatozoa was produced by the gonads of boars expressing the weakest sexual behaviour – 10.9%, differing significantly from the representatives of groups I and II ($P \leq 0.05$).

Table 3

The influence of the libido boar on the defects of sperm distal tail loop free normal head and „pseudo droplet”

Group	Distal tail loop, %		Free normal head, %		„Pseudo droplet”, %	
	LSM	SE	LSM	SE	LSM	SE
I	0.214	0.634	0.927	0.089	1.191	1.301
II	0.753	0.428	1.413	0.715	3.028	1.297
III	0.809	0.597	1.728	0.953	2.931	0.973

The significance - „pseudo droplet”

I – II*** I – III** II – III***

Table 4

The influence of the libido boar on the diadem defect of head, stricture of head base and total defects

Group	Diadem defect of head, %		Stricture of head base, %		Total defects, %	
	LSM	SE	LSM	SE	LSM	SE
I	1,829	0,328	0,755	0,351	9,317	1,218
II	1,734	0,785	1,211	0,489	9,52	3,71
III	2,846	1,531	1,528	0,541	10,921	4,211

The significance – total defects

I – III* II – III*

* $P \leq 0.05$

Discussion

Inciting sexual reflexes and sexual behaviour are inborn, however, some of the reflexes are conditioned, and so they can be stirred up or hampered by external factors. Many authors (Levis et al., 1997; Kawęcka, 2002; Hemsworth and Tilbrook, 2007) claim that features connected with boars' sexual behaviour differ and depend on the race, age, place, way of utilization and individual influence. Many authors (Dubiel et al., 1985; Owsiany et al., 2003) obtained in their research a high changeability of time necessary for the effective mounting of the dummy by a boar. Our previous research (Szostak and Sarzyńska, 2011; Szostak and Przykaza, 2011) proved that Polish Large White boars were characterized by high libido and very good semen parameters.

Analysing the results of own research concerning the influence of sexual behaviour of boars of this race on semen features we found that boars with the highest libido produced ejaculates of the biggest volume, with a substantially larger amount of live spermatozoa and a higher percentage of spermatozoa with progressive motility. Kondracki et al. (2012) claim that the level of a boar's sexual behaviour in a later period of utilisation (that is after 3, 6 and 9 months) depends on the sexual behaviour determined at the beginning of its utilisation.

The authors state that the sexual behaviour of boars in a later period of utilisation depends most on the time passed from the moment of mounting the dummy to the moment of erection, and the total time of copulation determined at the beginning of utilization. In their research they did not find any close relation between the level of a boar's libido and the frequency of sperm morphological changes. In our research, conducted on Large White Polish boars aged 24-36 months, we found that there was a significant influence of boars with the highest libido on the percentage of occurrence of sperm with the "pseudo-droplet" defect, but the total number of sperm defects did not have much significance.

Conclusions

A significant relation between the libidos of Large White Polish boars on semen features was found. Ejaculates of high-libido boars were characterized by the biggest volume, the greatest number of live spermatozoa and the highest percentage of spermatozoa with progressive motility.

It was found that there was a weaker relation between the level of the libido of boars and the frequency of sperm morphological changes. A strong relation was only found with regard to the defect referred to as the 'pseudo-droplet' defect. The total percentage of determined sperm defects in the semen of high-libido boars was significantly lower than in the semen of boars with a lower level of sexual behaviour.

The results of the assessment of the libido of boars may be used for predicting the ejaculation efficiency of a boar. However, they are not so useful for predicting the occurrence of sperm defects.

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