

Sperm Motility after the Addition of Prostaglandin F2 α to the Landrace Boar Diluted Semen

Ioana Dana Pandur, Nicolae Pacala

*Banat's University of Agricultural Sciences and Veterinary Medicine from Timișoara,
Faculty of Animal Sciences and Biotechnologies, 300645-Timisoara, Calea Aradului, 119, Romania*

Abstract

Prostaglandin F2 α (PGF2 α) has been used to improve reproductive performance in swine. The objective of this study was to investigate whether the sperm motility from Landrace boars improves when PGF2 α (Dinolytic®; 5 mg PGF2 α /ml) was added to diluted semen. Boars from one large production unit, were manually collected; semen was either enriched with PGF2 α (group 1, n=18), either untreated (group 2, n=16). Total volume of semen collected, percent of motility and number of obtained doses were recorded. Only boars from the first group (with PGF2 α supplemented semen) showed motility over 80% and even 100%. The untreated semen showed motility values around 65-70%.

Keywords: boar, motility, semen, PGF2 α

1. Introduction

Collecting semen from a boar and inseminating a sow to induce pregnancy has been successfully practiced for many years. The technology has been developed to such a point that conception rate and litter size are no different between sows and gilts bred by natural service and those bred by artificial insemination technique [1].

The only way to have an impact on the fixed costs per semen dose is to produce more doses per boar place; effectively to serve more sows per boar. The key to enhancing artificial insemination efficiency is to find ways of reducing costs whilst never compromising performance. Improved fertility will maximize productivity of the swine industry [2].

Myometrial contractility is an essential component in the fertilization process because it is the mechanism by which spermatozoa are transported to the site of fertilization. PGF2 α in semen has

been shown to induce uterine contractions, thereby, facilitating sperm transport during fertilization [3].

In commercial situations, treatment with PGF2 α has been used to expedite mounting behavior, as well as restore libido in boars displaying decreased sex drive [4].

Addition of prostaglandin F2 α (PGF2 α) to extended boar semen has been shown to slightly increase reproductive parameters in sows such as the conception rate and the total number of piglets born alive [5].

The physiological role of PGF2 α and other seminal components in a sow's reproductive tract contributes to the timing of ovulation in response to mating [6].

All this above has conducted to use PGF2 α in diluted semen without destroying the quality of the sperm.

The scope of this experiment was to test the influence of PGF2 α added to diluted semen over the sperm cells motility of Landrace boar's semen.

* Corresponding author: Ioana Dana Pandur
Tel: 0729099416, Email: tm81sgr@yahoo.com

2. Materials and methods

The researches were carried out on two groups of boars raised in intensive system with controlled microclimate. The aim of this study was to determine whether there are differences between sperm motility from prostaglandin F_{2α} supplemented semen compared to sperm motility from untreated diluted semen.

Semen was collected from two groups of Landrace boars (group 1, n=18; group 2; n=16) of various ages housed in the same environment, collected 1-2 times/week. The ejaculate was collected from each boar using the gloved hand technique into a pre-warmed thermal mug containing a plastic collection bag with a filter. The collection room was isolated so that boars could not observe other boars being collected from. The housing system is intensive, the barns being designed with controlled microclimate, in individual pens. Same type of feed was used for all boars, base on boar's weight. After collection, the semen was then weighed in the collection cup in order to determine the volume; the weight was determined as difference between the weight from the weighting scale and the weight of the collection cup (1g=1 ml).

Motility and morphology were visually determined using a phase-contrast microscope, in condition of active metabolism on raw semen (the temperature was approximately 35°C) by a skilled and experienced technician which may have greatly influences about the relative accuracy of this research. These conditions are assured using pre warmed microscope slide and cover with a warm cover-slip.

A total of 15 µl of sperm in a Makler counting chamber were observed using an Olympus 10×0.30 PLAN objective (negative phase contrast field). Each analysis captured several fields and at least 1000 spermatozoa were counted. A scale from 0 to 100 was used, motility being expressed using percentage.

Sperm concentration, the percentage of sperm cells exhibiting motility, and sperm velocity were determined using a electronic photometer and the number of doses and the total extended volume for that ejaculate were determined. Concentration was expressed in billions of sperm cells per diluted sperm millimeter, with a 5% error.

The following information (boar ID, total volume collected, percent of motility, number of obtained doses) was then recorded.

Semen samples were diluted in MIII extender from Minitube, after dilution the diluted semen being kept for another 30 minutes at room temperature. Although the level of antibiotics in short-term extenders may be insufficient, contamination was never observed using phase contrast microscopy at 20× magnification.

The number of doses from one ejaculate was calculated as follow:

Number of doses=Raw sperm collected (ml) x Sperm cells concentration (mil./ml) x Motility (%)/number of sperm cells per dose (n)

The product used during this experiment was Dinolytic (Dinolytic®; Pfizer, 5 mg PGF_{2α}/ml), which contains natural prostaglandin, as tromethamine salt, which is the active substance of the product (*Dinoprostum tromethamini*) and benzoic alcohol.

Diluted semen obtained after processing were distributed in two groups, as follow:

- group I, formed by 38 ejaculates collected from 18 Landrace boars, for which was added 1 ml prostaglandin F_{2α} (Dinolytic®; 5 mg PGF_{2α}/ml) in 100 ml of diluted semen, right after dilution;
- group II, formed by 32 de ejaculates collected from 16 Landrace boars, for which semen was not treated.

Sperm motility was again determined right after adding prostaglandin in diluted semen from group I, in order to be compared with the one determined for group II.

The results obtained after determining the sperm motility were keyed and statically analyzed.

Data from each ejaculate from each boar (every ejaculate was considered as a case; n=70) were managed using Microsoft Excel® and SPSS for Windows. The significance of difference between the variance was determined by Student test, after the percentages were transformed in angular degrees.

3. Results and discussion

The goal of this study was to know the effects of different treatments of PGF_{2α} on boar sperm quality.

This study investigated whether the sperm motility from Landrace boars improves when 1 ml PGF_{2α}

(Dinolytic®; 5 mg PGF2α/ml) was added to 100 ml of diluted semen, right after dilution. The experimental group was formed by ejaculates processed and enriched with PgF2α (n=38), while the control group was formed by ejaculates

untreated (n=32). During the experiment it has been recorded the total volume collected, percent of motility and number of obtained doses.

Table 1. Test difference for sperm motility, depending on the experiment batch, after addition of prostaglandin F2α to the diluted semen

| Specification | \bar{x} | | Differences | Difference semnification |
|---------------|---------------|--------------------|-------------|--------------------------|
| | Control group | Experimental group | | |
| Motility (%) | 68.44 | 85.92 | 17.48 | 0.001*** |

test t,*** p<0.001

Regarding motility (Table 1), the sperm collected from Landrace boars with PGF2α supplemented semen (85.92%) was higher with 17.48 percentage points from the one collected from Landrace boars with untreated semen (68.44%), this difference being very significant (p<0.001). Bellow is rendered meaningful the difference between the control group and the experimental group regarding the sperm cells average motility determined in raw sperm collected from Landrace boars (Figure 1).

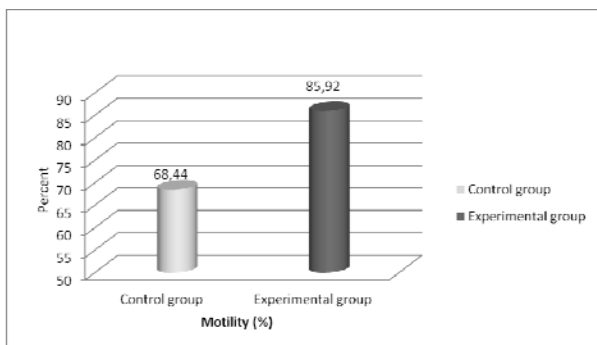


Figure 1. Graphic representation of average sperm motility calculated for Landrace boars

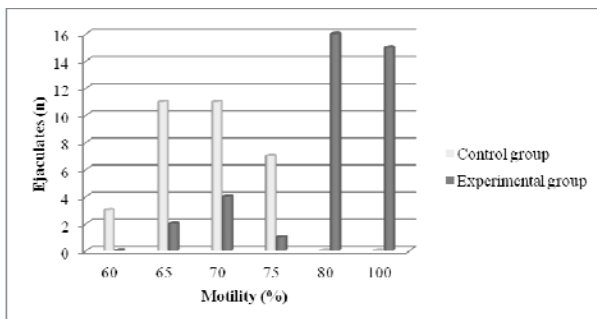


Figure 2. Graphic representation of sperm motility, depending on the experiment batch and ejaculate number

Based on the fact that sperm motility from Landrace boars semen supplemented with PGF2α was the only parameter with very significant differences, it has been also determined the number of Landrace boars that had ejaculates with motility between 60 and 100% (Figure 2). Also, from image 2 it can be notes that only boars from the first group (with PGF2α supplemented semen) showed motility over 80% and even 100%. The group with untreated semen showed motility values around 65-70% for most of the ejaculates collected and processed. Yeste et. al. (2008) [7] has carried out a similar study in order to determine how the addition of PGF2α affects boar sperm quality. Because of this study we can conclude that the addition of prostaglandin F2α at concentrations of 0.5 ml, 1 ml or 2 ml does not damage the spermatozoa, furthermore it is an very important factor over the artificial insemination biotechnology because of her impact over the decrease of the fixed costs per semen tube. Relevant data are also provided by sperm viability and motility results on PGF2α 5 mg/100 ml treatments after 6 days of cooling.

4. Conclusions

Average motility, assessed for experimental group (85.92%), right after prostaglandin F2α adding was 17.48 percentage points higher than the one calculated for control group (68.44%), without any treatment, this difference being statistical significant (p<0.001).

Only for ejaculates collected from the boars from experimental group was estimated motility over 80%. For control group, most of the ejaculates had motility values between 65 and 70%.

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