

POSTCERVICAL ARTIFICIAL INSEMINATION OF SOWS IN COMBINATION WITH SYNTHETIC SEMINAL PLASMA (PREDIL MR-A®)

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SUMMARY: The use of artificial insemination in pigs has been adapted worldwide as the reproductive method of election at farm level. The postcervical method is launch as a method to improve the reproductive efficiency and genetic progress. A strategy to enhance farrowing rate and litter size of artificially inseminated female pigs is to "stimulate" the uterus and oviduct by adding various compounds to extended boar semen or injecting a compound into the female before insemination. The aim of this study was to evaluate the effect of seminal synthetic plasma Predil MR-A® as a method to facilitate procedures with postcervical artificial insemination of sows. The postcervical insemination was performed with 1.5×10^9 spermatozoa in control group and 1.5×10^9 spermatozoa with 20 ml of chemical synthetic plasma Predil MR-A® in test group. The results show that after postcervical insemination with in combination of chemical synthetic plasma Predil MR-A® were obtained 84,27 % conception rate, 83,15 % farrowing rate, 10,79 total born piglets and 10.07 piglets born alive per liter.

Key words: sows, artificial insemination, seminal plasma Predil MR-A®.

INTRODUCTION

Artificial insemination of sows is effective method for intensive use of elite boars. Currently, three main pig artificial methods can be performed depending on the site of sperm dose deposition: cervical/conventional insemination, postcervical/intrauterine insemination and deep intrauterine insemination. Since 10 years ago, the postcervical method was launched as a method to improve the reproductive efficiency (increase in fertility and litter size) and genetic progress (due to the reduction in the use of elite boars) and several papers (Watson and Behan, 2002, Levis et al., 2002, Belstra, 2002, Dimitrov et al., 2007, Dimitrov et al., 2007) where published with diverse results obtained when comparing with the traditional cervical method for artificial insemination of sows. Other way to increase productivity rate of sows is by substances added

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to semen with fertility-regulated function. Oxytocin, prostaglandins, estrogens and synthetic seminal plasma (Predil MR-A®, Presus®) stimulate the uterine contractions, respectively the sperm transport and the metabolism of spermatozoa (Martin Rillo et al., 1996, Levis, 2002, Castaneda Morreno, 2002). The studies of some authors (Martin Rillo et al., 1996, Lyczynski, et al., 2000, Garcia Ruvalcaba et al., 2008, Garcia Ruvalcaba et al., 2009) showed, that the using of Predil MR-A® synthetic seminal plasma prior artificial insemination of sows (cervical or postcervical deposit of semen dose) have a positive effect on farrowing rate and litter size.

The aim of this study was to examine the effect of using of the synthetic seminal plasma Predil MR-A® in postcervical insemination of sows.

MATERIAL AND METHODS

The study was conducted in one pig commercial pig farm during June/August 2009 of Bulgaria. In the experiment were included total 173 females from Dunabe White breed. The lactation length was 25 days. After weaning the animals were housed in pens containing 10 to 13 individual animals. The sows were provided *ad libitum* access to feed and water.

Semen was collected no more than twice per week from boars housed at the same farm by using the gloved hand method. Obtained ejaculates were individually assessed for volume, number of sperm cells, and percent of motile spermatozoa. Volume (without gel fraction) was determined by using a graduated glass vessel with precision of 0.01 ml. Number of sperm cells was determined by using a Thoma counting chamber. Percentage of motile spermatozoa (0 to 100%) was subjectively evaluation with a light microscope at a magnification of 100X. Spermatozoa were diluted in DZNB extender and packaged in 100 ml plastic bottles. Diluted sperm was stored in a cooler unit at 15-17° C until used within 24 to 48 hours after collection.

Estrus detection of weaned sows was performed twice per day (09:30 to 10:30 and 15:00 to 16:00) starting on day 3 after weaning with a mature boar. Sows were randomly assigned to one of the following groups: control group (n=85) - postcervical insemination with 50 ml/1.5 x 10⁹ spermatozoa; test group (n=88) - postcervical two-phase insemination with 50 ml/1.5 x 10⁹ spermatozoa with in combination with 20 ml. chemical synthetic plasma Predil MR-A®. The postcervical insemination was conducted with postcervical catheter with supernatural long yellow trip including inner cannula. In postcervical two-phase insemination protocol, previously infused with 20 ml of chemical synthetic plasma Predil MR-A® warmed up to 37° C before beginning the introduction of the cannula. This procedure speed up the relaxation of the sow's cervix and makes easier the introduction of the cannula through the cervix rings into the uterus, followed by semen deposition and avoiding backflow. Catheters and chemical synthetic plasma Predil MR-A® were supplied from Kubus S.A, Madrid, Spain. The sows were inseminated 2 times per estrus. The technicians in the farm have good experience for using of post-cervical technique for artificial insemination. The gilts were not used in the experiment. The conception rate was determined by diagnosed at 28 to 30 days after insemination by ultrasonography (PREG-TONE®, Renco Corporation, USA). The farrowing rate was calculated as percent of inseminated females that farrowed. The total piglets born per litter and piglets born alive per litter were counted at farrowing. The farrowing index was calculated as piglets born alive per litter/100

inseminations (percentage of farrowing rate x piglets born alive per litter).

Prior to data analysis sows were categorized into two weaning-to-estrus interval of ≤ 6 days or > 6 days and the parities of females ≤ 5 parities or > 5 parities. A one way ANOVA with fixed effects statistical analysis were used. The post hoc comparisons were done by LSD test. All calculations were made with the statistical package, Stat-Soft® STATISTICA, Tulsa, OK).

RESULTS AND DISCUSSION

The mean conception rate and farrowing rate have a nonsignificant tendency for improving in the test group – 84,27% and 83,15% in comparison with control group – 79,07% and 76,74% respectively (Table 1).

Table 1. Reproductive performance in sows after postcervical insemination with Predil MR-A® (mean \pm SD)

Parameters	Control group	Test group
Number of sows	85	88
Conception rate, %	79.07	84.27
Farrowing rate, %	76.74	83.15
Total born piglets, nrs.	11.83 \pm 3,61	10.79 \pm 3,39
Live born piglets, nrs.	10.75 \pm 3,18	10.07 \pm 3,05
Farrowing index	824.95	837.32

Not significant differences between groups.

In contrast for the litter size parameters as total born piglets and live born piglets there have a nonsignificant tendency for the better results in control group – 11,83/10,75 nrs. and 10,79/10,07 nrs. piglets. In generally the farrowing index value is the more in test group with 12,37. Table 2 indicates the reproductive data according to the weaning-to-estrus interval. The using of synthetic seminal plasma Predil MR-A® did not significant effect on the reproductive parameters between groups depending weaning-to-estrus interval.

Table 2. Reproductive performance in AI sows, in relation with weaning-to- estrus interval, WEI (mean \pm SD)

Parameters	WEI interval ≤ 6 days		WEI interval > 6 days	
	control group	test group	control group	test group
Number of sows	46	76	39	12
WEI, days	4.54 \pm 0.75	4.28 \pm 1.89	8.07 \pm 1.16	7.83 \pm 0.93
Conception rate, %	80.43	85.71	79,48	75.00
Farrowing rate, %	78.26	84.42	76.92	75.00
Total born piglets, nrs.	11.55 \pm 3.47	11.00 \pm 3.13	12.13 \pm 3.86	10.44 \pm 3.39
Live born piglets, nrs.	10.66 \pm 3.32	10.09 \pm 3.05	10.58 \pm 3.08	9.77 \pm 3.03
Farrowing index	834.25	85179	813/81	732.75

Not significant differences between groups.

Although not significant differences, sows cycling within up to 6 days after weaning and inseminated with synthetic seminal plasma had greater conception rate and farrowing rate (85,71% and 84,42%) when compared with control group – sows inseminated without synthetic seminal plasma up to ≤ 6 days and > 6 days too. The lowest data

were obtained in animals inseminated with synthetic seminal plasma after 6 days of weaning. In generally, the better reproductive results are in the sows cycling up to 6 days (control and test group).

Table 3 indicates the reproductive performance of sows inseminated with synthetic seminal plasma Predil MR-A® depending of the parity of the animals.

Table 3. Reproductive performance in AI sows, in relation with farrowing parity (mean±SD)

Parameters	≤ 5 parity		> 5 parity	
	control group	test group	control group	test group
Number of sows	67	64	18	24
Parity, nrs.	3.25±1.07	3.40±1.10	6.26±0.45	6.84±0.85
Conception rate, %	79.10	82.81	77.78	87.50
Farrowing sows, %	77.61	82.81	77.78	83.33
Total born piglets, nrs.	11.63±3.95A	10.54±3.27 AB	12.53±2.03B	11.36±3.60
Live born piglets, nrs.	10.62±3.59 A	956±3.05 A	10.80±1.42	10.77±3.53
Farrowing index	824.21	791.66	840.02	897.46

^{AB} Within a row, means with a common superscript differ ($p < 0,01$).

The sows in test group inseminated with synthetic seminal plasma had a higher value of conception rate and farrowing rate – 82,81% and 82,81% (≤5 parity), and 87,50% and 83,33% (>5 parity) respectively. In contrast regarding piglets litter parameters (total born piglets and live born piglets) the sows in control group had a significant higher results. The intensive studies for application of postcervical insemination technique in sows show that the reduction of semen dose do not decrease the reproductive parameters. Depending of catheter model, semen dose and the experience of the technician were obtained various results – 88,70-92,60% conception rate and 10,80-10,90 nrs. live piglets (Watson and Behan, 2002), 83,30-95,16 % fecundity and 9,77-11,61 nrs. live born piglets (Levis, Burroughs and Williams, 2000), 87,80 farrowing rate and 10,20 nrs. alive born piglets (Roberts and Billkei, 2005). Normally this method is recommended in animals after first parity. In the gilts this manner of insemination is a problem of passing the inner cannula of the catheter trough the cervix and the low reproductive performance.

The idea of present study was to check how can to improve the reproductive efficiency of the postcervical insemination technique. The one of the main problems of artificial insemination of sows is that after dilution of boar semen to reduce some natural physiological stimulus in seminal plasma (Garcia Ruvalcaba et al., 1997; Srisuwan, 2001; Ramirez Ovalle, 2002; Rekiel and Sujka, 2007). The results of this experiment show that two-phase postcervical insemination with pre-treatment with synthetic seminal plasma Predil MR-A® have a positive effect of fecundity and farrowing rate. Simillar tendency was find in our previous study (Garcia Ruvalcaba et al., 2009). The effect of using of synthetic seminal plasma Predil MR-A® is by increment of sperm concentration in the oviduct isthmus brought by dilution effect in the cervix and due to uterine contractions improvement, on the other hand there is also an important effect in spermatozoa motility thus spermatozoa transport into uterus.

In present study the positive effect of postcervical insemination with in combination with synthetic seminal plasma was find in the weaning-to-oestrus interval. The

best conception rate and farrowing rate were found in animals inseminated within 6 days after weaning. The same positive effect of the combination of synthetic seminal plasma was found in the sow parity category. The better results (conception rate and farrowing rate) were obtained in test group. The significantly better results in control group (postcervical insemination without synthetic seminal plasma) were obtained regarding piglets parameters.

CONCLUSION

The two-phase postcervical insemination with in combination of synthetic seminal plasma Predil MR-A® improved reproductive results in sows.

The usage of synthetic seminal plasma Predil MR-A® by means of two phase insemination method is a recommended technique to improve the reproductive results obtained through postcervical insemination in pig farms.

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POSTCERVIKALNO VEŠTAČKO OSEMENJAVANJE KRMAČA U KOMBINACIJI SA SINTETIČKOM SEMENOM PLAZMOM (PREDIL MR-A®)

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Izvod

Veštačko osemenjavanje se koristi kao nezaobilazni metod reprodukcije na farmama svinja širom sveta. Tehnologija postcervikalne inseminacije se koristi kao metod daljeg unapređenja reproduktivne efikasnosti i genetskog unapređenja proizvodnje svinja. Strategija povećanja vrednosti prašenja i veličine legal, uključuje dodavanje supstanci za stimulaciju kontrakcija uterusa, u inseminacione doze ili injekciju ovih materija krmači pre osemenjavanja. Cilj ovog rada je da se ispita uticaj dodavanja sintetičke semene plazme Predil MR-A®, u inseminacione doze, kao metoda povećanja efikasnosti postcervikalne inseminacije. Postcervikalna inseminacija je izvedena inseminacionim dozama sa 1.5×10^9 spermatozoida, pri čemu je dozama za osemenjavanje ogledne grupe krmača, dodato 20 ml sintetičke semene plazme Predil MR-A®. Postcervikalno osemenjavanje dozama dopunjenim sa sintetičkom semenom plazmom, rezultiralo je sa 84.27% koncepcije, 83.15% prašenja, 10.79 ukupno rođene i 10.07 živo rođene prasadi po čeglu.

Ključne reči: veštačko osemenjavanje, sintetička semena plazma Predil MR-A-krmača.

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