The use of oxytocin in liquid semen doses to improve the reproductive performance of sows and litter parameters

Damian Knecht, Kamil Duziński, Sebastian Środoń
Institute of Animal Breeding, Wroclaw University of Environmental and Life Sciences, ul. Chelmonskiego 38C, 51– 630 Wroclaw, Poland

Introduction. Porcine production still incurs huge losses due to seasonal variations in the reproductive performance of sows. Among a range of solutions, the application of proactive substances (progestagens, gonadotropins, prostaglandin and its derivatives) directly into the organism of sows, or as a component of semen has also been used. Artificial insemination excludes proper stimulation of mechanoreceptors located in the vagina, which during natural mating results in the release of oxytocin. In the present study , oxytocin was administrated in insemination doses to eliminate seasonal fluctuations in the reproductive performance of sows throughout the year and to improve litter performance in terms of industrial pig production.

Material and methods. The experiment was carried out at an industrial pig farm located in Poland, and lasted two years. The farm was located in a temperate climate zone, which is distinguished by the four seasons: Winter (January to March), Spring (April to June), Summer (July to September) and Autumn (October to December). The experiment was conducted using Polish Large White × Polish Landrace crossbreed sows divided into Control and Oxytocin (inseminated with 100 mL semen doses, to which 0.5 mL of oxytocin - 5 IU was added just before insemination) groups. The proportion of weaned to repeat sows was similar between groups. The insemination ratios of the different boar breeds were similar in both groups. Excluding farrowing rate, for each of the litters, the following parameters were assessed: average litter size, average piglet weight, piglet mortality percentage, average number of piglets weaned, average weaned piglet weight and daily gain. In addition, the fecundity index was calculated to indicate the number of piglets born after 100 inseminations. The numerical material was analyzed using the STATISTICA statistical program.

Results. The application of 0.5 mL oxytocin to 100 mL insemination doses, just before insemination, has a positive effect on the reproductive performance and litter parameters of sows inseminated in different seasons. For all the analysed seasons, higher farrowing rates were always reported in the Oxytocin group (Figure 1). Only for Spring did the farrowing rate between the groups remain at a similar level. Statistically confirmed differences (P≤0.01) were noted between groups in Autumn and Summer seasons. In each of the seasons, higher average litter sizes were observed in the Oxytocin group, especially for Winter, Spring (P≤0.01) and Summer (P≤0.05)(Table 1). The biggest differences between the birth weight were reported for Spring (0.22 kg, P≤0.01) and Winter (0.17 kg, P≤0.05). Piglet mortality from birth to weaning was similar between groups. It was proven statistically that there was a lower number of weaned piglets in the Winter season (P≤0.01) in the Control group. Regardless of insemination season, the average weight of weaned piglets was always higher in the Oxytocin group. Daily gains developed differently depending on the group and season. Statistical difference was noted in the Winter season (P≤0.05).The fecundity index parameter directly indicates the number of piglets born after 100 inseminations (Figure 2). Much better results were noted in the Oxytocin group (P≤0.01). The lowest differences between groups were reported for Spring, 37.73, and the highest for Summer, 100.61.

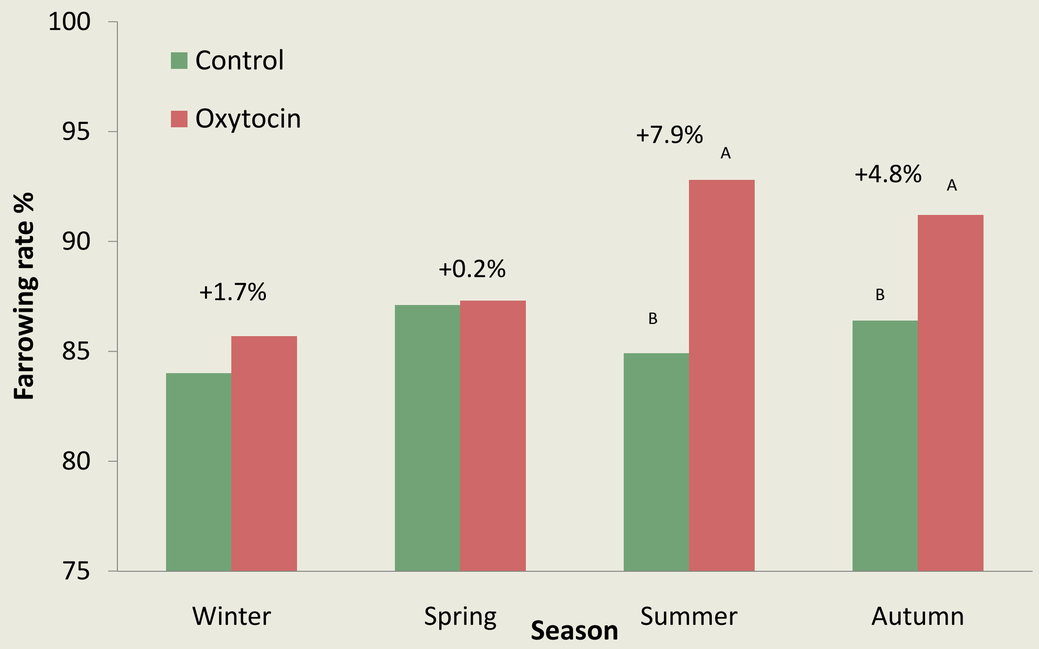

Figure 1. Farrowing rate in different seasons, including the experimental group. A,B- means the statistically significant differences between the experimental groups in the same season, at P≤0.01

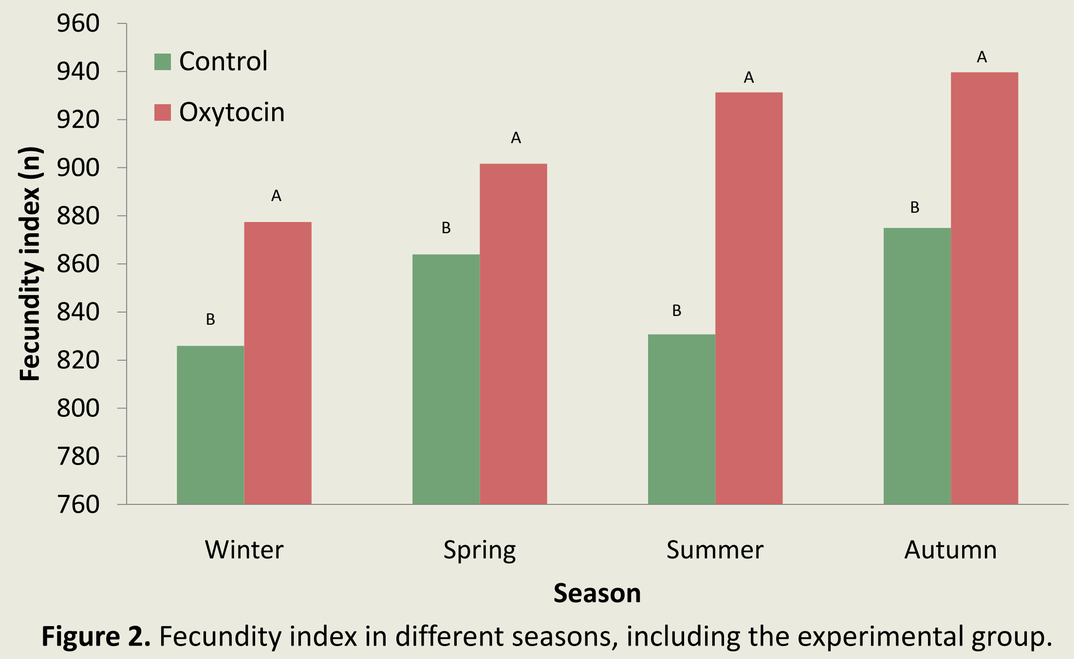

Figure 2. Fecundity index in different seasons, including the experimental group. A,B- means the statistically significant differences between the experimental groups in the same season, at P≤0.01

Table 1. Results of reproductive performance of sows in different seasons, including the experimental group (mean ± SD).

Item	Winter		Spring		Summer		Autumn	
	Control	Oxytocin	Control	Oxytocin	Control	Oxytocin	Control	Oxytocin
Number of litters (n)	1282	1154	1177	1071	1075	1147	1201	1042
Litter size (n)	9.83±0.42^{B}	10.24±0.36^{A}	9.91±0.32^{B}	10.33±0.29^{A}	9.78±0.31^{b}	10.05±0.34^{a}	10.13±0.36	10.3±0.35
Birth piglet weight (kg)	1.52±0.21^{b}	1.69±0.28^{a}	1.39±0.15^{B}	1.61±0.25^{A}	1.59±0.22	1.64±0.33	1.52±0.25	1.61±0.24
Piglets mortality (%)	5.12±1.47^{b}	3.69±0.99^{a}	3.31±1.09	3.29±1.11	3.06±0.95	3.94±1.26	4.06±1.5	4.25±1.63
Piglets weaned (n)	8.33±0.33^{B}	8.87±0.41^{A}	8.88±0.43	8.99±0.36	8.58±0.37	8.52±0.42	8.77±0.39	8.89±0.38
Weaned piglet weight (kg)	7.85±0.24^{B}	8.43±0.25^{A}	8.04±0.31^{B}	8.56±0.25^{A}	8.43±0.29	8.52±0.32	7.93±0.58	8.2±0.25
Daily gain (g)	225.1±9.89^{b}	232.47±10.23^{a}	234.75±12.18	237.5±11.44	239.73±14.39	233.41±12.63	227.27±15.89	225.6±12.21

^{A,B}- indicates statistically significant differences between the experimental groups in the same season, at P≤0.01
^{a,b}- indicates statistically significant differences between the experimental groups in the same season, at 0.01<P≤0.05

Conclusions. On the basis of the presented results, it is concluded that the use of oxytocin directly affects the farrowing rate of sows or, in the case of seasons with low improvement of this rate, the other parameters of the reproductive performance of sows (litter parameters). In the absence of negative effects, year-round insemination with oxytocin addition into seminal doses is recommended, which effectively improves the production performance and reduces the problem of seasonality in reproduction.