

POSTWEANING ESTRUS REACTION OF SOWS AFTER THE TREATMENT WITH eCG IN WARM AND COOL SEASONS*

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SUMMARY: Numerous studies show significantly reduced sow fertility in the warm period of the year. The aim of this study was to investigate the effect of sow treatment with eCG preparation, 24h after weaning, on the estrous reaction level. A significantly ($p < 0.01$) higher number of sows, treated with single eCG injection of 1,000IU (primiparous) or 1,500IU (older sows), manifested estrus within 7 days after weaning (83.7%) in comparison with the sows which were not treated (63.9%). In addition, the treatment with eCG results in a high level of estrus synchronization, both in the warmer and in the cooler season of the year. Namely, on day 4 and day 5 after weaning, estrus was detected in 81% of eCG treated sows within the cooler season, and in 78% of sows treated in the warmer season. These values were significantly ($p < 0.01$) lower in the control (untreated) sows (41.1% in the cooler, vs. 33.3% in the warmer season). The obtained results show that the treatment with placental gonadotropin can be an effective method of increasing sow fertility in the warmer season of the year.

Key words: fertility, season, eCG-treatment, weaning, sow.

INTRODUCTION

The herd reproductive efficiency in the industrial pig production is measured by the number of weaned piglets per sow per year. This value, however, can vary greatly due to the influence of many genetic and paragenetic factors. However, as the heritability for the average number of weaned piglets per litter was about 10% (See, 2002), the phenotypic value of this parameter is significantly affected by many paragenetic factors. The main

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parameters of fertility such as the weaning-to-estrus interval, farrowing rate, embryonic or fetal survival rate, live born piglets per litter and the survival rate of piglets during the lactation period are the most important factors which influence the number of weaned piglets per sow per year (Nielsen, 1981a; Tomes et al., 1982; Stančić, 1994).

The value of these parameters of fertility can be modified by the influence of numerous factors, of infective and non-infective etiology (Vanroose et al., 2000; Stančić et al., 2011). Non-infective causes of reduced fertility are numerous and, in production, mostly seem to interact so it is very difficult to define precisely the individual effect of each. However, these factors are: nutrition, housing, insemination technology, body condition, treatment with placental gonadotropin (eCG, and hCG) and general health status of sows (Stančić, 2005, Stančić et al., 2010; Stančić et al., 2011). Under modern production conditions, a phenomenon known as “seasonal infertility of pigs” is the most important factor in reducing sow fertility parameters. Moreover, during the last 40 years, significantly lower values of the sow fertility parameters have been recorded in the warmer part of the year (Almond, 1992). The studies in Eastern Europe have shown a measurable extension of weaning-to-estrus interval, reducing farrowing rate and litter size, as well as an increase in the number of regular and irregular return (rebreeding) rate, during the warmer periods of the year (Almond and Bilkei, 2005). It has been shown that treatment with placental gonadotropins (eCG, and hCG), immediately after weaning, can substantially increase sow fertility in the warm period of the year (Almond and Bilkei, 2005; Taker i sar., 2008; Stančić i sar., 2010).

Therefore, the aim of this study was to investigate whether it is possible to reduce the weaning-to-estrus interval and increase the farrowing rate in sows after the treatment with placental gonadotropin in the warmer period of the year.

MATERIALS AND METHODS

The experiment was conducted on one large pig farm unit in the AP Vojvodina (Serbia), in a one year period. The farm capacity was about 5,000 breeding sows (purebreds Large White, German Landrace, Dutch Landrace, Duroc and Hampshire, as well as their crosses F1 and F2 generations). The sows were kept in enclosed buildings, except the weaned sows up to the time of successful insemination. The pregnant sows were kept for about 30 days in individual boxes, and later, up to about 7 days before farrowing, in the group boxes with outlets. During lactation, lasting about 30 days, the sows were housed in individual pens. Sow feeding was adequate. The estrus detection was performed in the presence of a teaser boar once a day. The artificial insemination was carried out by liquid diluted semen, with 100 ml volume doses, containing about 5×10^9 progressively motile sperm. The artificial insemination was performed few hours after estrus detection, and about 24 hours later. The control of rebreeding was performed in the facilities for inseminated (pregnant) sows, starting about 14 days after insemination.

The hormonal treatment was carried out about 24 hours after weaning litters. Placental gonadotropin preparation eCG (equine chorionic gonadotropin), formerly known as PMSG (“Sugonal” Veterinary Institute Subotica), was used. Each sow was treated with a single intramuscular injection of 1,000 IU eCG (first farrowing) or 1,500 IU eCG (older sows), during the warmer (May - September) and cooler (October - April) seasons of the year. The

data for this study were obtained from the farm reproductive records, for a total of 2,535 sows (455 first parity and 2,080 higher parity sows). The values of these parameters of reproductive performance were analyzed in relation to parity and the season.

The data were analyzed by the software package “Statistics 12”.

RESULTS AND DISCUSSION

In the warmer months of the year, a significantly lower ($p < 0.01$) number of sows had a short duration of weaning-to-estrus interval (WEI: ≤ 4 , and 5 to 6 days), while the number of sows with longer WEI duration (7 days) significantly increased. Thus, in the cooler season, within the first 4 days after weaning, estrus was manifested in 27.9%, and in the warmer season in 18.7% of sows, while these values for WEI 5 to 6 days were 46.7% (cool) and 37.2% (warm). However, the number of sows which manifested estrus 7 days after weaning was significantly higher ($p < 0.01$) in warmer (44%) compared to the cooler season of the year (25.4%) (Table 1).

Table 1. Distribution of estrus reaction within first 7 days after weaning

Parity		Weaning-to-estrus interval (days)								
		≤ 4		5 - 6		7		Total		Total (C+W)
		C	W	C	W	C	W	C	W	
1.	n	33	12	50	14	92	69	175	95	258
	%	18,8 ^a	12,6 ^b	28,5 ^a	14,7 ^b	52,6 ^a	72,6 ^b			
$\geq 2.$	n	310	115	525	238	221	229	1056	582	1596
	%	29,3 ^a	19,7 ^b	49,7 ^a	40,9 ^b	20,9 ^a	39,3 ^b			
Total	n	343	127	575	252	313	298	1231	677	1854
	%	27,9 ^a	18,7 ^b	46,7 ^a	37,2 ^b	25,4 ^a	44,0 ^b			

C – Cool season; W – Warm season.

^{a, b} Values with different superscripts, within same row and interval, significant differ ($p < 0,01$).

It was also found that a significantly ($p < 0.01$) lower number of the first parity sows react with estrus within the first 4 days after weaning (18.8% in the cool and 12.6% in the warm season) compared to the higher parity sows (29.3% in the cool and 19.7% in the warm season). Conversely, 7 days after weaning, estrus manifested over 72% of the first parity sows in the warmer and 52.6% in the cooler season, while in these WEI range, were 39.3% higher parity sows in the warmer, and 20.9% sows in the cooler season. The differences were statistically significant ($p < 0.01$) (Table 1).

Approximately 24 hours after weaning, the sows were treated with a single intramuscular injection of eCG (older sows 1,500 IU, and first parity sows 1,000 IU) in the cooler and warmer season of the year. The objective was to determine whether the treatment with gonadotropin preparations may increase the degree of sow estrus reaction, within the first 7 days after weaning, during the warmer season of the year.

It has been shown that a significantly ($p < 0.01$) larger number of the total sows treated with eCG (83.7%) manifested estrus within the first 7 days after weaning in comparison with the control (non-treated) sows (63.9%). A significant increase in estrus reaction, within the first 7 days after weaning, after treatment with the eCG compared to the control sows during the warm period of the year, were also found in the first parity sows (76.5% vs. 49.7%) and in the older sows (85.2% vs. 67%) (Table 2).

Table 2. Sows estrual reaction within first 7 days after weaning

Parity		Treatment				
		eCG		Control		
		C	W	C	W	
1.	Treated		132	98	264	191
	In estrus	n	107	75	175	95
		%	81,1 ^a	76,5 ^a	66,3 ^b	49,7 ^c
≥ 2.	Treated		684	492	1211	869
	In estrus	n	618	419	1056	582
		%	90,3 ^a	85,2 ^a	87,2 ^a	67,0 ^b
Total	Treated		816	590	1475	1060
	In estrus	n	725	494	1231	677
		%	88,8 ^a	83,7 ^a	83,4 ^a	63,9 ^b

C – Cool season; W – Warm season.

^{a, b} Values with different superscripts, within same row and interval, significant differ ($P < 0.01$).

It is important to point out that the number of estrus sows, treated with eCG in the warmer, compared to the cooler season, was reduced by only 5% ($p > 0.05$) both in the primiparous sows (76.5% vs. 81.1%) and in the older sows (85.2 vs. 90.3%). However, this value in the control sows, significantly ($p < 0.01$) decreased in the warmer seasons by 16.6% in the primiparous sows (49.7% vs. 66.3%) and by 20.2% in the older sows (67% vs. 87.2%) (Table 2). Furthermore, the treatment with eCG results in high level of postweaning estrus synchronization, both in the warmer and cooler season of the year. Namely, on day 4 and day 5 after weaning, estrus was induced in 78% sows treated in the warmer and in 81% sows treated in the cooler season of the year. In this same weaning-to-estrus interval, estrus was detected in 41.1% of untreated (control) sows in the cooler and 33.3% sows in the warmer season of the year (Figure 1).

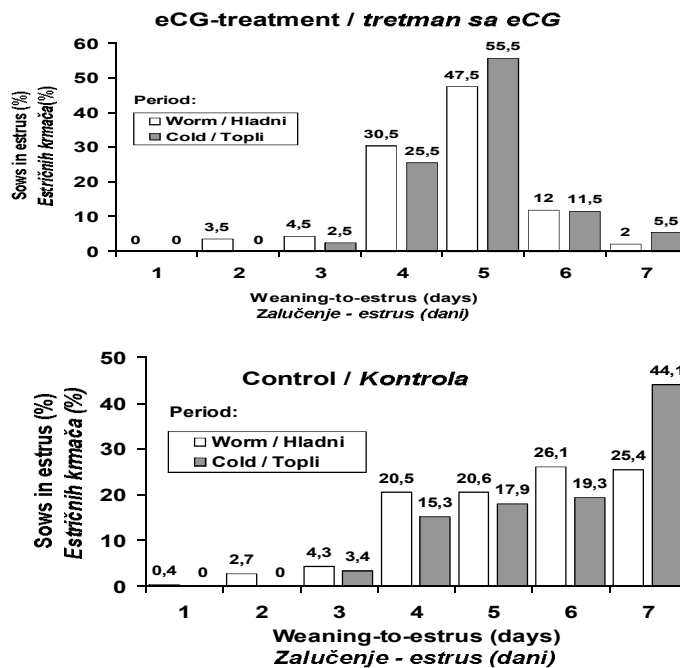


Figure 1. Distribution of sows estrus reaction after eCG treatment in worm and cold season

Seasonal infertility is well-known phenomenon in the pig reproduction. It is manifested with lower values of the basic parameters of sow fertility during the summer months (Stančić et al., 2011). Some of these parameters are: increased occurrence of postweaning anestrus, extended weaning-to-estrus interval, lower values of conception rate, increased number of rebreeding, abortions and pseudopregnancy, as well as the lowered number of vital live-born pigs (Love, 1978; Rozeboom et al., 2000). This is associated with the negative effects of high ambient temperature, on the hormonal mechanisms (release the pituitary FSH and LH) that re-establish postweaning estrus response, as well as on the establishment and/or maintenance of pregnancy (lower conception rate and increase embryonal and foetal mortality) (Britt et al., 1983; Xue et al., 1994; Stančić, 1994; Prunier and Quesnel, 2000; Bassett et al., 2001; Peters and Pitt, 2003; Stančić et al., 2011).

The results of our study show that, after a single eCG injection, 24h after weaning, during the warm period of the year, within 7 days after weaning, a significantly ($p < 0.01$) higher number of sows manifested estrus (83.7%), compared to sows which were not treated (63.9%). Similar results were obtained by other authors (Almond and Bilkei 2005; Bracken et al., 2006; Tucker et al., 2008; Stančić et al., 2010). Based on these results, it can be concluded that the treatment with placental gonadotropin preparations on the day of weaning can be an effective method of increasing and synchronizing the sow postweaning estrus reactions. Therefore, it can contribute to the reduction of the level of sow infertility during the warm summer months.

CONCLUSION

Based on the obtained results, it can be concluded that the treatment of sows with placental gonadotropin, 24 hours after weaning, can significantly increase the number of sows in estrus within the first 7 days after weaning, during the warm season of the year.

These results demonstrate that postweaning gonadotropins treatment can contribute to the reduction of the negative influence of warm season on sow fertility in the intensive pig production herds.

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ESTRUSNO REAGOVANJE KRMAČA TRETIRANIH SA eCG POSLE ZALUČENJA U TOPLOJ I HLADNOJ SEZONI

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Izvod

Brojna istraživanja pokazuju značajno smanjen fertilitet krmača u toplom periodu godine. Cilj rada je bio da se ispita uticaj tretmana krmača preparatom eCG, 24h posle zalučjenja, na stepen i sinhronizaciju estrusnog reagovanja. Pokazalo se da značajno ($p < 0.01$) veći broj krmača tretiranih sa 1,000ij do 1,500ij eCG, manifestuje estrus unutar 7 dana po zalučjenju (83.7%), u odnosu na krmače koje nisu bile tretirane (63.9%). Osim toga, tretman sa eCG dobro sinhronizuje pojavu estrusa, kako u toploj tako i u hladnoj sezoni godine. Tako je, 4. i 5. dana po zalučjenju, estrus manifestovalo 81% krmača tretiranih sa eCG u hladnoj i 78% krmača u toploj sezoni. Ove vrednosti su bili značajno ($p < 0.01$) niže kod kontrolnih krmača (41.1% u hladnoj i 33.3% u toploj sezoni). Dobijeni rezultati pokazuju da tretman sa placentalnim gonadotropinima može biti efikasan metod povećanja fertiliteta krmača u toplom periodu godine.

Ključne reči: fertilitet, sezona eCG-tretman, zalučjenje, krmača.

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