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Original Scientific Article

FERTILITY OF GILTS WITH PROLONGED PREINSEMINATION ANESTRUS AFTER PROGESTAGEN-eCG TREATMENT

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Summary: The objective was to determine the effects of Regumate® alone or Regumate®+eCG treatment on the synchronization of estrus and fertility in delayed puberty (n=30+30) and normal cyclic gilts (n=30+30). Gilts were fed daily a complete diet containing 20 mg/gilt Regumate® for 18 days. Twenty-four hours after the last feeding of Regumate®, all gilts received an i.m. injection of 1,000 IU eCG. Gilts were inseminated artificially (AI) 12 and 24 h after first detection of standing estrus. More normal cyclic gilts (84.6%) than delayed puberty gilts (66.7%) expressed estrus by d 4.8 after Regumate® alone treatment ($p < 0.05$). However, similar proportion of normal cyclic (90%) and delayed puberty gilts (93%) were in estrus by d 4.2 after Regumate® + eCG treatment ($p > 0.05$). These findings indicate that about 70% of delayed puberty gilts had established cyclic ovarian activity (i.e. sexually mature, cyclic gilts), while about 30% were truly delayed puberty gilts (sexually immature, prepubertal acyclic gilts), before progestagen treatment. AI of delayed puberty gilts resulted in 80 to 85.7% farrowing rate and 10.50 to 11.04 liveborn piglets per litter. Obtained results demonstrate that progestagen treatment may be an effective tool for increasing gilts' reproductive efficiency and reducing the number of gilts culled from the breeding herd due to prolonged preinsemination anestrus.

Key words: progestagen; eCG; fertility; prolonged anestrus; gilt

Introduction

The most common reason for culling gilts from the breeding herds is prolonged preinsemination anestrus, i.e. when estrus is not detected in gilts older than 8 months of age (1, 2). Estrus may be undetected in gilts that have not established pubertal cyclic ovarian activity and those gilts are defined as truly delayed puberty gilts (3), or in cyclic, sexually mature, but behavioural anestrus gilts (4, 5).

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Recent investigation on large swine breeding farms in Vojvodina (Serbia) demonstrated that 30 to 40% of gilts failed to exhibit behavioural estrus even after 8 months of age, thus increasing economic problems for swine producers. These gilts are culled from the breeding herd as delayed behavioural anestrus gilts, i.e. prolonged pre-insemination anestrous gilts (5, 6, 7). However, previous results of post mortem examination of reproductive organs have shown that many of these gilts actually have cyclic ovarian activity, and that behavioural delayed anestrus may be the result of poor estrus detection technology on farm (8, 9, 10, 11). Based on these findings, we assume

that treatment with progestagen preparation could result in a good estrus response and fertility parameters (farrowing rate and litter size) after artificial insemination of delayed behavioural anestrus gilts. Namely, it has been demonstrated that treatment with progestagen preparation alone is highly effective in synchronizing estrus in randomly cycling gilts, but not in prepubertal (acyclic) individuals (12, 13).

Therefore, the aim of this paper was to compare fertility in prolonged preinsemination anestrus gilts and normal cyclic pubertal gilts, after artificial insemination in estrus synchronized by progestagen treatment.

Materials and methods

General. The experiment was conducted at a swine breeding farm in Vojvodina (Republic of Serbia) with the capacity of 5,500 sows, with average lactation duration of 30 days. Gilts were maintained in groups of twenty to twenty five in a building for replacement gilts. All studied animals were fed and housed in the same way and in the same period of the year. Estrus detection at the farm was conducted once in 24 hours by direct contact with teaser boars.

Experimental animals. Two categories of gilts were used in the experiment (60 gilts in each group). First group: Gilts culled from a breeding herd due to prolonged preinsemination anestrus (estrus not detected until 8 month of age, av. 258 days), i.e. delayed puberty gilts. Second group: Sexually mature (cyclic) gilts with at least one spontaneous estrus cycle, about 210±5 days of age, i.e. normal cyclic gilts. Gilts in this group served as controls.

Hormonal treatment. All gilts were treated with progestogen preparation Regumate® (Allyl trenbolone, Altrenogest, Roussel UCLAF, agro-division Veterinaria, Bernburg, Germany). Gilts were fed 2.5 kg of a complete ration containing 20 mg Regumate® for 18 days. The next day after progestagen treatment, half of the total treated gilts in both groups (n = 30) received an i.m. injection of 1,000 IU eCG - Equine Chorionic Gonadotropin (Folligon®, Intervet-Boxmer, Holland).

Estrus detection. Starting from the second day after hormonal treatment, the behavioural estrus manifestation was tested two times a day, in an interval of about 12 h, by full mature boar contact.

Artificial insemination was performed 12 h and 24 h after detection of standing estrus. Insemination dose, volume 100 ml, contained a minimum of 3 x 10^9 spermatozoa. Disposable SoftGilt Catheter (Minitübe, Germany) was used.

Recorded data: Farrowing rate from insemination in the first estrus after treatment, live born, stillborn and total born piglets were determined for each litter.

Statistical Analyses. Descriptive statistics, t-tests were performed using the 10th edition of the Statistics software package. Descriptive statistics was performed on characteristic intervals: end of treatment to estrus, average piglets born per litter (liveborn, stillborn and total). T-test was used to determine differences between means. Differences in the characteristics on Intervals: end of treatment to estrus (days), average piglets born per litter (liveborn, stillborn and total) were made by a t-test (t-test for Dependent Samples). The difference between number of gilts in estrus and gilts farrowed (from treated) per treatment were tested by t-test (t-test for Dependent Samples). The statistical significance was set at $p < 0.05$. The difference between number of gilts farrowed (form AI) per treatment were tested by t-test (t-test for Independent Samples). The statistical significance was set at $p < 0.05$.

Results

The percentage of delayed puberty and normal cyclic gilts expressing estrus and interval from end of treatment to estrus, after Regumate or Regumate + eCG treatment, are shown in Table 1.

Significantly fewer ($p < 0.05$) delayed puberty gilts were in estrus after treatment with Regumate alone, compared with all other groups. More delayed puberty gilts and normal cyclic gilts were in estrus after Regumate+eCG treatment, compared to Regumate alone treatment ($p < 0.05$). The average end of treatment-to-estrus interval was 4.8 days in Regumate alone group and 4.2 days in Regumate + eCG group, in both delayed puberty and normal cyclic gilts. The difference in duration of these intervals was statistically significant ($p < 0.05$).

Farrowing rate and litter size of delayed puberty and normal cyclic gilts, inseminated in estrus after Regumate or Regumate + eCG treatment, are shown in Table 2.

Farrowing rate was very similar ($p > 0.05$) in normal cyclic gilts treated with Regumate alone (84.6%) or Regumate + eCG (85.2%), as well as in delayed puberty gilts treated with Regumate + eCG (85.7%). Significantly lower farrowing rate (80.0%) was recorded in delayed puberty gilts, treated with Regumate alone ($p < 0.05$). Total litter size, liveborn and stillborn piglets per litter were greater ($p < 0.05$) in normal cyclic and dealyed puberty gilts treated with Regumate + eCG, compared with normal cyclic and delayed puberty gilts in Regumate alone group. These values were not significantly different between normal cyclic and dealyed puberty gilts within the same treatment groups ($p > 0.05$).

Table 1: Estrus manifestation after hormonal treatment

		Hormonal treatment			
		Regumate®		Regumate® + eCG	
		Delayed puberty	Normal cyclic	Delayed puberty	Normal cyclic
No. gilts treated		30	30	30	30
Gilts in estrus	n	20	26	28	27
	%	66.7[a]	86.7[ab]	93.3[b]	90.0[b]
Interval: end of treatment to estrus (days, mean ± SD)		4.8±0.70[a]	4.8±0.81[a]	4.2±0.86[b]	4.2±0.85[b]

ab Values within rows with different superscripts differ ($p < 0.05$).

Table 2: Farrowing rate and litter size

		Hormonal treatment			
		Regumate®		Regumate® + eCG	
		Delayed puberty	Normal cyclic	Delayed puberty	Normal cyclic
No. gilts treated		30	30	30	30
Gilts farrowed (n)		16	22	24	23
Farrowing rate (%)		80.0[a] (16/20)	84.6[b] (22/26)	85.7[b] (24/28)	85.2[b] (23/27)
Average piglets born per litter (mean ± SD)	Liveborn	10.50±1.033[a]	10.41±1.008[a]	11.04±0.999[b]	10.96 ±0.976[b]
	Stillborn	0.69±0.602[a]	0.68±0.716[a]	0.75±0.737[b]	0.95 ±0.926[b]
	Total	11.19±1.047[a]	11.09±1.192[a]	11.79±1.141[b]	11.91 ±1.379[b]

In parentheses: farrowed/inseminated.

ab Values within rows with different superscripts differ ($p < 0.05$).

Discussion

It has been shown that Allyl trenbolone (altrenogest, Regumate®), an orally active progestagen substance, is effective in suppressing follicular development and estrus expressing in gilts. Namely, this progestagen does not prevent normal luteolysis, but continues to block the onset of estrus after luteolysis occurs (14). Therefore, feeding of altrenogest, in a dose of 15 to 20 mg/day/gilt over a period of 14 to 18 days, results in succesfull estrus synchronization in sexually mature gilts (15, 12, 16). Equine CG (eCG) has been frequently used after alternogest (Regumate®) tretament in order to stimulate follicular development and to achieve better synchronization of estrus and ovulation in gilts (14, 17).

In our study, more normal cyclic gilts (84.6%) than delayed puberty gilts (66.7%) expressed estrus by d 4.8 after Regumate® alone treatment ($p < 0.05$). However, similar proportion of normal cyclic (90%) and delayed puberty gilts (93%) were in estrus by d 4.2 after Regumate® + eCG treatment ($p > 0.05$). These findings indicate that about 70% of delayed puberty gilts, had established cyclic ovarian activity (i.e. sexually mature, cyclic gilts), while about 30% were truly delayed puberty gilts (sexually immature, prepubertal acyclic gilts), before progestagen treatment. Previous researches demonstrated that daily feeding of Regumate® alone, at levels of 15 to 20 mg/d for 14 to 18 d synchronized estrus in a large proportion of treated randomly cycling gilts, but not in prepubertal (acyclic) gilts. On the other hand, eCG stimulates the onset of estrus in prepubertal gilts but does not synchronize estrus in cycling females (11 - 14, 16 - 20). Thus, a combination of Regumate® and eCG treatments could be an effective way of synchronizing estrus in a group of gilts for which the cycling status is unknown (16).

Satisfactory farrowing rate (80% to 85.7%) and litter size (10.4 to 11.0 liveborn piglets) were obtained in treated group of gilts, after artificial insemination in estrus synchronized by Regumate®. Total litter size, liveborn and stillborn piglets per litter, tended to be greater ($p < 0.05$) in gilts treated with Regumate® + eCG combination than in gilts treated with Regumate® alone. It has been recently demonstrated that sexually mature (cycling) gilts given eCG 24 h after withdrawal of Regumate® had a higher ovulation rate than did gilts given Regumate® alone (11, 14, 17, 18, 21).

The results obtained in this study show that treatment with Regumate® + eCG combination results in good estrus synchronization and high fertility (farrowing rate and litter size) in delayed behavioural anestrus gilts (i.e. gilts with unknown cyclic status). Therefore, progestagen treatment may be an effective tool for enhancing reproductive efficiency in herds of replacement gilts. This can significantly reduce the number of gilts culled from the breeding herd due to prolonged preinsemination anestrus.

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PLODNOST PRI MLADICAH SVINJ S PODALJŠANIM PREDOSEMENITVENIM ANESTRUSOM PO ZDRAVLJENJU Z PROGESTAGENOM eCG

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Povzetek: Cilj raziskave je bil določitev učinka zdravljenja z Regumate® ali z Regumate® v kombinaciji z eCG na sinhronizacijo estrusa in plodnost pri mladicah svinj v podaljšani puberteti (n = 30+30) in pri normalnih mladicah v pojatvenem ciklusu (n = 30+30). Mladice so bile dnevno 18 dni hranjene s popolno krmo, ki je vsebovala 20 mg Regumate®/svinjo. Štiriindvajset ur po zadnjem krmljenju mladic z mešanico, ki je vsebovala Regumate®, so vse mladice prejele i/m injekcijo 1000 IU eCG. Mladice so bile nato umetno osemenjene 12 in 24 ur po prvem odkritju estrusa. Več mladic z običajnim ciklusom (84,6 odstotka) kot mladic v zapozneli puberteti (66,7 odstotka) je imelo izražen estrus 4,8 dni po zdravljenju samo z Regumate® ($p < 0,05$). Po zdravljenju z Regumate® v kombinaciji z eCG pa je bil ugotovljen podoben delež mladic z običajnim ciklusom (90 odstotkov) in mladic v zapozneli puberteti (93 odstotkov) v estrusu 4,2 dni po zdravljenju ($p > 0.05$). Te ugotovitve kažejo, da je imelo približno 70 odstotkov mladic v zapozneli puberteti urejeno ciklično dejavnost jajčnikov (tj. spolno zrele, ciklične mladice), medtem ko je bilo približno 30 odstotkov mladic pred zdravljenjem s progestagenom resnično zapoznelih (spolno nedozorele, predpubertetne aciklične mladice). Umetna osemenitev je pri mladicah v zapozneli puberteti povzročila 80 - 85,7 odstotno stopnjo prasitev in 10,5 - 11,04 živorojenih pujskov na gnezdo. Dobljeni rezultati kažejo, da je lahko zdravljenje s progestagenom učinkovito orodje za povečanje reproduktivne učinkovitosti mladic in zmanjšanje števila mladic, izločenih iz plemenske črede zaradi daljših predosemenitvenih anestrusov.

Ključne besede: progestagen; eCG; rodnost; podaljšan anestrus; mladica