韓國家畜繁殖學會誌 19(2) : 147~152(1995)
Korean J. Animal Reprod.

Effects of Different Hormone Treatments on the Estrus Synchronization and Superovulation of Gilts
Ⅰ. Effects of Altrenogest and PG600 Treatments on the Estrus Synchronization of Gilts

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미경산돈의 발정 동기화 및 과배란시 호르몬 처리간의 효과
Ⅰ. 미경산돈의 발정 동기화에 있어 Altrenogest와 PG600 처리 효과

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요 약

본 연구는 돼지의 발정 동기화를 시키는데 있어 Altrenogest와 PG600간의 효과를 비교하기 위해 축산기술연구소에서 1994년부터 1995년 사이에 실시하였다. 먼저 시험돈은 자연 발정주기를 매일 2회씩 관찰하였고(Control), 한 group은 발정주기의 15일경에 PG600을 피하 주사했으며(PG600), 나머지 한 group은 발정주기와 관계없이 9일 동안 20mg의 Altrenogest를 사료에 첨가 급여하였다(Altrenogest). 그후 대조구를 제외한 두 그룹은 각각 PMSG 1500 IU를 PG600 처리후 16일째에, Altrenogest 처리구는 Altrenogest 처리후 24시간에 각각 근육주사하였으며, 약 3일후 hCG 750 IU를 각 처리별로 근육주사하였다. 이 결과 대조구에서는 85%, Altrenogest는 90.1%, PG600구에서는 100%의 발정 발현율이 나타남으로써 전체 발현율로써는 처리간에 별차이가 없었으나, hCG주입후 9일내에 발정 발현정도는 대조구(25/53)에 비하여, PG600구 (47/47)가 높았다. 또한 황체수 및 회수난자수에서는 각각 대조구 12.9±1.8, 12.7±3.9, Altrenogest구 25.5±0.7, 15.0±4.2, PG600구 25.4±13.1, 19.0±12.8로 호르몬 처리간에는 별차이가 없다. 그러나 대조구에 비해서는 호르몬 처리구에서 유의적으로 ($P<0.05$) 높았으며, 정상 난자율에서는 호르몬 처리구보다 대조구에서 약간 높은 경향을 보였다. 따라서 본 연구에서 호르몬 처리에 의한 발정동기화가 효율적으로 가능하다는 것이 입증되었으며 이러한 발정동기화기술은 노동력 및 비용절감측면에서 효과가 있는 것으로 사료된다.

Ⅰ. INTRODUCTION

The synchronization of estrus in gilts would be a useful tool for the most swine production systems. An effective method of controlling the time of estrus and ovulation in swine has been investigated by researchers during the past 45 years. It would reduce labour required for estrus detection, reduce replacement gilts retained and faciliate using artificial insemination and group farrowing.

Early studies ascertained that use of exogenous hormone can influence the estrus cycle

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(Baker et al., 1954; Nellor, 1960). Many compounds, however, often caused undesirable side effects, including cystic follicles, decreased fertility, or teratogenic effects (Webel, 1978). Additional data indicate that neither ovulation nor early embryonic development are synchronous process in swine (Pope et al., 1989; Didion et al., 1990; Martin et al., 1990; Xie et al., 1990). It is clear that a great amount of variation exists throughout the chronology of events associated with estrus, ovulation, and early embryonic development in swine.

Altrenogest suppressed follicular maturation with no detectable effect on the lifespan of C.L when fed at recommend levels (15~20 mg daily). At lower doses (2.5 or 5 mg daily), follucular growth was not inhibited and incidence of cystic follicules 10 days after treatment was higher. The hormonal patterns (progesterone, estradiol, LH) did not differ during and after treatment (18 days) between a low (2.5 mg) and high dose (15 mg) except for estradiol.

Although PG600 works quite well, the percentage of gilts displaying standing estrus within 4 to 6 day could be improved. Gilts given PMSG alone following leteal regression (day 15 to 16 of the estrus cycle) show estrus 4 to 7 days later following treatment and ovulate receiving hCG (Day et al., 1965).

Thus the purpose of this study is to compare the synchronization, superovulation, and recovery of zygote among with different hormone treatments in gilts.

Ⅱ. MATERIALS AND METHODS

1. Breeding management

Gilts (205~265 days of age) penned in group feed and observed for estrus daily with a mature boar during treatments after the last feeding of altrenogest and injection of PG600. Estrus detection was performed twice daily by moving gilts in group to a pen where they were exposed to a boar. Estrus gilts have not feeding for a day before surgery.

2. Estrus synchronization

One group of gilts was synchronized by individual oral administration of 20 mg of altrenogest in approximately 2.0 kg of feed. The altrenogest was fed for 9 days and was initiated without regarding to the stage of the estrus cycle. The other group of gilts were received PG600. Immediately prior to use, the lyophilized PG600 was diluted with a sterile diluent provided by the manufacturer. The solution was injected (intramuscular injection) through a 3.8-cm, 20-gage disposable hypodermic needle into the neck behind an ear. Gilts assigned to the control group were not injected.

3. Superovulation

The superovulation of 53 cyclic gilts, were induced utilizing PMSG 1500 IU 24 hours after the last feeding of altrenogest and HCG 750 IU 72 hours later. PG600 for synchronization of estrus was administrated to approximately day 16 of estrus cycle and superovulation was induced by 1,000 IU PMSG and 750 IU HCG injection later.

Ⅲ. RESULTS

1. Days of estrus cyclic

Number of gilts exhibiting estrus after administration of hormone are summarized in Table 1. Gilts was more estrus synchronized in the short times after treatment with PG600 than altrenogest. The average interval from last day of treatment to detection of estrus 50% was 6 days. On days 4~6 and 7~9, a total of 64% of treated gilts exhibited estrus. Thirteen of 106

Table 1. Number of gilts exhibiting estrus after administration of altrenogest or PG600

(unit: herd)

Treatment	No. of gilts	No. of gilts showing estrus	Days of estrus cyclic							Non estrus
			1~3	4~6	7~9	10~12	13~15	16~18	19~21	
Control	53	45(85.0)	9	12	4	7	3	6	4	8
Altrenogest	53	48(90.1)	1	12	25	9	1	–	–	5
PG 600	47	47(100)	10	33	4	–	–	–	–	–

Day 0 was the day of last altrenogest treatment for the experimental gilts

Table 2. Superovulation response for female swine with natural estrus, altrenogest or PG600

(unit: herd)

Treatment	No. of gilts	Ovaries evaluated ($\bar{x}$)			
		No. of corpora lutea	No. of ovulated embryos	Recovery ratio(%)	Normal (%)
Control	30	12.9 ± 1.8^{b}	12.7 ± 3.9^{b}	98.3	73.1
Altrenogest	2	25.5 ± 0.7^{a}	15.0 ± 4.2^{a}	58.8	53.4
PG 600	8	25.4 ± 13.1^{a}	19.0 ± 12.8^{a}	74.8	65.8

* a,b ; values with different superscripts are significantly different, $p<0.05$

gilts fail to exhibit estrus after treatment.

All of gilts treated PG600 showed estrus within 10 day but control group was detected during the 21 days. Occurence of estrus peaked on 4 to 6 day, regardless of hormone treatments. Estrus was observed in 110 gilts (71.9%) during 1 to 9 day post-treatment.

2. The number of ovulated embryos

Superovulation response for female swine with natural estrus, altrenogest, and PG 600 are summarized in Table 2. There was a significant increase in the number of ovulations from 12.7± 3.9 in the control to 19.0±12.8 in the gilts treated with PG600, 1,500 IU PMSG and 750 IU hCG.

However normal ratio was low in treated group with altrenogest (53.4%) compared to those (73.1%) of control. Therefore, there was a significant linear correlation between ovulation rate and the number of normal embryos. Although the treated gilts with hormones had more C.L and ovulated embryos, the quality of embryos generally not good.

Ⅳ. DISCUSSION

In our present study, estrous activity started on the first day after the end of treatment, and was maximal on Days 1~3, 4~6 and 7~9 when 13.1, 37.3 and 21.6% of the animals showed estrus, respectively. Thus, 85.0% of the hormone treatment gilts were synchronized within a period of 9 days, but control group was only 47.2%. This degree of synchronization is smiliar to those reported by other authors working with the PG600 injection (Hemsworth, 1982).

Differences in responses to synchronization have been reported across geographical locations (Kraeling et al. 1981). Ova were recovered at 48 to 56 hr after the hCG injection so that only the oviducts would have to be flushed.

Ovum recovery were different of range from 58.8 to 98.3% among the treatment groups. Rampaect et al. (1976) reported ovum recoveries of 51 to 79% from the uterus; normal ovum development fo various treatment groups, based upon the appearence of cleavage varied between 14% and 69%.

Data on ovulatory response to superovulation in altrenogest treatment procedure are similiar to other published reports (Williams et al., 1992; Pinkert et al., 1989) and in PG600 treatment was higher than them. Although the number of ovulatory structures was different to that of control and hormone treatment groups, the lower total ova recovery rate may be related to inappropriate timing of surgery for ova collection.

In conclusion, we found that the hormone treatment provide adequate stimulation and synchronization of ovulation for the efficient collection of embryos. The effective method of synchronizing estrus in swine would provide procedures with useful management tool by reducing the labour required to detect estrus, faciliating the use of artificial insemination and assisting in batch farrowing.

V. SUMMARY

The purpose of this study was to examine the estrus synchronization and superovulation of pigs with hormone treatments. Three different kinds of procedures for synchronization and superovulation were used as follow: 1) gilts in natural estrus behavior (control); 2) gilts synchronized with 20mg altrenogest for 9 days regardless of the estrus cycle; 3) gilts received PG600 (400IU PMSG + 200 IU hCG) in 15 day of the estrus cycle; and then gilts administrated with PMSG (1,500 IU) and hCG (750 IU) after altrenogest and PG600 treatment for superovulation.

Estrus was checked daily with a boar, in estrus synchronization, the intervals from hormone treatment to estrus were different between PG600 (43/47) and altrenogest (13/53) within 6 days. The percentage of animals displaying a estrus response were not different by hormone treatments.

The average number of corpora lutea (C.L) and ovulated embryos were similar between PG600 25.4±13.1, 19.0±12.8 and altrenogest 25.5±0.7, 15.0±4.2, respectively, but was increased ($P<0.05$) by hormone treatment compared to that 12.9±1.8, 12.7±3.9 in the control. The number of normal embryos after ovulation was higher in the control than hormone treatment.

Therefore, these results suggest that altrenogest and PG600 treatment could be a valuable for cut down the labour and cost by synchronization.

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