Usefulness of Zeranol® in Synchronizing Breeding in Gilts

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Introduction

In the pig, administration of high doses of estrogen (5 mg/d) on days 11-15 of the estrous cycle results in pseudopregnancy, i.e., maintenance of the corpora lutea following ovulation (Frank et al., 1977). In addition, Zavy et al. (1988) demonstrated that the administration of prostaglandin-F2α ($PGF_2\alpha$) to pseudopregnant gilts resulted in regression of corpora lutea (CL) and the synchronization of estrus. More recently, Pusateri et al. (1996) reported that much lower doses of estradiol-17β could induce long-term pseudopregnancy in gilts.

Zeranol has been reported to possess about 14% of the affinity of estradiol-17β for the estrogen receptor (Katzenellenbogen et al.,1979). It was of interest to examine whether treatment of gilts with implants containing zeranol could induce pseudopregnancy in gilts. Zeranol is the active component of Ralgro®, a growth promoting implant for cattle and sheep. Inducement of pseudopregnancy by zeranol followed by regression of induced CL by $PGF_2\alpha$ could provide a useful tool for swine producers to synchronize breeding in their gilt replacement pool.

Materials and Methods

Crossbred gilts (171 ± 0.3 d, 240.6 ± 3.1 lb) were blocked by weight and ancestry to control (n = 40) or treatment (n = 40) groups. As shown in Figure 1, treated gilts received 500 IU of human chorionic gonadotrophin (hCG) and a Ralgro implant (36 mg) on day 0. All gilts were checked once daily for estrus beginning on d-3. On d 42, treated gilts received two 10 mg injections of Lutalyse ($PGF_2\alpha$) spaced 6 h apart. Treated gilts not displaying estrus within 7-d of the first administration of $PGF_2\alpha$ received two additional 10 mg injections of PG spaced 6 h apart on d- 49. Gilts detected in estrus on d 45-58 were inseminated twice, 24 h apart, with pooled semen via AI. Blood samples were obtained on d 0, 7, 18 and 42 and assayed for serum progesterone. Ten control gilts and 10 treated gilts not displaying estrus during the breeding period (d 45-58) were slaughtered on d 73. Ovarian weights, the number of follicles ≥ 4 mm, uterine weight and the length of the uterine horns were measured. Bred gilts were slaughtered on d 58-62 of gestation (d 105, 110 and 115 of the experiment). The number of CL, number of fetuses, fetal lengths and fetal weights were determined.

Results

1. Adminstration of 500 IU of hCG induced 80% of the gilts to ovulate within 7 days, as suggested by serum progesterone concentrations >1 ng/mL (Table 1).
2. Zeranol appeared to maintain hCG-induced CL in some treated gilts. Forty-five percent of treated gilts versus 0% of control gilts maintained elevated progesterone concentrations on d 7, 18 and 42 after hCG ($P < 0.0001$).
3. Treatment with hCG + zeranol followed by regression of the induced CL with PGF2α did not increase the proportion of gilts available for breeding. Twenty one of 39 treated versus 18/40 control gilts were detected in estrus on d 45-58 of the experiment.

4. Zeranol implants appeared to inhibit gonadotropin secretion in cyclic as well as pregnant gilts, as suggested by reduced ovarian weights at slaughter in cyclic and pregnant gilts and fewer ovarian follicles $\geq$ 4 mm in cyclic gilts (Tables 2 and 3).
5. Zeranol treatment reduced the number of fetus, fetal weight, fetal length and fetal survival at d 58-60 of gestation (Table 3).

Conclusions

1. Treatment of peripubertal gilts with 500 IU of hCG and zeranol (36 mg) failed to induce pseudopregnancy in the majority of gilts.
2. Treatment with a combination of hCG and zeranol followed by $PGF_2\alpha$ to regress the resulting CL did not produce significant estrous synchronization.
3. At a dose of 36 mg, zeranol ear implants exerted deleterious effects upon fetal development and survival in gilts bred at 6 to 8 weeks after implantation.

Application

A reduction in fetal development and survival in gilts utilizing zeranol implants limits the usefulness of this synchronizing tool. Perhaps a lower dose of zeranol in the implant may achieve the goal of synchronizing estrus and maintaining the desired litter size of the swine operation.

References

Frank et al., Prostaglandins 14:1183-1196, 1977.

Katzenellenbogen et al., Endocrinology 105:33-40, 1979.

Pusateri et al., Biology of Reproduction 55:582-589, 1996.

Zavy et al., Theriogenology 30:721-732, 1988.

Table 1. Gilts with elevated serum progesterone concentrations following administration of hCG and zeranol in peripubertal gilts[a b]

	Day of Experiment			
	0	**7**	**18**	**42**
Control	0/40 (0%)	0/40 (0%)	11/40 (27.5%)	12/40 (30.0%)
Treated	1/40 (2.5%)	31/39* (79.5%)	33/39 (84.6%)	21/39 (53.4%)
P <	NS	0.0001	0.0001	0.05

[a] Serum progesterone concentrations >1 ng/ml.
[b] hCG (500 IU) and zeranol (36 mg) were administered on d 0 in treated gilts.
* One gilt died on d 1.

Table 2. Effects of zeranol on uterine and ovarian parameters in non-cyclic peripubertal gilts[a]

	n	**Ovarian wt, g**	**# Follicles, = 4 mm**	**Uterine wt, g**	**Uterine Length[b], mm**
Control	7	8.3	11.1	221	119
Treated	6	5.8	0.5	329	131
	SE	0.8	3.6	69	8
	P <	0.06	0.06	NS	NS

[a] Gilts were slaughtered on d 72 of the experiment.
[b] Total length of both uterine horns.

Table 3. Effects of zeranol on fetal and ovarian parameters at d 58-62 of gestation[a]

	n	**CL #**	**CL wt, g**	**Fetuses, #**	**Fetal wt, g**	**Fetal length, mm**	**Fetal survival, %**
Control	16	15.5	8.2	12.0	120.5	131.5	78.0
Treated	16	16.6	7.2	7.5	83.3	116.5	44.8
	SE	0.7	0.3	0.8	5.3	2.9	4.4
	P <	NS	0.05	0.001	0.0001	0.001	0.0001

[a] Gilts were slaughtered on days 105, 110 and 115 of the experiment.
Zeranol (36 mg) was implanted on d 0 in treated gilts.

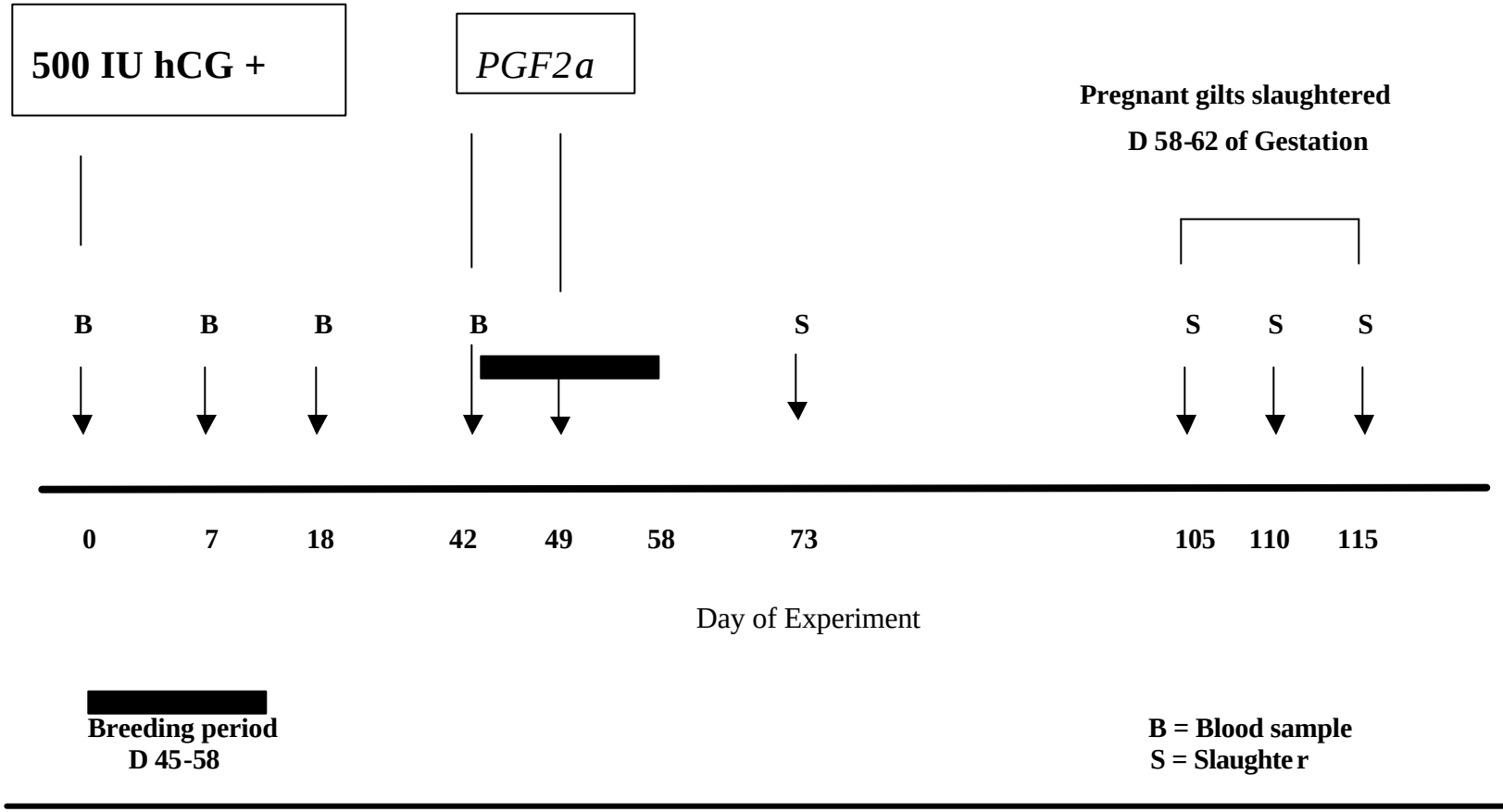

Figure 1. Experimental Design