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EFFECTS OF FLUSHING, ALTRENOGEST, AND PUBERTAL STATUS ON LITTER TRAITS IN GILTS[1]

M.T. Rhodes, D.L. Davis, and J.S. Stevenson

Summary

We tested the effects of flushing (3.4 lb extra ground sorghum grain for at least 10 days before estrus) and estrous synchronization with altrenogest on litter traits in gilts. Altrenogest had no effect on litter size or weight, but flushing increased both traits. The response to flushing occurred entirely among gilts artificially inseminated at the pubertal estrus. Pubertal gilts represented approximately 40% of the gilts in our experiment, and their improvement in litter size was almost two pigs. When all gilts were considered, flushing improved litter size by .9 pigs.

Introduction

Litter size is generally less for replacement gilts than for the older sows in a herd. Smaller litters can be attributed mainly to fewer eggs released at ovulation (ovulation rate) by young females. Two strategies have been employed widely to improve ovulation rates for gilts: 1) delaying breeding until a later postpubertal estrus and 2) increasing feed intake before breeding. This report describes an experiment that compares the effects of pubertal status and flushing on litter size in gilts in which their breeding estrus was either synchronized by feeding altrenogest[1], a synthetic progestogen, for 14 days or was not synchronized (no altrenogest) prior to breeding.

Procedures

Chester White x Yorkshire x Duroc gilts with an average weight of 237 lb were utilized in a series of eight trials. Gilts were moved from an indoor finishing barn to outside pens and given 3 to 5 days of fenceline contact with two mature boars. Twenty-one days after their initial move, gilts were weighed, ear tagged, moved to a confinement breeding barn where they were placed in 21 in x 66 in individual stalls, and allotted to treatments. Littermates were distributed across treatments when possible.

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[1]The authors appreciate the generous donation of altrenogest by Rousel-Uclaf, Paris, France. Altrenogest is a synthetic hormone and is not available to swine producers at this time.

Each gilt was fed either 15 mg altrenogest per day for 14 days in 4 lb of a complete gestation diet or diet with no altrenogest (control). One-half of the gilts receiving each altrenogest treatment (0 or 15 mg/day) were fed an additional 3.4 lb of ground sorghum grain (flush treatment) beginning the ninth day of altrenogest treatment and continuing until estrus. This resulted in control, altrenogest, flush, and altrenogest + flush treatments. Before feeding each day, feed not consumed the previous day was weighed and discarded. Blood was collected twice (10 days between collections) and assayed for progesterone to classify gilts as pubertal (first estrus) or postpubertal (second or later estrus) at breeding, based on the concentration of progesterone in their blood serum. Progesterone concentrations greater than 2 nanograms (ng)/cc in either sample indicated that a gilt had ovulated previously at least once, and she was considered to be postpubertal at breeding. A progesterone concentration less than 2 ng/cc in both samples indicated that the gilt had not reached puberty, and if she exhibited estrus during the breeding period, she was considered to have been bred at the pubertal estrus.

Estrous detection was conducted twice daily (0800 and 1600 hr) for 10 days after the last altrenogest treatment, and estrous gilts were inseminated artificially (AI) with semen from at least two boars at 8 to 16 hr and again at 24 hr after the first detected estrus. Flushing was discontinued after estrus was detected, to avoid possible detrimental effects of high feed intake on embryo survival.

Results

Altrenogest treatment had no effect on the number of pigs born or litter weight at farrowing (table 1). However, flushing increased ($P=.06$) the number of pigs farrowed, the total weight of all pigs born ($P<.05$), and pigs born alive ($P=.05$). These effects of flushing were limited to gilts inseminated at the pubertal estrus (table 2). Therefore, gilts experiencing their pubertal estrus at AI farrowed fewer ($P<.06$) pigs than gilts inseminated at puberty that had received the flush treatment before breeding. The latter gilts (flushed and AI at puberty) farrowed litters equivalent in size and weight to gilts inseminated at their second or later estrus.

Discussion

In an earlier experiment, we found that the combination of flushing and altrenogest increased litter size compared to receiving no treatment or only altrenogest. Because that experiment did not include gilts that were flushed but not given altrenogest, we could not determine whether the effects on litter size were due only to flushing, or if the combined treatment of altrenogest and flushing was required. Our present experiment demonstrates that flushing alone produces the full response in litter size.

We also found previously that the altrenogest and flushing treatment was only effective in improving litter size for gilts bred at puberty. Our present study confirms that observation, because flushing pubertal gilts resulted in an increase of nearly two pigs, but had no effect on the litters of postpubertal gilts (table 2). Therefore, it appears that flushing increases litter size because the unstimulated ovulation rates of gilts at puberty are not sufficient to challenge the biological

capacity of their uteri to support fetuses to farrowing. In contrast, gilts bred at a postpubertal estrus were likely already ovulating enough eggs to challenge their uteri and additional eggs released because of flushing could not be supported to farrowing. Because nearly 40% of the gilts in our experiment were inseminated at puberty (table 2), effects of flushing also were apparent when expressed over all gilts (both pubertal and post pubertal). Therefore, the benefits of flushing in a particular herd will likely depend upon the proportion of pubertal gilts among replacement gilts at mating.

Table 1. Effects of Altrenogest and Flush Treatments on Litter Traits in Gilts

	No Flush		Flush	
Item	No Altrenogest	Altrenogest	No Altrenogest	Altrenogest
No. of gilts farrowing	32	47	35	49
No. of pigs born[a]	8.9	9.5	10.3	10.0
Litter weight, lb[b]	22.9	24.8	26.9	27.1
No. of pigs born alive	8.0	8.6	9.0	9.0
Weight of live pigs, lb[c]	21.7	22.6	24.4	25.2
No. of mummified fetuses[d]	.03	.15	.27	.07

[a]Flushed gilts farrowed more (P=.06) pigs.

[b]Flushed gilts farrowed heavier (P<.05) litters.

[c]Flushed gilts farrowed more (P=.05) pounds of live pigs.

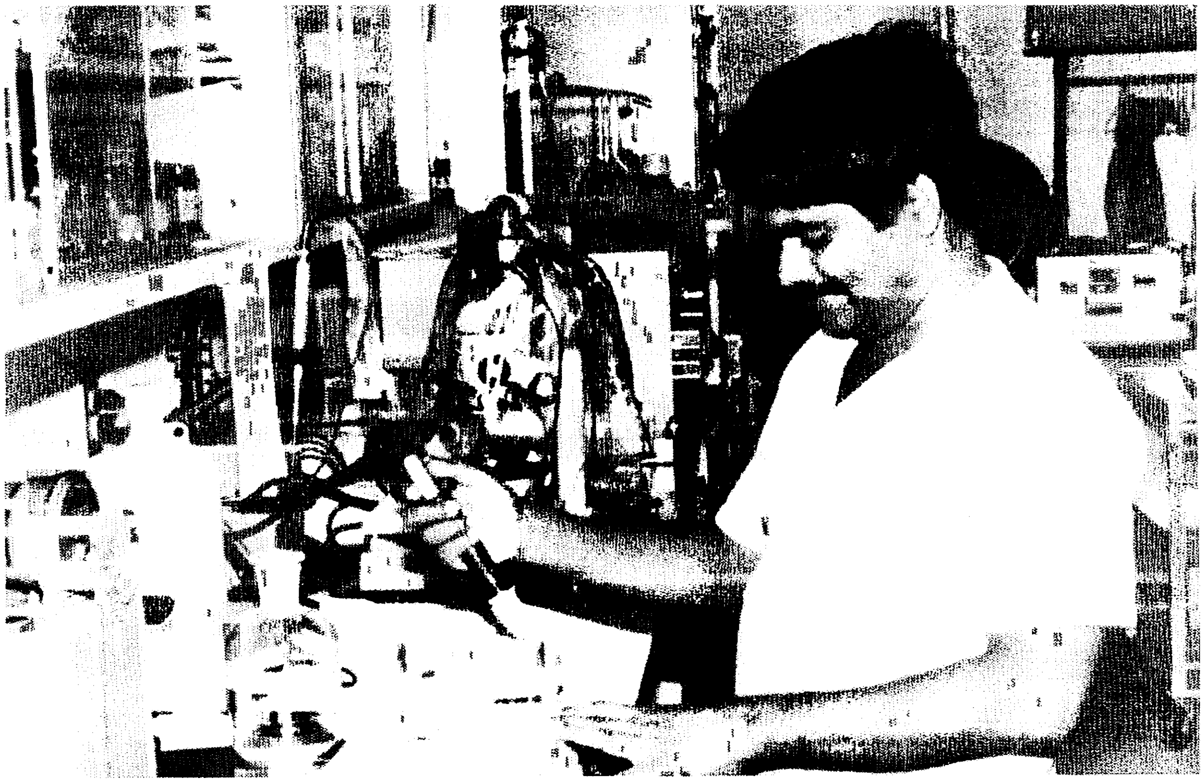
[d]Flush by altrenogest interaction (P<.05).

Table 2. Flushing Effects on Litter Traits of Pubertal and Postpubertal Gilts

Item	Pubertal[a]		Postpubertal	
	No Flush[b]	Flush	No Flush	Flush
No. of gilts farrowing	34	29	43	54
No. of pigs born	8.4	10.3	10.1	9.9
Litter weight, lb	21.9	27.4	25.7	26.6
No. of pigs born alive	7.6	9.3	9.0	8.7
Weight of live pigs, lb	20.2	25.6	24.1	24.0
No. of mummified fetuses	.09	.12	.09	.22

[a]Pubertal gilts were inseminated at their first estrus and postpubertal gilts at their second or later estrus after puberty.

[b]Gilts inseminated at puberty and not flushed farrowed fewer (P=.05) pigs, fewer (P<.10) live pigs and fewer pounds of total (P<.10) and live (P<.10) pigs.



Bibhash Paria, post doctoral research associate in swine physiology, pipettes culture media in the laboratory.