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Flushing affects secretion of the hormones controlling reproduction

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FLUSHING AFFECTS SECRETION OF THE HORMONES CONTROLLING REPRODUCTION¹

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Summary

Nineteen gilts were assigned to receive either 0 or 15 mg altrenogest/day for 14 consecutive days. On the day corresponding to the last altrenogest treatment, gilts not fed altrenogest were injected twice (morning and evening) with prostaglandin $F_{2\alpha}$ to ensure regression of their corpora lutea. From the ninth day of altrenogest treatment until estrus, one-half of each altrenogest group was offered an additional 3.4 lb of ground sorghum grain (flush). Serial blood samples were collected for a 4-h period each day from day 1 through day 4 (last altrenogest or prostaglandin $F_{2\alpha}$ treatment was day 0) and analyzed for estradiol-17 β , progesterone, follicle-stimulating hormone (FSH) and luteinizing hormone (LH). Flushing resulted in an increased ovulation rate (16.3 vs 13 corpora lutea) and a shortened interval to estrus (5 vs 5.9 days). Altrenogest treatment resulted in an increased interval to estrus (5.8 vs 5.1 days). The data were analyzed relative to estrus using days -5, -4, -3 and -2 before first standing estrus (day 0). Altrenogest increased estradiol by 1.5 pg/ml and decreased progesterone by .9 ng/ml, whereas flushing increased ($P<.05$) progesterone by .6 ng/ml and concentration of FSH by 1.6 ng/ml.

These data point to changes in FSH and(or) P as likely hormonal causes for increased ovulation rates in flushed gilts.

Introduction

It is well established that increasing feed intake for 10 to 14 days before breeding increases the number of eggs produced. This practice, termed flushing, has not been applied generally by swine producers because it has not increased consistently litter size. Our recent work indicated that consistent improvement in litter size can be attained if feed intake is reduced to 4 lb/day as soon as gilts are detected in estrus. As a part of our studies on flushing, we investigated the effects of treatment on secretion of reproductive hormones by gilts that were either treated or not treated with the estrous-synchronizing hormone, altrenogest.

¹We gratefully acknowledge the donation of altrenogest (Regu-mate®) and partial support of this research by Roussel-UCLAF, Paris, France. Altrenogest is an experimental hormone and is not available to swine producers at this time.

Procedures

Nineteen nulliparous gilts were assigned to receive either 0 or 15 mg altrenogest/day for 14 consecutive days. From the ninth day of altrenogest until estrus, one-half of each altrenogest group was offered 3.4 lb of ground sorghum grain (flush) in addition to the 4 lb of a basal diet fed each day. These groupings provided the following treatments: 1) control (n = 4), 2) altrenogest (n = 4), 3) flush (n = 5), and 4) altrenogest plus flush (n = 6).

On the last day of altrenogest treatment, those gilts receiving the 0 mg dose of altrenogest were given 25 mg prostaglandin $F_{2\alpha}$ (PGF) in two injections (0700 h, 15 mg and 1900 h, 10 mg) to ensure luteolysis.² All gilts were fitted with indwelling anterior vena cava catheters on the 11th or 12th day of altrenogest treatment. Blood samples were collected every 15 min from 1200 to 1600 h on day 1 through day 4 after the last altrenogest treatment or PGF injection. An individual sample taken at the same time each day from each gilt was analyzed for concentrations of progesterone in serum. Each 15-min sample was analyzed for serum follicle stimulating hormone (FSH) and luteinizing hormone (LH). After all samples had been analyzed for FSH and LH, samples within each day for each gilt were pooled to be analyzed for serum estradiol-17 β . Data were analyzed statistically for daily concentrations of estradiol, progesterone, average FSH, average LH, and LH secretion characteristics (number of peaks, baseline concentration, peak amplitude, and peak duration). Interval from last altrenogest treatment or from PGF injection to estrus was calculated and number of corpora lutea was determined by midventral laparotomy on day 11 to 15 after estrus.

Results

Flushing resulted in an increased ($P=.06$) ovulation rate (16.3 vs 13 corpora lutea, Table 1) and a shortened ($P<.01$) interval to estrus (5 vs 5.9 days.) Altrenogest treatment resulted in an increased ($P<.01$) interval to estrus (5.8 vs 5.1 days). The hormonal data were analyzed as days -5, -4, -3 and -2 before estrus (day 0). Altrenogest treatment increased ($P<.05$) estradiol by (1.5 pg/ml) and decreased ($P<.01$) progesterone by .9 ng/ml whereas flushing increased ($P<.05$) progesterone by .6 ng/ml (Fig. 1) and the concentration of FSH by 1.6 ng/ml (Fig. 2) in serum. These data point to changes in FSH and (or) progesterone as likely hormonal causes for increased ovulation rates in flushed gilts.

Discussion

Our results indicate that the pattern of hormone secretion is altered in flushed gilts. Changes attributable to altrenogest treatment also were detected but these altrenogest-induced changes did not affect the number of eggs produced. More work is required to establish exactly how the changes in FSH and/or progesterone affected the ovulation rate. As this information becomes available it will be possible to develop improved methods for stimulating high ovulation rates. Our previous observations (1984 Swine Day Report, p. 9) indicate this will increase the number of pigs born, particularly for gilts bred at their first estrus after puberty.

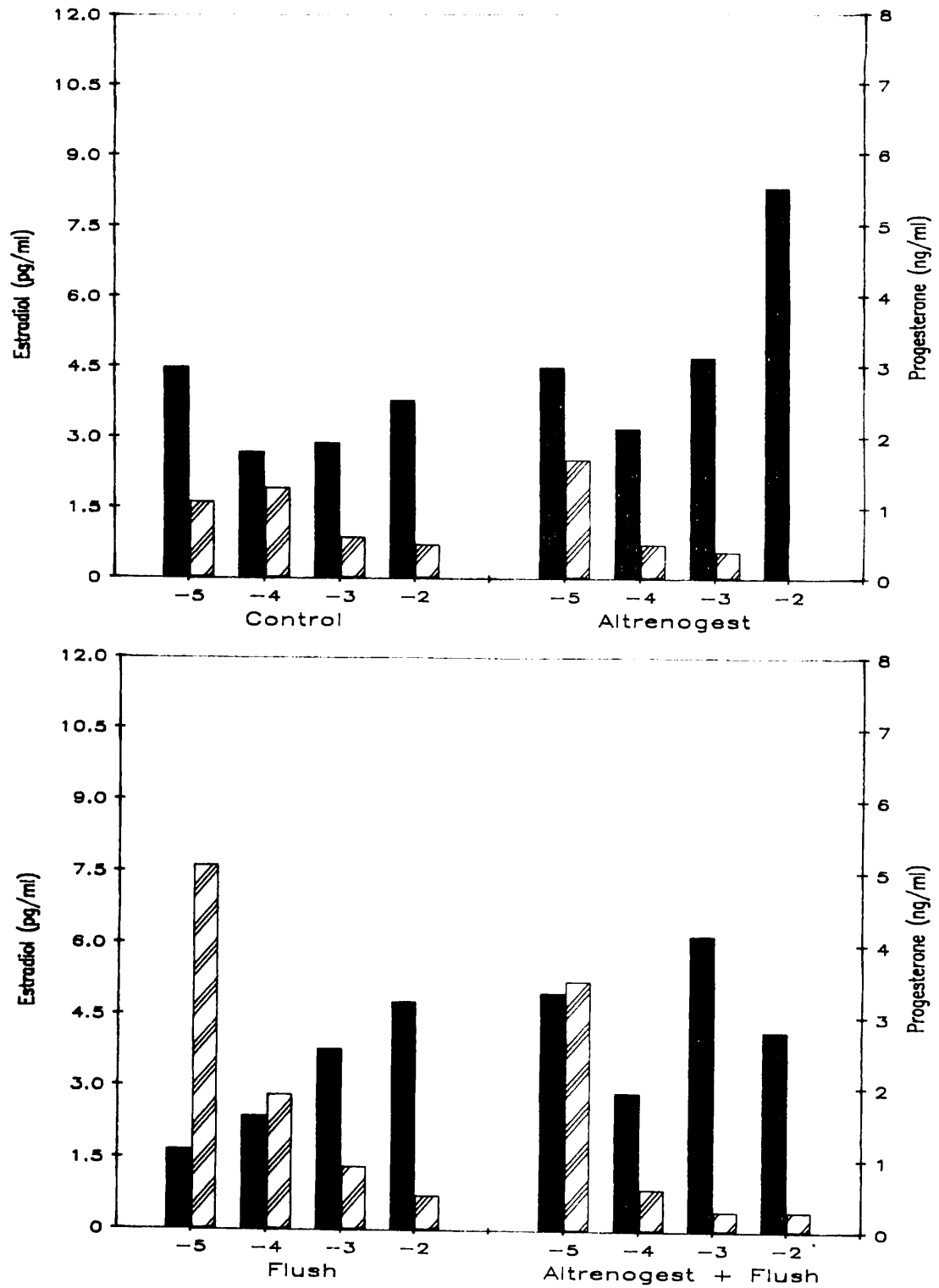


Fig. 1. Concentrations of estradiol (solid bars) and progesterone (hatched bars) in serum on days -5, -4, -3, -2 before the estrus (day 0) following altrenogest or injection of prostaglandin $F_2 \alpha$.

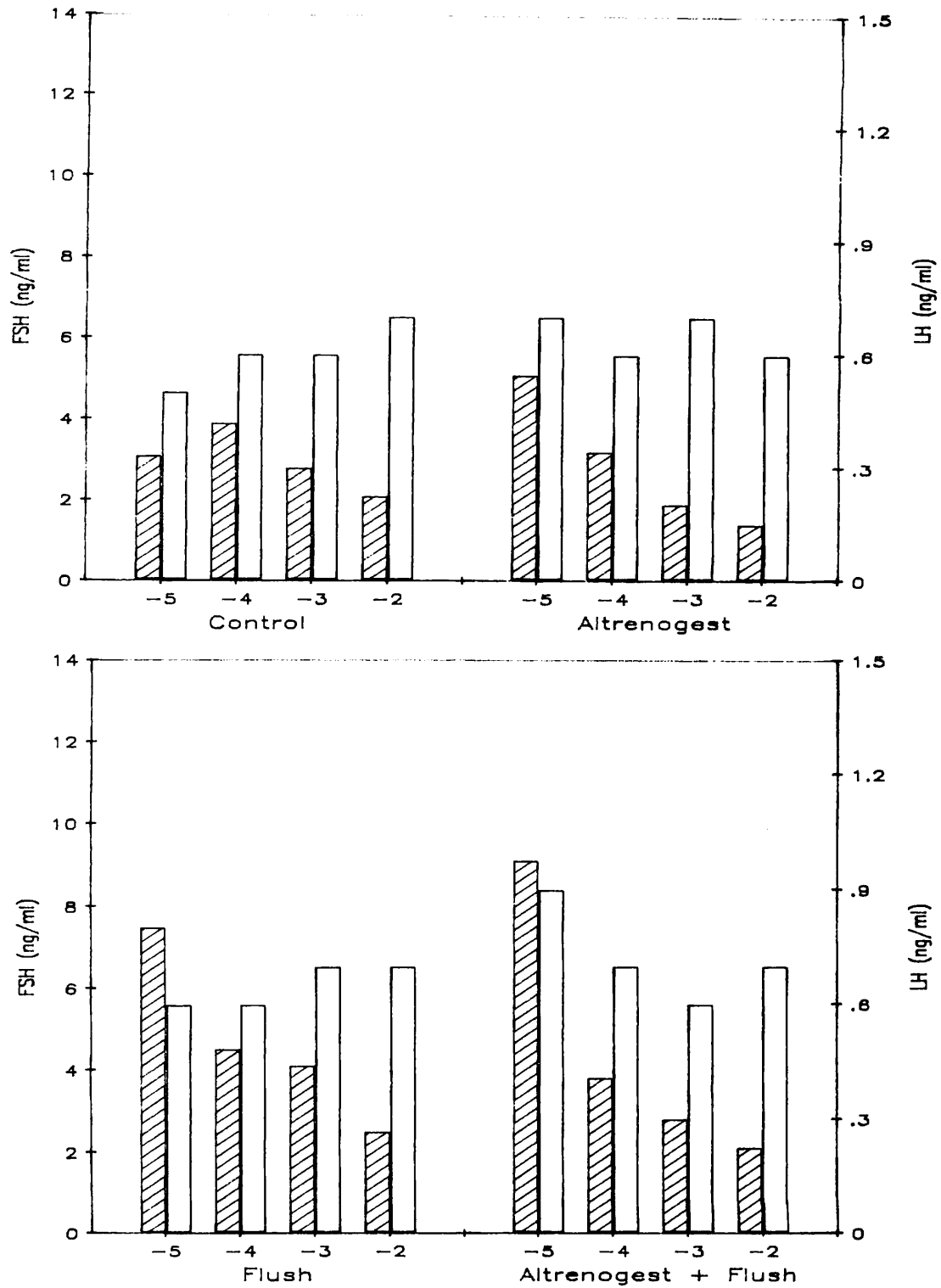


Fig. 2. Concentrations of FSH (hatched bars) and LH (open bars) in serum on days -5, -4, -3, -2 before estrus (day 0) following altrenogest or injection of prostaglandin $F_{2\alpha}$.

Table 1. Number of Corpora Lutea and Interval to Estrus after Altrenogest Treatment or PGF Injection^a

Variable	Treatment Group								Main Effects	
	Control		Altrenogest		Flush		Altrenogest + flush		Flush - no flush	Altrenogest - no Altrenogest
No. of Gilts	4		4		5		6		--	--
No. 8 corpora lutea	12.5	1.7	13.5	1.7	16.8	1.5	15.8	1.4	3.3 ^b	.02
Interval to estrus (d)	5.3	.3	6.5	.3	4.8	.3	5.2	.2	-.9 ^c	.8 ^c

^aLeast squares means.

^bP = .06.

^cP < .01.