

Comparison of Estradiol-17 β , Progesterone and Litter Size among Primiparous Sow Breeds Weaned after Lactation for 7 or 21 Days*

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ABSTRACT

This study was carried out to find out the changes on serum concentrations of estradiol-17 β , progesterone in primiparous Duroc, Landrace and Yorkshire sows weaned at 7 or 21 days. Also, we compared the litter size at birth and weaning among the breeds weaned after lactation for 7 or 21 days. The estradiol-17 β concentrations among the breeds were 6.9~8.8 pg/ml and 6.4~8.8 pg/ml after lactation for 7 or 21 days, respectively. The progesterone concentrations ranged from 0.3 ng/ml to 1.6 ng/ml. Duroc sow showed higher progesterone concentration compared with Landrace and Yorkshire sows weaned after lactation for 7 or 21 days. Also, we found out that litter size at birth and weaning, respectively, did not show any differences between day 7 and day 21 of lactation. From the facts mentioned above, it was suggested that very early weaning systems could work with no apparent adverse effect on prolificacy.

(Key words : Estradiol-17 β , Progesterone, Litter size, Primiparous sow)

I. INTRODUCTION

As lactation length is reduced, most authors agree there is a concomitant reduction in the number of piglets born per litter in the next parity (Aumaitre, 1972; Cole et al., 1975).

Varley (1979) has concluded the 3-week weaned sow probably incurs a reduction of up to 0.2 piglets per litter in prolificacy and Varley and Cole (1976a, b) have shown that a sow weaned at 7~10 days

post partum will show a decrease of between 1.5 and 2.0 piglets per litter at the next farrowing.

Despite these reports there have been commercial reports (Pay, 1973; Looker, 1974) suggesting that very early weaning systems can work with no apparent adverse effect on prolificacy. Some of this discrepancy may be accounted for by differences in feeding systems but Varley and Cole (1976a) have observed that varying the feed plane from 2 to 4 kg/day in lactation and from weaning to service has no effect on prolificacy for the early weaned sow.

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Varley and Cole (1976b) have shown that ovulation rate is unaffected by lactation length but the ability of embryos to survive the first 3 weeks of gestation is very severely impaired by subjecting sows to a very short lactation.

Since the extent to which these hormonal changes occur when lactation is very short is not known, we have monitored the changes in serum concentrations of estradiol-17 β and progesterone in Duroc, Landrace and Yorkshire sows weaned at 7 or 21 days of lactation. Also, we compared the litter size at birth and weaning among the breeds weaned after lactation for 7 or 21 days.

II. MATERIALS AND METHODS

1. Experimental Animals

This study was performed with 96 primiparous Duroc, Landrace and Yorkshire sows kept at Livestock Experiment Station and Chungnam National University. The average breeding age, weight and backfat thickness of gilts were 212.7~224.0 days, 123.2~139.8 kg, 15.1~15.6 mm, respectively. During gestation all sows were kept indoors. During the first 30 days after breeding, gilts were kept in pens, three or four animals per pen. Then, the gilts were transferred to individual gestation installs. One week before expected farrowing all gilts were moved to individual farrowing pens, where they remained during the lactation.

During gestation the gilts were fed 2.4 kg per day (2.96 Mcal/kg, 16% crude protein) and during lactation all gilts were fed a wet diet (3.34 Mcal/kg, 17% crude protein) *ad libitum*, three times per day. Litter size was the actual number of piglets born or weaned alive per sow.

2. Blood Collection and Analysis

Blood samples were obtained at 10 a.m. of the next day weaned after lactation for 7 or 21 day by

inserting a 21-gauge, hypodermic needle attached to 10 ml syringe through surface vein in the ear. Blood samples were allowed to clot at 4°C and serum was obtained by centrifugation. Serum was kept at -20°C until assayed.

3. Hormone Analyses

Serum estradiol-17 β and progesterone concentrations were determined using an enzyme immunoassay kit (Amerlite, Kodak Clinical Diagnostics Ltd., Amersham, England). The kit was used according to the manufacturers instructions with modifications as described by Rojkittikhun et al. (1993). The intra-assay coefficients of variation, based on the precision profiles of 20 assays, were 10.3 and 5.6% for low and high progesterone concentrations, respectively. The corresponding inter-assay co-efficients of variation were 8.0% and 7.1%. The intra-assay coefficients of variation were 21.2 and 6.8% for low and high estradiol-17 β concentrations, respectively. The corresponding inter-assay coefficients of variation were 21.8 and 7.1% for low and high assay controls, respectively. The sensitivity was below 1 pmol/l and 2 nmol/l for the estradiol-17 β and progesterone assay, respectively.

4. Statistical Analysis

All analyses were performed using the SAS software package (1996). Duncan's multiple range test and student's t-test were used to compare mean value of individual treatments, when the F-value was significant ($P < 0.05$).

III. RESULTS

1. Comparison of Breeds and Estradiol-17 β in Sows Weaned after Lactation for 7 or 21 Days

As shown in Table 1, serum concentrations of estradiol-17 β did not show any differences between

day 7 and day 21 of lactation. Also estradiol-17 β concentrations were no differences among the Duroc, Landrace and Yorkshire sows after lactation for 7 or 21 days, respectively. The estradiol-17 β concentrations among the breeds were 6.9~8.8 pg/ml and 6.4~8.8 pg/ml after lactation for 7 or 21 days, respectively.

2. Comparison of Breeds and Progesterone in Sows Weaned after Lactation for 7 or 21 Days

As shown in Table 2, serum progesterone concentrations were higher in Duroc sow compared with Landrace and Yorkshire sows weaned after lactation for 7 or 21 days, respectively. The serum concentrations of progesterone did not show any

differences between day 7 and day 21 of lactation.

3. Comparison of Litter Size at Birth and Weaning among Breeds Weaned after Lactation for 7 or 21 Days

As shown in Table 3, litter size at birth and weaning, respectively, did not show any differences between day 7 and day 21 of lactation. There were no differences on litter size at birth and weaning among the Duroc, Landrace and Yorkshire.

IV. DISCUSSION

The present study confirmed that serum concentrations of estradiol-17 β and progesterone, and

Table 1. Comparison of breeds and serum concentrations of estradiol-17 β in primiparous sows weaned after lactation for 7 or 21 days

Breed	Estradiol-17 β , pg/ml ¹	
	Day 7 of lactation	Day 21 of lactation
Duroc	8.8±1.4 (15) ²	8.8±1.6 (18) ²
Landrace	6.9±0.7 (14)	6.8±0.5 (15)
Yorkshire	7.5±1.0 (16)	6.4±1.4 (18)

¹ Mean±SE.

² Figures in the parentheses indicate the number of primiparous sow.

Table 2. Comparison of breeds and serum concentrations of progesterone in primiparous sows weaned after lactation for 7 or 21 days

Breed	Progesterone, pg/ml ¹	
	Day 7 of lactation	Day 21 of lactation
Duroc	1.6±0.5 ^a (15) ²	1.3±0.4 ^a (18) ²
Landrace	0.3±0.1 ^b (14)	0.3±0.1 ^b (15)
Yorkshire	0.4±0.2 ^b (16)	0.3±0.1 ^b (18)

¹ Mean±SE.

² Figures in the parentheses indicate the number of primiparous sow.

^{ab} Means with different letters within the same column differ significantly (P<0.05).

Table 3. Comparison of litter size at birth and weaning among breeds weaned after lactation for 7 or 21 days

Breed	Litter size at birth ¹		Litter size at weaning ¹	
	Day 7 of lactation	Day 21 of lactation	Day 7 of lactation	Day 21 of lactation
Duroc	9.9±1.0 (15) ²	8.8±0.4 (18) ²	9.1±0.9 (15) ²	7.9±0.5 (18) ²
Landrace	9.5±0.7 (14)	9.3±0.8 (15)	9.1±0.5 (14)	8.6±0.6 (15)
Yorkshire	10.9±0.6 (16)	9.2±0.7 (18)	10.9±0.6 (16)	8.1±0.6 (18)

¹ Mean±SE.

² Figures in the parentheses indicate the number of primiparous sow.

litter size in primiparous sows weaned after lactation for 7 or 21 days did not show any differences. Also, we confirmed that the litter size at birth and weaning, and the serum concentrations of estradiol-17 β except progesterone did not differ among the primiparous Duroc, Landrace and Yorkshire sows. The decline in plasma estrogen concentrations coincident with the LH surge is consistent with the reported ability of LH to terminate estrogen secretion in other species and with observations from cyclic sows at estrus (Van de Wiel et al., 1981; Foxcroft and Van de Wiel, 1982).

Plasma levels of progesterone decrease sharply around the time of parturition and remain low throughout lactation (Ash and Heap, 1975; Baldwin and Stabenfeldt, 1975; Parvizi et al., 1976).

Varley (1976) has observed that difference may exist in the response of plasma progesterone to different lactation lengths. The 42-day weaned group follows very closely the 7-day weaned group until 10 days post coitum but then plasma progesterone for the 7-day weaned sows drops away much faster than for the 42-day group up to day 20 post coitum. In this study, serum concentrations of progesterone in primiparous sows weaned after lactation for 7 or 21 days did not differ but progesterone concentrations were higher

in Duroc sow than in Landrace and Yorkshire sows. Although progesterone concentrations were different among the breeds, the concentrations were baseline levels.

Varley (1979) has concluded that the 3-week weaned sow probably incurs a reduction of up to 0.2 piglets per litter in prolificacy. Varley and Cole (1976a, b) reported that a sow weaned at 7~10 days post partum showed a decrease of between 1.5 and 2.0 piglets per litter at the next farrowing. However, Pay (1973) and Looker (1974) reported that very early weaning systems worked with no apparent adverse effect on prolificacy. Varley and Cole (1976a) have observed that varying the feed plane from 2 to 4 kg/day in lactation and from weaning to service has no effect on prolificacy for the early weaned sow.

In conclusion, this study has not demonstrated any differences on serum concentrations of estradiol-17 β and progesterone, and litter size in primiparous Duroc, Landrace and Yorkshire sows weaned after lactation for 7 or 21 days.

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