1997

Effect of Early Weaning on Sow Reproductive Performance — A Review

Donald G. Levis
University of Nebraska - Lincoln, dlevis1@unl.edu

Effect of Early Weaning on Sow Reproductive Performance — A Review

Donald G. Levis[1]

Summary and Implications

A review of literature was conducted to evaluate the effects of lactation length on reproductive performance of sows. As lactation length decreases there is an increase in the weaning-to-estrus interval, a decrease in farrowing rate, a decrease in subsequent litter size and an increase in pigs weaned per sow per year. Because of herd-to-herd differences in the influence of lactation length on reproductive performance, it is advised that each farm conduct a preliminary study to evaluate the effect of the considered lactation length before implementing the "new" weaning age of piglets.

Introduction

Weaning pigs earlier than 21-days of age has become a popular practice in pork production because segregated early weaning has prevented vertical transmission of some diseases pigs encounter from their mothers. Nursery mortality can be less than 1.5% when segregated early weaned pigs are weaned into an off-site, single-stage nursery and provided nutrient-rich, highly palatable diets. In addition, the growth performance of early weaned pigs can be in excess of .44 lb per day during the first week after weaning and over .88 lb per day from weaning to 10 weeks of age. Although performance of pigs is enhanced by using segregated early weaning, reproductive performance may be compromised when sows lactate for less than 21 days.

Weaning-To-Estrus Interval

Seven scientifically controlled experiments indicate the weaning-to-estrus interval (WEI) decreased as lac-

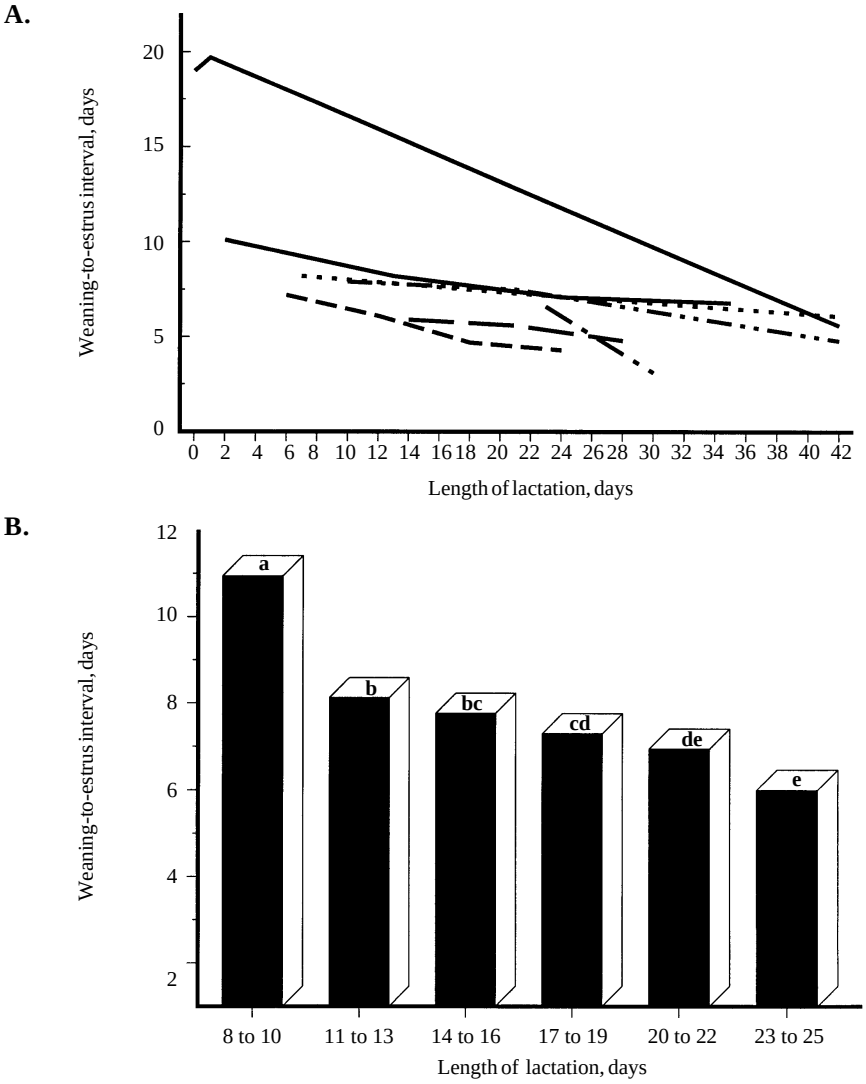

Figure 1. The influence of lactation length on weaning-to-estrus interval (Panel B from Dial et al., 1995, University of Minnesota). Columns with different letters differ (P < .05).

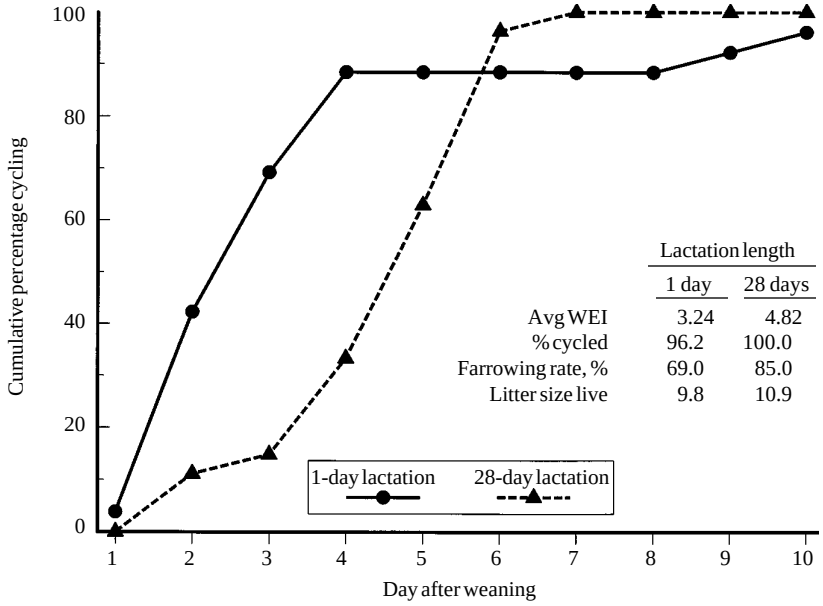

Figure 2. Cumulative percentage of weaned sows cycling after a 1- or 28-day lactation.

tation length increased (Figure 1A). An analysis of PigCHAMP® data found the relationship between lactation length and WEI to be curvilinear when lactation ranges from eight to 25 days (Figure 1B). Sows weaned at eight to 10 days of lactation had a significantly greater WEI than sows weaned at 11 to 25 days lactation. Sows weaned at 14 to 16 days of lactation had a significantly greater WEI than sows weaned at 20 to 25 days of lactation. Some producers wean sows shortly after birth (at birth to two days after birth) to maximize the number of piglets nursing each sow in the farrowing facility. The WEI for multiparous sows weaned within 24 hours after farrowing has ranged from 3.2 to 19.7 days. A problem that has occurred when sows are weaned within 24 hours of farrowing is the formation of cystic follicles. Cystic follicles occur in sows weaned within 24 hours of giving birth because both luteinizing hormone (LH) and follicle stimulating hormone (FSH) have not been suppressed. It takes two to three days of nursing by the litter to suppress LH and FSH. Sows having cystic follicles are characterized by one or more of the following: (1) prolonged and unpredictable return to estrus, (2) constant estrus, (3) prolonged anestrus and (4) irregular estrus. Scientific literature on how parity affects the WEI in sows weaned at less than 2 days of lactation could not be located.

The WEI is influenced by average daily feed intake during lactation. Sows eating an average of less than 9.2 lb of feed per day during a 10- to 19-day lactation have a longer WEI than sows eating an average of 9.2 to 12.5 lb of feed per day. The WEI for lactation lengths of 10 to 19 days is similar when sows eat an average of 12.5 lb or more per day. A scientifically controlled study in Australia indicated lactation feed intake is also important for first-litter sows lactating for 28 days. When first-litter sows consumed an average of 6.6 or 11.0 lb of feed per day during a 28-day lactation, the WEI was 20 and nine days, respectively.

(Continued on next page)

An analysis of PigCHAMP® data by the University of Minnesota indicated the WEI to increase in a curvil inear manner as lactation length decreased for parities 1, 2, 3 to 6, and 6+. The Minnesota researchers also found that as lactation length decreased the rate of increase in the WEI was greatest for first-litter sows. The delayed WEI for first-litter females may be related to feed intake during lactation. Additional research is needed to clarify how lactation length and lactation feed intake within parity influences the WEI.

The WEI for all evaluated genetic lines increases in a curvilinear fashion with decreasing lactation length. Because the WEI of some genetic lines is less responsive to changes in lactation length than others, it is important for each farm to evaluate the effect of lactation length on the WEI.

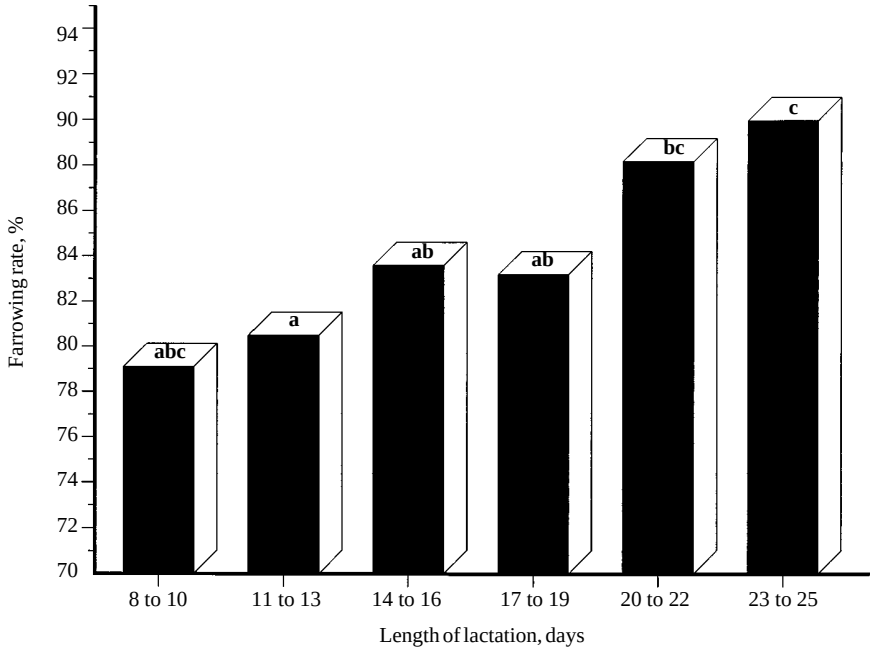

Figure 3. The influence of lactation length on farrowing rate (Dial et al., 1995, University of Minnesota). Columns with different letters differ (P < .05).

Percentage of Sows Cycling after Weaning

It is also important to know what effect lactation length has on the percentage of sows cycling within 10 days after weaning as well as the percentage of sows cycling on each of the first 10 days after weaning. Unfortunately, a scientific study reporting the percentage of sows cycling on each of the first 10 days after weaning for lactation lengths of seven, 14, 21 or 28 days could not be located. Two scientific studies indicated that 91 to 99% of sows weaned at six to 12 days of lactation will cycle within 20 to 30 days after weaning. Figure 2 shows the occurrence of postweaning estrus in sows weaned within 24 hours of parturition or at 28 days of lactation. Although 96.2% of sows weaned within 24 hours of farrowing did cycle within 10 days after weaning, their farrowing rate was 69% as compared to an 85% farrowing rate for sows weaned at 28 days of lactation.

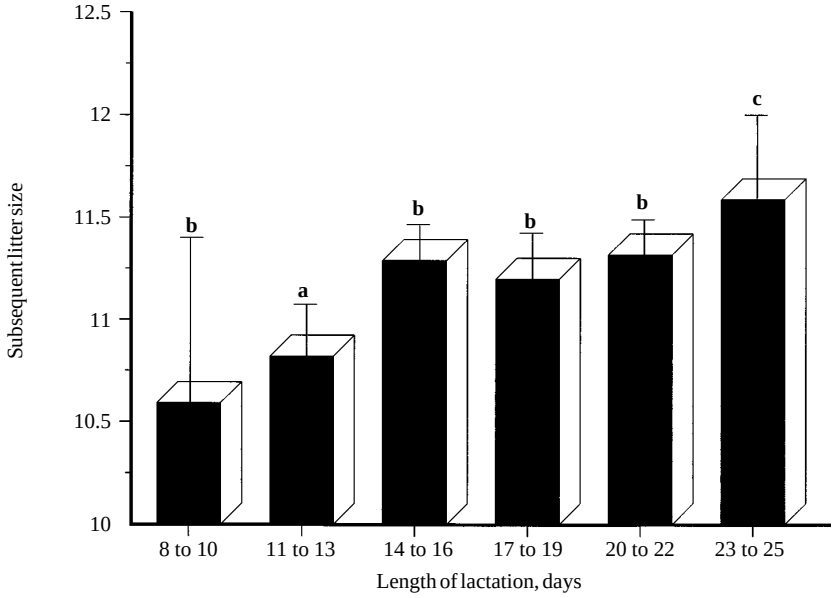

Figure 4. The influence of lactation length on subsequent litter size (Dial et al., 1995, University of Minnesota). Columns with different letters differ (P < .05).

Farrowing Rate

A University of Minnesota study has shown farrowing rate decreases as weaning age decreases (Figure 3). Their

Table 1. Effect of lactation length on farrowing rate

Lactation length, days	Farrowing rate		
	Average	Top 33%[a]	Top 10%[a]
14 to 18	84.9	85.5	86.3
19 to 25	85.2	87.2	88.5
26 to 32	86.0	87.8	88.7

[a]Top 33% and top 10% on the basis of pigs reared per sow per year.

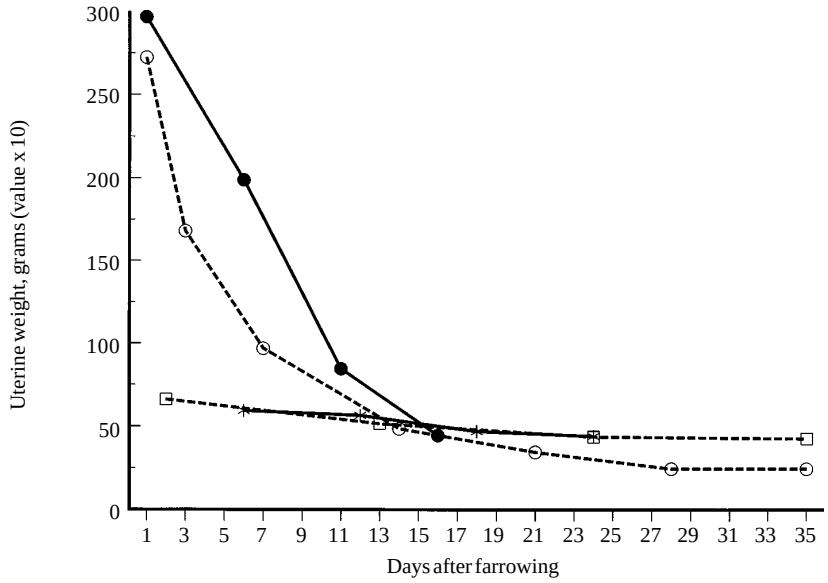

Figure 5. The influence of the number of days after weaning on uterine weight. Data from four studies.

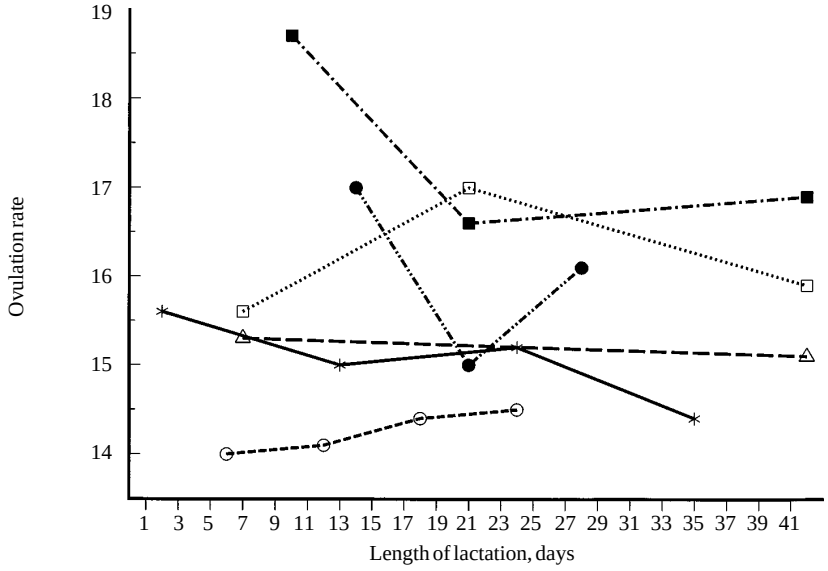

Figure 6. The influence of lactation length on ovulation rate. Data from six studies.

study indicated farrowing rate is significantly lower for lactation lengths of 11 to 19 days as compared to lactation lengths of 23 to 25 days. A substantial amount of variation occurred when sows were weaned at eight to 10 days of lactation; thus, there was not a significant difference when comparing an eight to 10 day lactation period with other lactation periods. Regardless of whether producers are ranked as average, in the top 33% or in the top 10% on the basis of pigs reared per sow per year, data complied from the Meat and Livestock Commission in England indicated a slight decrease in farrowing rate as lactation length decreased from four to two weeks (Table 1). The amount of decrease in farrowing rate will vary between farms because of management factors and the number of days between lactation lengths being compared.

Subsequent Litter Size

A University of Kentucky study indicated subsequent litter size (piglets born live) for sows weaned at six, 12, 18 or 24 days of lactation was 8.8, 9.0, 10.2 and 10.4 pigs, respectively. Subsequent litter size increased ($P < .05$) in a sigmoidal manner. There was a relatively small difference in litter size between sows lactating six or 12 days, a marked increase between sows lactating 12 or 18 days and a plateauing of litter size between sows lactating 18 or 24 days. An analysis of PigCHAMP® data by the University of Minnesota found a curvilinear relationship between lactation length and subsequent litter size born for sows conceiving on first estrus after weaning (Figure 4). A substantial amount of variation was found in subsequent litter size for sows weaned at eight to 10 days of lactation. Subsequent litter size was significantly reduced when sows lactated for 11 to 13 days as compared to lactation lengths of 14 to 25 days. Subsequent litter size was not significantly different between lactation lengths of 14 to 22 days. Subsequent litter size was significantly lower when sows lactated for 14 to 22 days as compared to sows lactating for 23 to 25 days.

Factors that might influence subsequent litter size of early weaned sows are: (1) duration of time needed for the uterus to undergo involution, (2) ovulation rate, (3) fertilization rate of ova and (4) rate of embryo survival.

Uterine involution. The uterus must undergo involution after parturition in order for the sow to breed back satisfactorily. Although the uterus undergoes the greatest weight loss during the first seven days after farrowing, the uterus continues to decrease in weight and length until 21 to 28 days after farrowing (Figure 5). It has been suggested the endometrium of the uterus is capable of receiving and implanting an embryo at 18 days after farrowing.

Ovulation rate. Six scientific studies indicated length of lactation did not

(Continued on next page)

significantly influence ovulation rate (Figure 6). In contract, a recent study at Kansas State University found that sows weaned at 5 to 11 days of lactation had a lower ovulation rate ($P < .05$) than sows weaned at 23 to 31 days of lactation (15.9 vs 24.0 ova).

Fertilization rate of ova. A University of Kentucky experiment found a linear decrease ($P < .05$) in percentage of ova fertilized when sows were weaned at two (81.9%), 13 (86.3%), 24 (96.5%), and 35 (98.0%) days of lactation. In contrast, a second study at Kentucky did not find a significant decrease in percentage of ova fertilized when sows were weaned at six (90.7%), 12 (94.1%), 18 (95.1%) and 24 (95.1%) days of lactation. However, the percentage of fertilized ova increased numerically as lactation length increased from six to 18 days.

Embryo survival. Five scientific studies have shown embryo survival decreases as lactation length decreases (Figure 7). Therefore, a lower embryonic survival rate of sows with a lactation length less than 21 days may be related to incomplete restoration of the uterine endometrium.

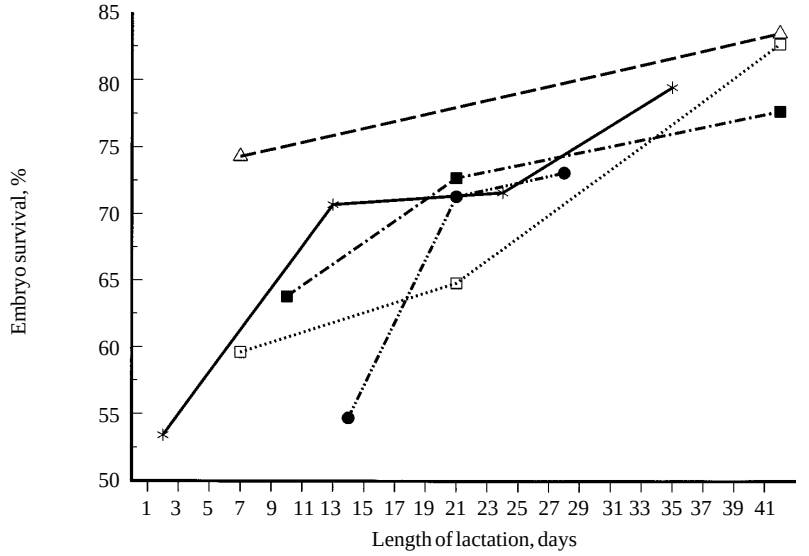

Figure 7. The influence of lactation length on embryo survival. Data from five studies.

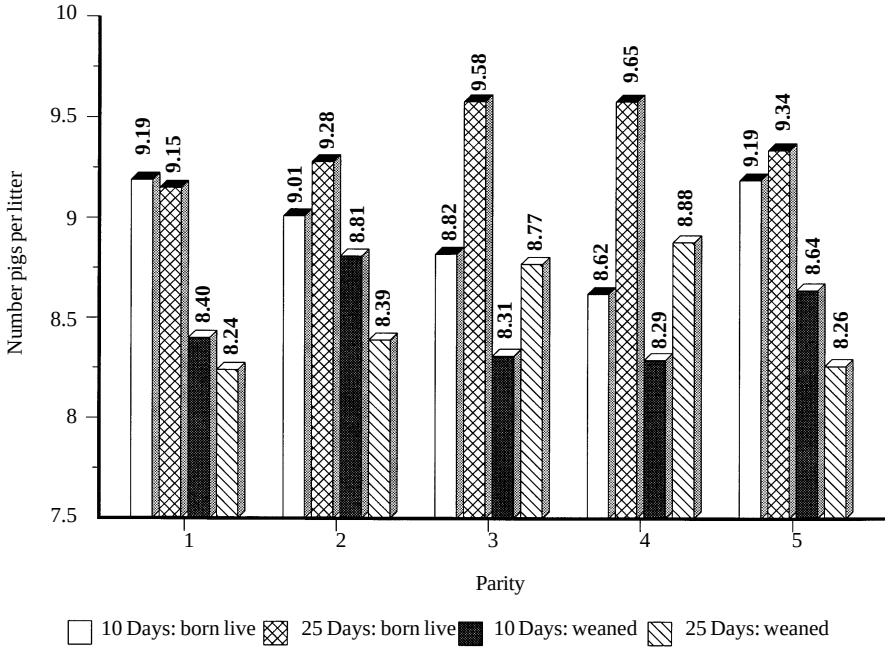

Figure 8. The average number of piglets born live and weaned at each parity of sows weaned after successive lactations of 10 or 25 days.

Longevity

There are two basic arguments about how lactation length may influence sow longevity. One, that sows with short lactation periods would have less body weight loss during lactation, thus they might survive longer because of the reduction of detrimental metabolic effects on vital tissues. The second theory: sows that have short lactation periods would farrow more frequently per year, resulting in higher culling rates due to a greater metabolic demand on their bodies. An analysis of PigCHAMP® data by the University of Minnesota found that average parity at removal and average herd parity are lower for herds using shorter lactation lengths as compared to herds using longer lactation lengths. Additional research is needed to confirm this suggestion.

Pigs Weaned Per Sow Per Year

Since each of the above reproductive traits were detrimentally affected as lactation length decreased, it might be concluded that sows should lactate a minimum of 24 days to optimize the number of pigs weaned per sow per year. However, it must be recognized the number of pigs weaned per sow per year is influenced by litter size born live, percent preweaning mortality and litters per female per year.

British researchers have evaluated the influence of a 10- or 25-day lactation length on number of pigs born live and weaned over five parities (Figure 8). The number of pigs born live per

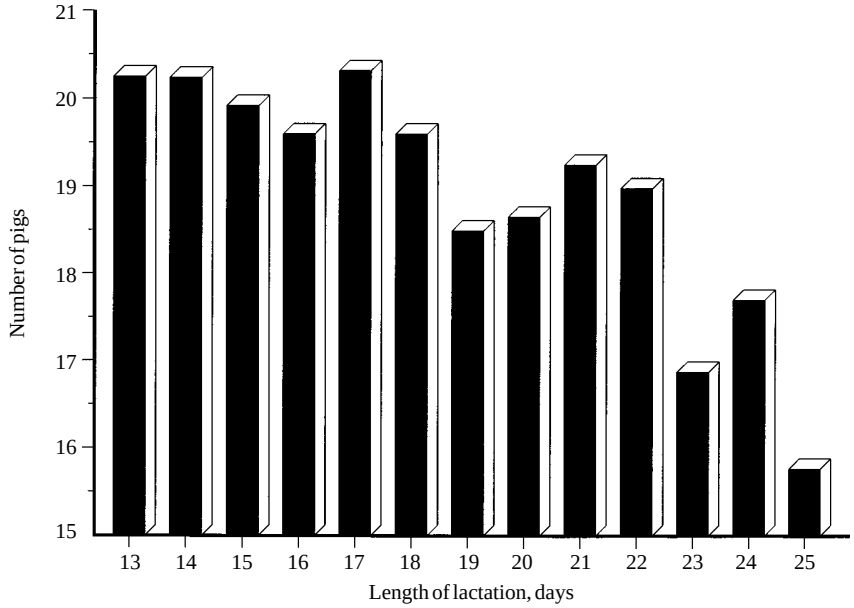

Figure 9. The influence of lactation length on the number of piglets weaned per inventoried female per year (Dial et al., 1995, University of Minnesota).

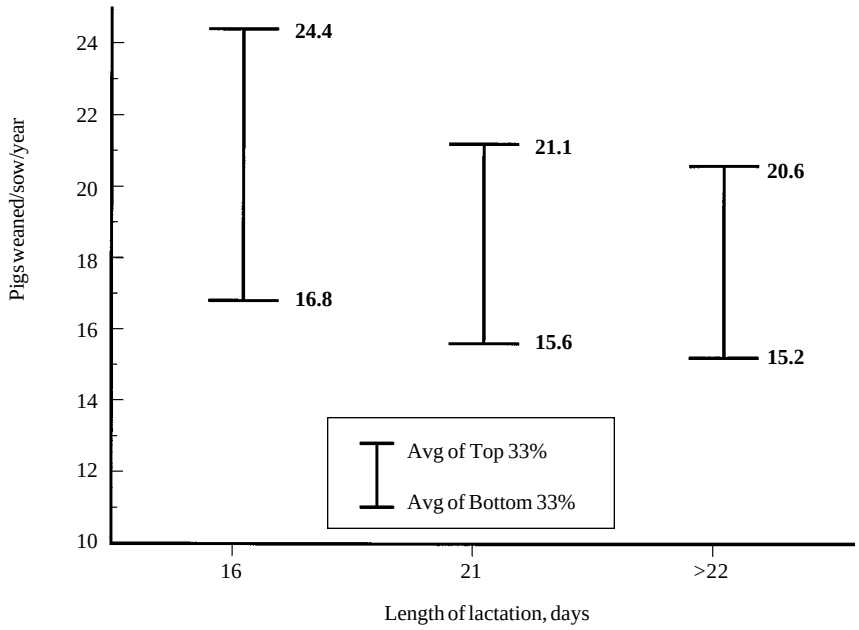

Figure 10. Variation of pigs weaned per sow per year within different lactation lengths.

litter decreased from parity 1 to parity 4 and then increased in parity 5 to the same level as parity 1 for sows weaned at 10 days of lactation. In contrast, sows that were weaned at 25 days of lactation had an increase in number of pigs born live between parity 1 and 3, no increase between parities 3 and 4 and a decrease between parities 4 and 5. When the total number of pigs born live and weaned are summed for parities 1 through 5, sows lactating for 10 days had 2.17 fewer pigs born live than sows lactating 25 days (44.83 vs 47.00). At weaning time, however, sows lactating for 10 days only had .09 less pigs than sows lactating 25 days (42.45 vs 42.54). Preweaning mortality was 5.31% for sows lactating 10 days and 9.49% for sows lactating 25 days. The difference in preweaning mortality is most likely due to the pigs having more days at risk for dying with longer lactation lengths. A farm-level analysis of PigCHAMP® data by the University of Minnesota found that the number of pigs weaned per inventoried female per year increased as lactation length decreased from 25 to 13 days (Figure 9).

It should be remembered a substantial amount of variation exists between farms for number of pigs weaned per sow per year, regardless of the length of lactation. For example, a producer who weans sows at 16 days of lactation and averages 16.8 pigs weaned per sow per year is producing 4.3 less pigs than a producer who weans at 21 days of lactation and averages 21.1 pigs weaned per sow per year (Figure 10).

---

[1]Donald G. Levis is a Professor of Animal Science and Extension Swine Specialist. References available upon request from the author.