EFFECT OF WEANING AGE ON SOW HERD PERFORMANCE

The average piglet weaning age in the United States declined from 28.8 days to 19.3 days between 1990 and 2000, according to USDA figures. Early weaning allowed the production of healthier, more uniform pigs and improved lifetime productivity of the sows by allowing a herd to market more pigs per year.

However, according to PigCHAMP summaries, weaning age has been creeping up for the last five years. This is in an effort to optimize overall reproductive efficiency. Maximum throughput in an operation can only be achieved when the weaning age does not significantly reduce sow reproductive performance and the utilization of farrowing facilities is maximized. What, then, are the impacts of weaning age on sow herd performance?

Uterine Involution

The sow remains anestrus during lactation because 1) the suckling influence of the litter suppresses ovarian and pituitary hormonal activity and 2) the suckling activity stimulates the release of prolactin. After suckling is reduced or the litter weaned, prolactin levels gradually decline, while the blood levels of luteinizing hormone (LH) and estradiol increase and work to stimulate estrus. It appears that this hormonal suppression provides the sow time for what is called uterine involution.

In order for the sow to breed back satisfactorily, the uterus must undergo involution. The sow’s uterus rapidly loses length and weight during the first two to three weeks of lactation and continues to do so until after weaning. This process provides time for uterus repair for future pregnancies. The rate of uterine involution, the weaning-to-estrus interval, and subsequent embryonic deaths have been linked to lactation lengths of fewer than 19 days.

Weaning within 24 hours of farrowing may also cause the formation of cystic follicles in sows because both LH and follicle stimulating hormone (FSH) have not been suppressed. It takes a minimum of 2 to 3 days to suppress LH and FSH. Sows with cystic follicles will show one or more of the following: 1) prolonged and unpredictable return to estrus, 2) constant estrus, 3) prolonged anestrus, and 4) irregular estrus.

Weaning-to-estrus Interval

Studies indicate that the weaning-to-estrus interval decreases as the weaning age increases (Figure 1). Sows weaned with fewer than 10 days of lactation demonstrate a much longer weaning-to-estrus interval, and the intervals are shortest for sows weaned between 3 and 4 weeks. A greater percentage of sows that lactate for more than 20 days return to estrus by day 7 than sows that lactate for 14 to 15 days. Primiparous sows are more susceptible than multiparous sows to the increased wean-to-estrus interval associated with lactation lengths of fewer than 21 days (Figure 2). This may be related to feed intake during lactation. Minimizing weaning ages of fewer than 17 days, especially in gilts, will aid in balancing return to estrus with maximum throughput.

Since the weaning-to-estrus interval typically has an inverse relationship with duration of estrus, sows that lactate for a short versus a long period tend to have a shorter duration of estrus. Therefore, weaning age could potentially impact insemination protocols. However, a simple and consistent multiple insemination protocol that delivers two inseminations during estrus, separated by 24 hours, appears consistently to optimize sow reproductive performance.

Acceptable weaning-to-estrus intervals for weaning ages between 10 and 19 days can be achieved when multiparous sows eat an average of 12.5 pounds or more each day. Maximum feed intake needs to be achieved during lactation to maintain body condition. Extremely thin sows that
are the result of inadequate energy intake during lactation often experience reproductive failure, regardless of weaning age.

Maximum feed intake by sows during lactation is both very important and very difficult to achieve. Intake during lactation can be maximized by increasing the feeding frequency, ensuring that feed is fresh, increasing the nutrient density of the diet, and providing a constant water supply that can deliver 0.25 gallons per minute. Feed intake can also be maintained by minimizing the effects of heat stress through appropriate environmental management.

**Ovulation Rate, Conception Rate, Embryo Survival, and Farrowing Rate**

Most studies have found that length of lactation does not influence the subsequent ovulation rate. However, the conception rate does generally decrease with shorter lactation lengths (Figure 3). Research also shows that embryo survival decreases as lactation length decreases. It is possible that the reduced embryonic survival rate of sows with a weaning age less than 21 days is related to incomplete restoration of the uterine endometrium.

Farrowing rate also decreases as weaning age decreases. Farrowing rate is significantly lower for weaning ages of 11 to 19 days compared to 23 to 25 days. Furthermore, a substantial amount of variation occurs when sows are weaned at 8 to 10 days of lactation. The observed reductions in conception and farrowing rates will also vary between farms due to other management factors.

**Subsequent Litter Size**

Substantial variation has been observed in subsequent litter size across studies of sows weaned with differing lactation lengths (Figure 4). However, subsequent litter size will generally be lower for sows with litters weaned at fewer than 18 days. Subsequent litter size of early weaned sows may be influenced by 1) duration of time needed for uterine involution, 2) ovulation rate, 3) fertilization rate of ova, and 4) rate of embryo survival.

**Weaning Weight**

Obviously sows that are allowed to lactate longer will produce heavier litter weaning weights. Average litter weaning weight increases significantly between 15 days of lactation (96 lb), 18 (103 lb), 21 (112 lb), and 24 (123 lb).

**Sow Longevity and Condition**

Sows with short lactation periods have a greater number of litters per female per year, creating a greater metabolic demand on their bodies. This appears to result in higher culling rates, as indicated by a lower average parity at removal for herds with shorter lactation lengths, compared to herds with longer lactation lengths. However, there is some compensation for sows with shorter lactation lengths, as they have less body weight loss during lactation.

**Genetic Line**

Genetic lines all tend to respond in the same curvilinear fashion with increasing weaning-to-estrus interval with decreasing lactation length. However, some genetic lines are less responsive to change in weaning age than others. Therefore, producers should evaluate the effect of reducing weaning age in their own herd.

**Pigs Weaned Per Sow Per Year**

The number of pigs weaned per sow per year is influenced by pigs born alive, pre-weaning mortality, and litters per female per year. While shorter lactation lengths negatively impact the numbers of live born pigs, it can improve pre-weaning mortality and litters per female per year. Observed reductions in pre-weaning mortality at earlier weaning ages may be due in part to the pigs having more days at risk for dying with longer lactation lengths.

Analysis of PigCHAMP® data has shown that pigs weaned per sow per year increased as lactation length decreased from 25 to 13 days (Figure 5). However, there is a substantial amount of variation in pigs weaned per sow per year that does exist between farms regardless of weaning age. Management skill, production environment, nutrition, and genetics will all influence the success of each farm’s reproductive performance at a given weaning age.

**Summary**

Weaning age is obviously an important influence on the litters per mated female per year. But to optimize overall sow herd performance, weaning age must be set at an optimal level. Reducing the lactation length will decrease the subsequent fertility of the female by extending the weaning-to-estrus interval, reducing conception rate, and decreasing subsequent litter size.

Therefore, to maximize throughput in an operation, the weaning age must be set where it does not significantly reduce sow reproductive performance. In most herds, the greatest impacts on reproduction are observed for lactation of fewer than 17 days. If a sow is to be rebred, she needs a minimum of three days of nursing to suppress the secretion of luteinizing hormone, avoiding the formation of follicular cysts or remaining anestrus.
Carefully monitoring and maximizing lactation feed intake to achieve more than 12 pounds/day can minimize the impact of shorter lactations. However, many of the effects of weaning age on reproductive performance are herd specific. Farms with the same genetics, nutrition, facilities, health status, and standard operating procedures can have very different responses to short lactations. Regardless of weaning age, good management from skilled sow farm personnel makes a successful contribution to any breeding program. Therefore, each farm should evaluate independently the impact of weaning age on productivity and throughput before implementing changes.

—M. Todd See
Tuesday, September 26, 2006

6:00 pm - 7:00 pm Opening reception
7:00 pm - 9:00 pm Speakers dinner

Wednesday, September 27, 2006

Speakers and Topics:

Deborah Johnson, North Carolina Pork Council
State of the North Carolina pork industry

Dr. Tim Stahly, Iowa State University
New developments in basic nutrition research and potential applications in swine

Ron Lamberty, American Coalition for Ethanol
Growing ethanol production and how it may affect the ingredients market

Dr. Joshua Hayes, USFDA, Center for Veterinary Medicine Division of Human Food Safety
Antimicrobials in U.S. food animal production: Assessing the public health risk

Dr. John Patience, Prairie Swine Centre Inc.
The practical management of animal variation

Dr. Jefferey Escobar, Virginia Polytechnic Insitute State University
Understanding how disease impacts animal growth