factsheet
Pork Information Gateway

Anestrus in Swine

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Introduction

By definition, anestrus is a condition in swine during which females do not exhibit estrous cycles. During anestrus, the ovaries are relatively inactive and neither large follicles (ovarian structures that contain an ovum or egg, and that secrete large quantities of estrogen; Figure 1) or functional corpora lutea (ovarian structures that secrete progesterone; Figure 2) are present. Anestrus usually results from insufficient secretion of gonadotropin-releasing hormone (GnRH) from the hypothalamic area of the brain. In cycling gilts and sows, GnRH travels by blood to the anterior pituitary gland, a pea-sized organ located near the base of the brain, where it causes secretion of the gonadotropins, luteinizing hormone (LH) and follicle-stimulating hormone (FSH). The LH and FSH in turn, stimulate growth of ovarian follicles, ovulation and in the case of LH, normal function of corpora lutea.

It is important to differentiate between true anestrus and apparent anestrus (Senger, 2003). True anestrus is typically characterized by insufficient GnRH secretion. The reasons for this include, but are not limited to, inadequate nutrition, environmental stress, or in the case of lactating sows, suckling-induced suppression of GnRH secretion by the nursing piglets. True anestrus can also be caused by the presence of certain pathogens (for example, uterine infections). Apparent anestrus, on the other hand, is actually a failure by farm personnel to detect estrus or recognize that a female is pregnant. The objective of this fact sheet is to discuss both true and apparent anestrus and management strategies designed to counter the negative effects of each on reproductive efficiency in both replacement gilts and sows.

Figure 1. Reproductive tract of a gilt showing follicles that secrete large quantities of estrogen.

True Anestrus in Gilts

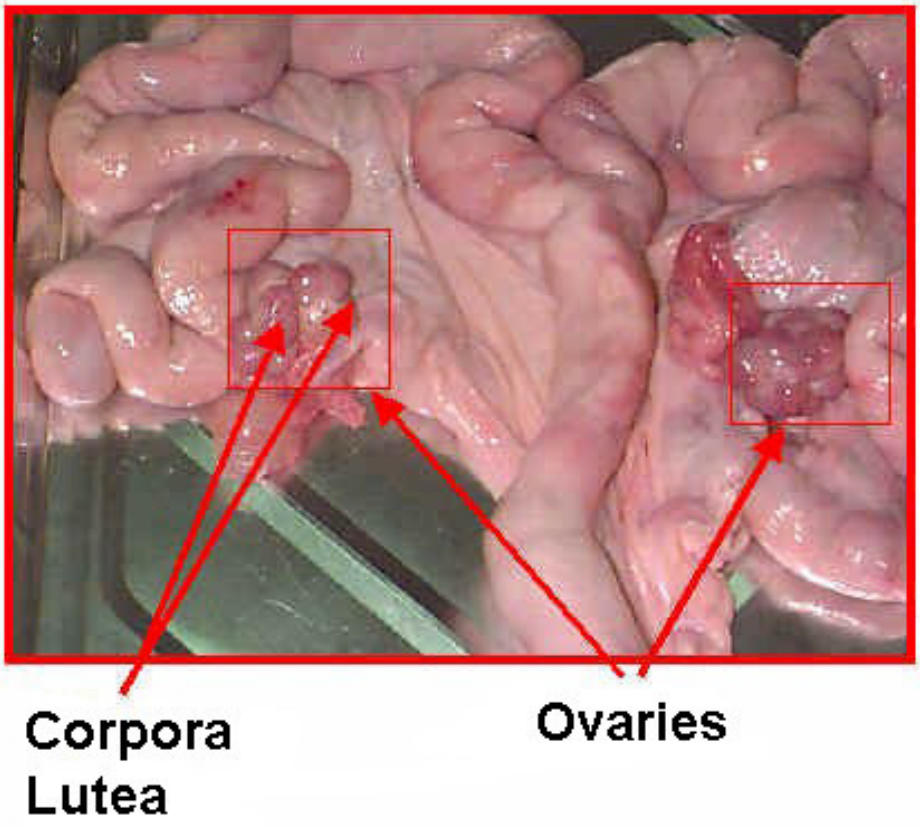

Figure 2. Reproductive tract of a gilt showing corpora lutea that secrete large quantities of progesterone.

In swine, normal estrous cycles are 21 days with a range of 18 to 24 days. Estrus or heat is the period of sexual receptivity and ovulation during which the gilt will accept the male and is capable of conceiving. The pubertal or first estrus, and hence the initiation of estrous cycles usually occurs between 170 and 210 days of age in gilts that receive boar stimulation. The days leading up to puberty can be considered a physiologically normal period of true anestrus. However, common producer complaints include delayed puberty (first estrus at greater than 210 days of age), silent estrus (large follicles and ovulation but no detectable estrus behavior) and the occurrence of anestrus after females have begun to cycle and show normal heat periods. Approximately 85% of gilts should be displaying regular estrous cycles by 210 to 240 days of age. It is likely that the percentage will not increase significantly for gilts kept beyond 270 days of age. Moreover, gilts that reach puberty late, if mated, tend to exhibit lower reproductive efficiency throughout their productive life compared with gilts that reach puberty earlier. Thus, it is not a genetically or economically sound management decision to keep non-cycling gilts beyond 270 days of age.

Delayed puberty has a genetic component, and age at first estrus is a moderately heritable trait. In total confinement facilities, Large White gilts tend to show more regular estrous cycles and begin cycling at an earlier age than most other breeds. To avoid delayed puberty, during selection, gilts should be examined closely for underdeveloped or abnormally shaped vulvas as these are indicators of abnormal internal reproductive organs and these animals will likely exhibit delayed puberty (Figure 3). This is often a characteristic of heavily-muscled, lean animals. It is best to purchase breeding stock from herds that have been shown to reproduce well under management conditions similar to those intended for the gilts purchased.

When gilts are housed in total confinement facilities, smaller numbers of gilts per pen (8 to 12) is considered advantageous for reproduction compared to larger numbers of gilts per pen. It is best to provide 20 ft2 of floor space per animal and 8 to 10 hours of daylight or artificial light per day. Although the effects of photoperiod and temperature on reproduction in domestic swine are not completely understood, longer day lengths and elevated ambient temperatures may decrease the proportion of gilts cycling. Under-nutrition can also cause anestrus in gilts as well as sows, as can the presence of zearalenone, a mycotoxin with estrogenic activity, in the daily ration (Edwards et al., 1987). This feed toxin originates from moldy corn or feed that has become wet or moist.

The transport effect and the boar effect are two management practices that can be employed to cause a synchronous estrus in prepubertal gilts, thus ending true anestrus. Transportation to a new facility or a new location within a facility, usually in concert with the mixing of animals from different pens, can induce estrus in 15 to 30% of gilts within 10 to 20 days if they are nearing the normal age of puberty. Exposing

Figure 3. Example of a gilt with an infantile vulva that is possibly indicative of abnormal internal reproductive organs.

gilts that are nearing puberty to a mature boar can also advance estrus in 30 to 90% of gilts within 3 to 7 days. Many breeding-herd managers use the transport and boar effects in conjunction with one another.

P.G. 600 is a drug marketed by Intervet /Schering Plough Animal Health (De Soto, KS), that can be used to hasten the onset of estrus in prepubertal gilts. P.G. 600 contains 400 IU of pregnant mare serum gonadotropin (PMSG) and 200 IU of human chorionic gonadotropin (HCG), hormones that mimic the actions of FSH and LH, respectively. Thus, when P.G. 600 is properly administered to prepubertal gilts that are at least 5.5 months of age and weigh at least 185 pounds, follicular growth is advanced. Estrus and ovulation follow. Although P.G. 600 can effectively induce a synchronous estrus in prepubertal gilts, efficacy of the compound for this use varies from farm to farm.

True Anestrus in Sows

Anestrus occurs naturally in nursing sows throughout conventional lactation lengths. A neural pathway connects the mammary glands to the hypothalamic area of the brain in sows. By the 3rd day of lactation, suckling by the piglets causes nerve impulses to travel to the brain resulting in decreased GnRH secretion. The low levels of GnRH allow for only low levels of pituitary secretion of the gonadotropins and as a result the ovaries remain inactive. Following the removal of the piglets at weaning, GnRH secretion increases once again and sows will then exhibit estrus in 3 to 7 days. Thus, anestrus during lactation and the interval immediately following weaning can be considered another physiologically normal period of true anestrus. Between 85 and 90% of sows should have exhibited estrus within the first 7 days following weaning. However, the duration of lactation will influence the return to estrus. Sows with lactation periods less than 21 days may require more time to cycle after weaning. There is also evidence to suggest that weaning the heaviest pigs in the litter at least 48 hours early (split weaning) will improve cycling performance, especially in first-litter sows. This is probably a result of an overall decrease in suckling intensity, which allows an increased release of GnRH after weaning.

A common cause of prolonged anestrus in weaned sows is insufficient energy or protein intake during lactation. This is particularly important in sows weaning their first litters. The frequency of feeding, the design of the feeders (large enough for sows) and waterers, and the nutrients in the feed should be evaluated. There may be a need to add energy or increase the protein in the lactation diet when feed intake is low. Improper feeding leading to excessive weight loss during lactation or insufficient weight gain during pregnancy are the primary considerations when prolonged anestrus occurs following weaning. Conversely, excessive feed intake during gestation (overweight sows) will lead to decreased feed intake during lactation resulting in severe weight loss and sometimes prolonged anestrus after weaning. The summer and fall months are the most common periods of reduced cycling in sows. The effect of season can be minimized if the previously mentioned practices are utilized to insure adequate nutrition of the gestating and lactating sow in combination with proper estrus detection procedures.

Housing sows in crates or in small groups, rather than large groups, may increase the percentage of sows that cycle early. Exposure to a mature boar, either in adjacent pens or by daily movement of the boar among the sows or the sows to the boars, will stimulate early cycling in weaned sows. P.G. 600 can be used to hasten the onset of estrus in weaned sows and thus end true anestrus. Rather than treating all sows with P.G. 600 at weaning, however, producers should consider treating only sows at risk for a delayed return to estrus. At-risk females include first and second parity sows and sows in poor body condition. Another alternative to injecting all weaned sows with P.G. 600 is to wean sows, check for estrus daily,

and breed sows that return to estrus on their own. Administer P.G. 600 to anestrus sows that have not displayed estrus by day 7 post-weaning. These animals should return to estrus within five days after treatment and can be mated. With this system, only sows experiencing a prolonged anestrus are treated with P.G. 600.

Table 1. Signs of estrus in gilts and sows

a) red, swollen vulva and enlarged clitoris
b) mucous discharge from the vulva
c) nervous, restless behavior
d) moving back and forth along pen partitions
e) frequent urination
f) increased vocalization
g) decreased appetite
h) mounting other females and/or standing to be mounted by other females
i) elevation of ears (pinning ears), locking knees and
j) elevating the back (immobilization or lordosis response)

Management to Avoid Apparent Anestrus

Diagnosis of problems resulting in anestrus should be based upon heat detection and breeding records. Since undetected heats often are mistaken for anestrus, heat detection methods should be evaluated (Belstra et al., 2008).

In response to high concentrations of estrogens in the blood, female swine approaching or in estrus will exhibit a variety of physiological and behavioral signs listed in Table 1. The immobilization response is the best indicator that female swine are actually in estrus and ready to be mated. Sows and gilts in estrus exhibit the immobilization response as a reaction to a combination of visual (sight), auditory (sound), olfactory (smell) and tactile (touch) stimuli originating from the boar. The most effective estrus detection system is one that fully employs all of these stimuli. Wherever possible, producers should place a mature (at least 12 months of age) estrus detection or "heat-check" boar in close contact with the sows or gilts being checked for estrus. Females should be checked for estrus at least once daily. During checks for estrus, allow each female adequate time for direct-boar exposure and closely observe the animals for estrual signs.

Maintaining the immobilization response requires considerable energy expenditure. If a female in estrus becomes fatigued, she may become refractory (unresponsive) to boar exposure and not resume an immobilization response for several hours. Thus, boar exposure during estrus checking should be restricted to small groups of females. When not checking for estrus, housing boars away from the females greatly increases the likelihood that sows and gilts in estrus will actually display the immobilization response when exposed to the boar during the estrus check.

Summary

During true anestrus, gilts and sows do not display estrous cyclity. There are periods in the life cycle of the female during which anestrus is a physiologically normal condition such as the prepubertal period in gilts and during the post-partum interval in sows. However, true anestrus may also be evident in cases such as in gilts consuming mold-contaminated feed, those displaying delayed puberty or in under-fed sows showing prolonged weaning-to-estrus intervals. Apparent anestrus, on the other hand, is actually a management problem and results from a failure by farm personnel to detect estrus. The diagnosis of problems with anestrus should be based upon excellent breeding and management records. Since undetected heats often are mistaken for anestrus, heat detection methods should be reviewed. Other diagnostic procedures might include feed analyses, slaughter examinations with veterinary assistance to determine if anestrus may be related to the presence of pathogens, or obtaining serum progesterone levels to determine if estrus has actually been missed.

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