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Management Practices to Reduce the Impact of Seasonal Infertility on Sow Herd Productivity[1]

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Introduction

During summer and early fall, many sow farms experience a variety of reproductive problems, such as, anestrus, extended weaning-to-estrus intervals, poor conception rates, higher embryo mortality rates and low farrowing rates. This phenomenon is commonly referred to as "seasonal infertility" and can also be present in boar studs, where the result is lower semen output and lower semen quality. Most researchers have attributed this seasonal infertility to heat stress and the fact that pigs are inherently seasonal breeders. Before pigs were domesticated, both sows and boars were seasonal breeders. In North America, pigs entered an anestrous season in the summer and early fall, which avoided the birthing of offspring in winter, a time when survival would not be optimal.

The primary goal of every operation must be to incorporate environmental strategies to reduce heat stress. Additionally, non-thermal interventions may also be incorporated into management strategies on a case by case basis (Table 1.) Most operations use many, but perhaps not all of the suggested methods to reduce the impact of seasonal infertility discussed in the proceeding text. The objectives here are to provide producers with the necessary background information to explore current and potential interventions that are not presently being conducted and develop an annual action list to reduce the seasonal effects on fertility.

SECTION I. HISTORY AND BACKGROUND

The Effect of Heat Stress and "Season" on Fertility

Much like humans, pigs feel heat based on temperature and humidity. Sows and boars both suffer from acute and persistent exposure to elevated ambient temperatures and humidity. As a result, infertility can be relatively short term or, sometimes, a permanent disability from which the animal will never recover. Heat stress to sows and boars occurs when ambient temperatures are outside of the animals'

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thermoneutral zone, which ranges between 45° and 70° F. In most cases, the effect of heat stress on reproduction has been related to ambient temperatures in excess of 80° F. In studies where temperatures were elevated experimentally for sows and gilts, anestrus increased and conception rates and embryo survival decreased.

There is also evidence that boars exposed to ambient temperatures in excess of 85° F have lower sperm output and poorer sperm motility, and increased morphological abnormalities. Normally, if this exposure is short, recovery will occur in 6 to 7 weeks. It takes 6 to 7 weeks for a new group of sperm cells to mature within the boar's testicle and epididymis, and the immature, developing sperm cells tend to be more sensitive than mature sperm. If a boar is subjected to heat stress sporadically over a two-month period, it is possible that the fertility of his semen could be reduced during this period as well as for the 6 to 7 week period after it has ended.

To determine if pigs are feeling the effect of heat, respiration rate can be monitored when they are in a resting, non-agitated state. This can be done by counting the number of times the rib cage moves in and out in during 60 seconds. Normal respiration rates for pigs are between 15 and 25 breaths per minute. When respiration rates exceed 40, the pigs are at risk of heat stress. If respiration rates climb over 60, then the pigs are probably suffering heat stress.

Under normal conditions, animals are in physiological homeostasis-in other words, all bodily systems are functioning normally. Heat stress poses a physiological challenge to breeding females because their bodies are programmed first to survive and then to reproduce. It is difficult to assess the physiological status of an animal and determine at what point it will return to reproductive readiness after a period of stress. Each animal may be at a different level of responsiveness during high temperatures. However, we know from experience that in the fall, when environmental conditions return to "normal," a consistent and regular estrus returns. Some of the management strategies outlined below will be more effective than others. Also, each strategy's effectiveness can be highly variable because females in a heat-stressed herd will be at different levels of reproductive competence. In short, some females may require greater levels or duration of intervention to return to normal reproduction.

SECTION II. SYSTEMATIC APPROACHES TO REDUCING SEASONAL INFERTIITY

Ventilation and Cooling

Mechanized Buildings—The first step in reducing the impact of heat stress on sow fertility is to make sure ventilation systems are in good working order and are providing adequate air movement. Minimum enclosed facility ventilation rates for a sow and litter, gestating sow, and breeding sow or boar during the summer months are 500, 180, and 300 CFMs/hd, respectively, however, these rates may be doubled during the summer months in the southeastern U.S.. Conduct a thorough maintenance inspection and test the ventilation system to ensure that these rates are met. It is not uncommon to find that (even in fairly new operations) ventilation systems do not operate as designed. Unless these systems are delivering the required ventilation rates, other management practices suggested here will not be effective. Additionally, fresh air must enter rooms at a speed of 600-1,000 ft/min. in order to circulate well and prevent cold air from falling on animals (drafts). Don't overlook the fresh air inlets; adjustments should be made seasonally. A good, year-round air-inlet-speed-goal is 900 ft/min.

Some operations also have installed components in mechanically ventilated gestation and breeding facilities called cool cells. Cool cells can be effective in keeping room temperatures 10 to 15 degrees cooler than outside temperatures by pulling the fresh air through wetted corrugated material. Another effective method to cool sows during lactation is the installation of nose coolers. In farrowing rooms that use negative pressure systems with a plenum as the air inlet source, a tube can be connected to the plenum and directed to the bottom of the farrowing crate near the sow's nose while she is lying down. This supplies constant air movement across her face when the ventilation system is activated.

The activation temperature for these systems should be set between 75° and 78° F. While this practice may not maintain a farrowing room temperature 75° to 78° when outdoor ambient temperature reaches 90° +, it will keep the room from heating up as quickly, because the cooling process will begin sooner. Pigs are more sensitive than humans to the combined effects of heat and relative humidity because they do not sweat. Thus, it is important to consider heat indexes and to adjust the activation temperatures of supplemental cooling systems. The simplest way to calculate the heat index to determine it by using the figure below or visiting the Weather Calculator on the Web site of the National Weather Service office in El Paso, Texas at:

htttp://www.srh.noaa.gov/elp/wxcalc/heatindex.html.

Extreme danger — Danger — Extreme caution — Caution

Apparent temperature
is how hot the heat-humidity combination makes it feel.

RELATIVE HUMIDITY (PERCENT)

AIR TEMPERATURE (DEGREES FAHRENHEIT)	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
140	125																				
135	120	128																			
130	117	122	131																		
125	111	116	123	131	141																
120	107	111	116	123	130	139	148														
115	103	107	111	115	120	127	135	143	151												
110	99	102	105	108	112	117	123	130	137	143	150										
105	95	97	100	102	105	109	113	118	123	129	135	142	149								
100	91	93	95	97	99	101	104	107	110	115	120	126	132	138	144						
95	87	88	90	91	93	94	96	98	101	104	107	110	114	119	124	130	136				
90	83	84	85	86	87	88	90	91	93	95	96	98	100	102	106	109	113	117	122		
85	78	79	80	81	82	83	84	85	86	87	88	89	90	91	93	95	97	99	102	105	108
80	73	74	75	76	77	77	78	79	79	80	81	81	82	83	85	86	86	87	88	89	91
75	69	69	70	71	72	72	73	73	74	74	75	75	76	76	77	77	78	78	79	79	80
70	64	64	65	65	66	66	67	67	68	68	69	69	70	70	70	71	71	71	71	71	72

Source: National Oceanic and Atmospheric Administration. A Heat Index may be calculated by the following formula: Heat index(HI), or apparent temperature(AI)= -42.379 +2.04901523(Tf) + 10.14333127(RH) - 0.22475541(Tf)(RH) - 6.83783x10**(-3)*(Tf**(2)) - 5.481717x10**(-2)*(RH**(2)) + 1.22874x10**(-3)*(Tf**(2))*(RH) + 8.5282x10**(-4)*(Tf)*(RH**(2)) - 1.99x10**(-6)*(Tf**(2))*(RH**(2)). Note: In order for the Heat Index formula to work correctly, you must use the relative humidity in percent form. In other words, if the relative humidity is 65%, use 65 for RH in the formula, not .65. Tf= air temperature in degrees Fahrenheit, RH= relative humidity expressed as a whole number.

For example, if it is 75° F in the barn, but the heat index is over 85° due to high humidity, the supplemental cooling system needs to be active. It is imperative that supplemental cooling systems are in place in all phases of sow production. These could include evaporative drip or spray cooling and circulating fans. Sprinkling is preferred to fogging, which uses smaller water droplets. Sprinkling cools the skin surface by wetting the skin and allowing the water to evaporate, where fogging cools the air and then the air must cool the skin. Most systems are designed to operate for a period of 1 to 2 minutes, up to 4 times per hour. Spray nozzles should provide at least 0.02 gallons of water per hour per head. Low-pressure drip systems in the farrowing house should be rated for 0.5 to 1 gallon per hour.

Along with earlier activation of the cooling systems, replacing heat lamps with regular, "household," 100-watt incandescent bulbs will reduce the ambient temperature of the farrowing room. Positioning heat lamps at the maximum distance away from the sows head will also reduce the impact of this supplemental piglet heat on the sow. Finally, heat lamps may need to be shut off or run on timers (off/day: on/night) during periods when temperatures do not fall below 85° F to help reduce room temperatures. If this strategy is practiced, a source of light will be needed somewhere in the room because some producers report lactation failure if sows and litters are subjected to total continuous darkness.

Periods of elevated temperatures also can harm the gilt pool. It is not uncommon to see increased periods of anestrus, shorter estrus periods, and lower conception rates in gilts during this time. In controlled studies, when higher temperatures were found to induce anestrus in gilts, cyclicity resumed after exposure for as little as 1 to 2 days to a relatively normal thermal environment. It may be possible to utilize this concept on commercial farms by constructing a "cool zone" in the breeding barn for the gilts. The minimum period that gilts will need to be exposed to this environment to resume cycling has not been determined, which means that if 2 to 3 weeks of gilts are required, a fairly large area in the breeding barn may be needed. Furthermore, cold water and air movement may not be sufficient cooling mechanisms when one considers humidity to be an equal contributor to heat stress. Consequently, some type of air conditioning system may be needed to remove humidity. The cost of this type of system may not be justified unless there are extensive problems with anestrus (< 10% cycling).

Naturally Ventilated Facilities—Some gestation and breeding facilities consist of a naturally ventilated, curtain sided or open sided building. For these facilities, minimum ventilation rates are not measured by air movement rates (CFM's), but are arbitrarily evaluated based on animal comfort. Management of non-mechanically ventilated buildings is fairly easy if the buildings were constructed with adequate side air inlet openings and orientated (east/west) to accommodate natural airflow. During hot weather, ventilation rates must be high enough to prevent overheating. Increased airflow is achieved by maximizing ridge openings and air inlets on both sides of the building. Furthermore, since we generally tend to ventilate for human comfort which is usually 3-4 feet above the pig level, air deflecting panels to direct air currents downward into the pig zone may be necessary to provided satisfactory ventilation at the pig level. It is important to consider supplemental cooling methods like evaporative cooling and circulator fans in naturally ventilated buildings and they are applied as previously described in the mechanized building section.

Changing Photoperiods

Aside from the studies on humidity and temperature, other research on sows bred in the summer and early fall has shown that gradual changes in the length of the day (photoperiod) may possibly reduce fertility. These studies looked at pigs kept in a constant, thermoneutral environment and measured fertility by farrowing rate and litter size. But the stimulatory influence of photoperiod on sow reproductive performance has not been consistently proven, and most results from these studies suggest that temperature has a greater effect than photoperiod. Reducing the photoperiod (10-h light/14-h dark) during high ambient temperatures in most studies did restore good estrus intervals. Some studies from Australia suggest that shortening the photoperiod is stimulatory, while other studies indicate the opposite effect. There may be several valid reasons for these differences. First, changes in natural photoperiod are gradual, not acute, and occur over a long period. Most studies that have been conducted both in controlled situations and on farm probably have not employed a long enough period of exposure to an altered photoperiod to actually see an effect, if one was present. The stimulatory aspect of photoperiod may be related to the actual ratio of light to dark; however, the rate of change or the time period over which the change occurs may be equally important, and, therefore, a year-round schedule of equal light and dark periods may not be of benefit.

Genetic Components

During the 1990's, simultaneous advances were made in pigs/sow/year, predominantly due to management, and lean (growth rate and percentage), predominantly due to genetics. Today, we are managing a more prolific, leaner, and larger mature sow than during 70's and 80's. In addition, gilts now grow faster, reach puberty at a heavier weight, and are mated both younger and leaner.

Breeding females of lean genotypes must maintain condition throughout breeding life. This can be accomplished by minimizing lactation fat losses and encouraging gestation fat recovery. Several gilt studies have clearly demonstrated that backfat depths of less than 0.5 inches are associated with reproductive inefficiencies. However, reduced reproductive performance is also consistently reported in females having more than 1 to 1.2 inches of fat when they are introduced into the herd. There appears to be an optimal gilt body condition range for introduction to the breeding herd that is dependent on genetic line. With leaner genetics, there is a substantial increase in maintenance requirement throughout lactation; thus management actions to encourage feed intake are needed. The combination of heat stress with substantial loss of body stores in thin females demands better reproductive management than a situation involving females with higher appetites and increased fat deposits.

When considering different genetic lines, an important consideration is knowing which performance testing methods and selection objectives were used. It has been well documented that selection for efficient lean growth can adversely affect reproductive performance. Selection for reduced backfat will result in reduced daily feed intake, increased age at puberty, fewer pigs born alive, greater preweaning mortality, and more nonproductive days. Litter size at birth and weaning and piglet weaning weight are also reduced with selection for low daily feed intake. The consequences of today's genetically leaner animal can result in reduced reproductive performance and, most importantly, reduced appetites.

Many of the strategies described throughout this paper will help to alleviate some of the symptoms of seasonal infertility, but a solution to the problem may be in establishing a genetic selection program for females that are more resilient to heat stress. Differences among breeds in the ability to adapt to heat have been reported for cattle, sheep, and goats. The beef cattle industry has successfully incorporated heat-tolerant breeds (i.e. Bos indicus) into traditional crossbreeding systems. This crossbreeding strategy has been shown to ameliorate the sensitivity of British and Continental cattle breeds to high ambient temperatures. The effects of high environmental temperatures in cattle are observed in higher rectal temperatures, increased respiration rates, and greater decline in milk yield, body weight gain, and feed consumption.

Production Scheduling

Season of the year, disease, environment, age, and genetic composition influence the number of females showing estrus and conceiving at a particular time. The number of replacement gilts needed to complete a farrowing group must be estimated in advance. As many as three replacement gilts may need to be selected for each farrowing crate to be filled. The number of gilts needed to insure one pregnant gilt farrows during hot weather doubles or even triples. Keeping more gilts in the pool at any one time will increase the chance of obtaining more than enough pregnant females for a predetermined schedule. However, space in the gilt pool is often allotted based on the average annual need. Increasing the number of available gilts without simultaneously increasing space allowance most likely will result in additional stress on the gilts through crowding, which may ultimately increase the incidence of anestrus.

Sow Mortality

It is not uncommon to see typical herd mortality rates of between 5 and 10 percent or even greater in many swine operations. In many operations the majority of sow mortality occurs within the first 30 days following parturition. Furthermore, it is not uncommon for sow mortality to double in the Southeast during the summer months because heat stress is added to the stressful conditions of farrowing and lactation. Effective management strategies that reduce the effects of heat stress on reproduction should indirectly reduce mortality rates. Genetic selection for longevity should also be a priority. It cannot be overlooked, considering that the swine industry as a whole has tended to ignore this trait in order to make rapid gains in the selection for leaner, later-physically-maturing genotypes. Failure to provide enhanced management to high lean genotypes may also result in higher mortality.

Lactation Feeder Management

Without question, getting sows to keep eating as much as they need or to prevent a drop-off in their consumption during the summer months is the most critical management step for reducing the impact of heat stress on seasonal infertility. Here are some ways to stimulate lactation feed intake.

Increase Feeding Frequency—When producers switch from feeding two times per day to three times per day, most experience a 10 to 15 percent increase in sow feed intake. There are some farms in North Carolina that actually feed four or more times per day in the summer. The main thing to remember is that when you increase the frequency of feeding, you must decrease the amount that you feed each time. For example, if you are feeding 6 pounds twice a day (12 pounds total), then when you increase to three times per day, you may want to feed around 6 pounds at the first feeding and 4 pounds at each subsequent feeding (14 pounds total).

The reason this strategy works is related to the normal increase in body temperature that occurs after a sow consumes a meal. Theoretically, there won't be as big an increase in a sow's body temperature after she eats 4.5 pounds (as after she eats 6 pounds) because there will be less feed to be digested. Consequently, this could be very important for sows whose body temperatures already may be in the upper end of the thermoneutral range due to high temperatures in their environment.

Keep Feed Fresh—Sows tend to be picky eaters compared to most animals. In warm conditions, feed is more likely to spoil, especially if it contains high levels of fat. Increasing the feeding frequency in conjunction with feeding slightly smaller meals is an excellent way to keep feed fresh.

Try Liquid Diets—Liquid feeding is a common practice to increase feed intake in many finishing operations and can be implemented during lactation. However, because of the short period of time that sows are actually in lactation, it may be more beneficial to acclimate females to this change of diet during late gestation. Success with this strategy may vary greatly among operations, but it has been reported to boost sow feed intake by as much as 15 percent. One drawback is that wet feed does not stay fresh in the trough for very long and molds will also accumulate without regular cleaning.

Add Fat to the Diet—As a result of poor feed intake, many sows are not able to meet the metabolic demands of lactation and may fall into a negative energy balance. This factor probably accounts for most of the reproductive disorders during periods of elevated temperatures. One way to ensure that sows are consuming enough energy, even though they are eating a smaller quantity of feed, is to add fat to the lactation diet. Supplemental fat (7 to 10 percent animal or vegetable fat) will increase the dietary metabolic energy content of the feed.

There are two important considerations in adopting this practice. First, a diet containing high amounts of fat will become rancid more rapidly than a traditional diet with only 1 to 2 percent fat. Sows will not eat rancid feed. Therefore, feeding smaller quantities more often and smelling feed leftover in the sow feeder at each feeding to check for spoilage should be a standard practice. Second, because sows are consuming less feed, dietary levels of essential vitamins and minerals also need to be boosted to compensate for less feed consumed on a daily basis.

Give Water Constantly—High ambient temperatures will increase water requirements. Increased water consumption coupled with increased urinary water loss is one mechanism by which pigs lose body heat. An increase in ambient temperature from 54°-60° F to 86°-95° F will cause pigs to drink more than 50 percent more water. Nursing sows need to consume 8 to 10.5 gallons of water every day, and gestating sows need 3 to 5 gallons. One rule-of-thumb to follow is a water-to-feed ratio of 5:1. Fresh, constant water is also critical during breeding and gestation. The watering system should deliver a minimum of 0.25 gallons per minute and ideally 0.5 gallons per minute. Sows will quickly become frustrated if the flow rate is low, and this will reduce their appetite for dry feed. Water temperature and quality are also important. During periods of high temperatures, pigs will consume almost double the quantity of cool water (50º F) as warm water (80º F).

Reducing Embryo Mortality During Periods of Heat Stress

Prenatal mortality may be as high as 40 percent in pigs. The majority of this embryo loss occurs during the first two to three weeks following breeding. Factors associated with embryo loss include stage of pregnancy, disease, age of dam, genetic factors, nutrition, external environment, intrauterine environment, and stress-including heat stress. When pigs are under extreme heat-related stress during the first 30 days following breeding, it is imperative that the following recommendations be put into effect to avoid increased embryo mortality:

(1) avoid late estrual inseminations,

(2) minimize unnecessary stress by mixing females only at weaning,

(3) refrain from or even stop moving females in gestation to different locations, and

(4) don’t raise or lower feeding levels within the first 30 days after breeding with expectations of improving reproductive performance. Provide a good, level plane of nutrition during and after breeding. The strategies also should be used through the year.

Late Insemination—Several processes occur following breeding to optimally prepare the uterus for implantation. A postbreeding inflammatory response occurs in the uterus of the pig to remove nonfertilizing spermatozoa and bacteria. In addition, during early to mid-estrus, uterine contractions help physically to remove the products of this inflammation. The first step in limiting embryo loss occurs during the estrus period, and that is to avoid late inseminations. The simplest way to prevent late estrual inseminations is to ignore the “target” number of inseminations and breed females totally on the basis of a strong, standing heat response. Another way to reduce mistimed inseminations is to determine the average estrous length in your weaned sows, gilts, and repeat breeders and based on these averages, shorten the last insemination interval. For example, if you normally service sows AM day 1, AM day 2, AM day 3, change your schedule to AM day 1, AM/PM day 2. Thorough heat-checking before performing subsequent inseminations will help prevent poorly timed, late artificial inseminations, which may interfere with uterine preparation for implantation.

Mixing Females—Once fertilization occurs in the oviducts, pig embryos descend into the uterus 24-48 hr after ovulation. However, implantation does not occur until day 13 and full attachment not until day 28. During this time, the pig is highly susceptible to stress factors, such as movement and temperature. If females are to be mixed, this should be performed on the day of weaning to prevent unnecessary stress on the female. Any unnecessary stress following breeding can result in embryo detachment and loss.

Moving Females—After breeding and around day 30 of pregnancy, females may be moved to a different location; however, mixing sows and gilts at any time during or following breeding greatly increases the chances of subsequent embryo mortality. Temperature changes also are likely to increase embryo mortality, and during early pregnancy females should be protected from heat or cold in order to avoid unnecessary stress. Make sure that cooling and heating systems are routinely maintained and functional. You should have a backup system in place (i.e., hoses and spray nozzles) in case of equipment failures.

Nutrition—Sows and gilts should be provided enough feed following breeding to keep them on an even plane at maintenance levels or slightly above for thin females. The pre-mating nutritional status appears to be a greater determinant of embryo numbers and survival than post-mating ration in gilts. Using this strategy requires "flushing" them with an extra 1 to 2 pounds of feed during the estrus cycle before mating. This can be attempted for sows as well, though most postweaned sows voluntarily restrict their own feed intake. Keep in mind that high feed intake during the 30 days following breeding may have a negative impact on swine embryos, especially in pregnant gilts.

Because gestating sows are limit fed there are no extra measures to take in feeding during periods of heat stress. Just ensure the female is consuming feed daily (hopefully around 4 to 5 pounds, depending on diet formulation). Appropriate action to boost appetite may be required, similar to the procedures used during lactation.

Hormonal Strategies

Historically, gonadotropins and progestens have been used with limited success to improve reproductive performance in swine. Nevertheless, application of these hormones in specific swine management areas has helped reduce the reproductive lag associated with heat stress and negative energy balances during lactation. Hormonal strategies using PG600® (400 I.U. PMSG + 200 I. U. hCG), Regumate® (progesterone), and Lutalyse® (prostaglandin) may help counteract the negative effects of heat stress. PG600® can be injected at weaning to stimulate follicular growth, speed return to estrus intervals, and reduce the incidence of anestrus. However, cost is a major consideration, and this approach may show benefits only in herds where extended wean-to-estrus lengths (more than 10 days) or high frequencies of anestrus occur. PG600® is most commonly used to stimulate puberty in 175+ day-old pre-pubertal gilts. This is generally very effective and may also be useful during periods of high ambient temperatures to stimulate a first estrus in incoming gilts where cyclicity is suppressed. Some producers treat only problem groups of sows, such as those with low feed consumption during lactation or low parity, to improve the efficiency of this technology. Prostaglandins, which are commonly used to induce parturition, are believed to speed uterine recovery when injected post-farrowing. However, prostaglandin used alone has not reduced the incidence of anestrus or extended wean-to-estrus interval (WEI).

Extended WEIs and anestrus following weaning in parity 1 sows are probably the most noticeable effect of heat stress on reproduction. The combination of heat stress, parturition, lactation, and poor feed intake contribute to poor reproduction in all sows; however, P1 females also have a metabolic demand for growth. One strategy to minimize the impact of heat stress on overall herd reproduction is to adjust female replacement schedules to avoid large numbers of P1 farrowings during July and August. It may also be possible to treat this subpopulation of females with hormonal therapy during lactation and at the time of weaning to stimulate the reproductive system. A single injection of PG600® at the time of weaning has been effective in reducing WEI in sows. However, a recent field report suggests that a vulvular injection of 1/2 cc. of Estrumate (not currently labeled for swine use) within 24 hours after farrowing in conjunction with PG600® at weaning may be even more effective at reducing WEI and the incidence of anestrus than the use of either of these components alone.

Continual feeding of Regumate® (for 14 days) suppresses follicular growth and estrus until withdrawn. Regumate® usage appears to be useful in estrus synchronization of cycling females (especially gilts) and may be a useful strategy to improve reproductive performance after a short lactation in sows (feed the hormone throughout lactation and withdraw at weaning). In this situation, Regumate® is fed for 14 days and followed by an injection of prostaglandin on the morning of Day 15. But cost and the delivery system are major limitations of this regimen, especially if sows are not consuming feed during periods of heat stress. NOTE: Regumate® and Estrumate(are currently not approved for swine use and is produced in an oil-base form that is difficult to handle.

Lactation Lengths and Split Weaning

The greatest metabolic demand on the sow is during lactation. Many post-weaning reproductive abnormalities can be attributed to low feed intake and depletion of fat reserves in the lactating sow.

Possible strategies to reduce nutritional requirements and maintain body condition include a shorter lactation period, cross-fostering to balance litter size and split weaning. A large data base showed that parity 3+ sows can be weaned, recycle, and conceive efficiently at lactation lengths as short as 9 days. However, first and second parity sows appear to need lactation lengths of 14 and 12 days, respectively, to cycle and conceive efficiently.

Reducing litter size during the last one third of 28 d or longer lactations by means of split weaning can be an effective strategy for conserving the body fat stores of the sow. However, some studies suggest the removal of more than two to three piglets earlier than 3 days prior to weaning may cause sows to cycle while still in the farrowing crate. Short cycling can be avoided and split weaning accomplished by removal of the heaviest two or three piglets 3 days before weaning. A disadvantage of this particular system is a resulting pig flow problem in the nursery that may involve extra labor and health issues resulting from double sorting and mixing of piglets. Space utilization to continue using all-in-all-out production practices should be practiced even when split-weaning females.

Summary

Outlined here are steps to reduce the impact of heat stress (seasonal infertility) on swine reproductive productive performance. In short, all of these considerations must be addressed for producers to cope with reproductive issues associated with seasonal infertility.

1. Incorporate the most advanced methods of ventilation and cooling into all phases of gilt development and sow productivity, and make sure they work. Don’t wait until sows and gilts are already heat stressed. Activate systems earlier to periods of prolonged high ambient temperatures.
2. Schedule animal activities in the early morning and evening, when temperatures are not as extreme. This practice benefits both employees and breeding females.
3. Set up a Cool Zone (reduced heat index) for the gilt acclimatization phase.
4. Implement strategies to reduce or avoid sow movements and mixing. Re-evaluate estrus detection strategies to ensure optimal reproductive stimulation and insemination protocols are used to avoid late estrual inseminations.
5. Evaluate specific problems (i.e., anestrus or prolonged WEI) and apply hormonal treatments when needed.
6. Feed nursing sows smaller quantities of more nutrient-dense diets more often.
7. Overcompensate for an increase in seasonal anestrus by having 10 to 15 percent more gilts available for breeding. However, avoid overcrowding of additional gilts.
8. Implement an early-wean/split-weaning program during the summer that will reduce the metabolic demand on lactating females.
9. Utilize genetics that have documented records for superior appetite and feed intakes.
10. Establish a long-term program to reduce the impact of heat stress on the sow herd through genetic selection of animals that can perform well in high temperatures.

Suggested Reading

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SECTION III. MANAGEMENT INTERVENTIONS TO REDUCE SEASONAL INFERTILITY

Table 1. Specific management interventions to reduce the immediate impact of seasonal effects on sow herd performance.

Management Area	*Potential Problems*	*Potential Intervention*
1. Gilt Development and Breeding	Failure to detect estrus following transition from developer to breeding	• More boar contact during estrus detection • Cool Zone (<10-15º F) for 5-7 days following move. • PG600 at the time of move (26-30 wks of age).
	Poor 25 d conception rates	• Increase space per animal. • Eliminate post-mating move or mixing.
2. Lactation	Poor feed consumption	• Cooling strategies and heat lamp management • Increase feeding frequency • Early AM Feedings (2:00 a.m.- 6:00 a.m.) or Late PM Feedings (10:00 p.m. - 2:00 a.m.) • Wet feed • Provide snout cooling • Increase room circulatory air movement (must install piglet hovers) • Increase nutrient density of diet
	Slow farrowings/high still births	• Induce parturition (PGF2α) and observe farrowings 24 h later. • Oxytocin every 30-45 min during last 1/3 of farrowing or after ~6 piglets have farrowed
	Post-farrow uterine infection	• 1 cc. Estrumate[a] (PGF2α) within 24 h of farrowing
	Increased sow mortality	• Increase gestation feeding/body conditions scores of thin sows • Increase evaporative cooling/dripping interval
3. Sow Breeding	Delayed wean to estrus intervals	• Increase lactation lengths (>14 d). • Increase feed intake during first 7 to 10 days of lactation • Estrumate[a] (PGF2α) after farrowing, PG600 at weaning (must use both in synchrony).
	Poor conception rates	• Skip heats for sows with low body condition scores (< 2). • Avoid late estrual inseminations • No mixing or moving females <35 days post A.I. or natural mating
4. Boar Management	Low sperm output	• Evaporative cooling strategies • Decrease collection frequency • Increase dietary energy and protein
	Poor quality ejaculate(s)	• Collect again 2-3 days later. • Allow 5-6 weeks for complete recovery.

[a] Not currently approved for swine use by FDA.