Swine reproduction for nonswine practitioners
Part 2. Disorders of swine that affect breeding males and females

Sherrie Clark
Virginia-Maryland Regional College of Veterinary Medicine, Blacksburg, VA

Abstract

Conditions or disorders that affect male and female swine generally negatively affect reproductive capacity and efficiency. Currently, swine industry relies heavily on healthy male and female breeding stock to replace superior genetics used in their intensive breeding programs.1 When congenital, metabolic, systemic illness, or other disorders affect the replacement stock and the existing breeding herd, the overall industry's reproductive success is reduced. There are several anatomical, metabolic, systemic and disease conditions that affect gilts, boars, and sows. This article will cover majority of the common disorders that a nonswine practitioner may need to have working knowledge in order to aid clients in differential diagnoses, diagnostic strategies, and potential therapies. Abortifacient agents will be mentioned; however, not as a primary component of the material.

Introduction

Maintaining a healthy breeding herd is the goal of swine producers. Success of their operation depends on keeping gilts, sows, and boars fit for selection, expressing normal breeding behavior and successfully achieving pregnancies and production of healthy piglets. There are a variety of disorders or conditions that can adversely affect the ability of these animals to achieve the reproductive goals of the farm. These conditions may affect the anatomy of males and females and not allow for sexual activity with the other sex. Additionally, there are metabolic disorders that relate to nutrition and elevated ambient temperatures that negatively influence the behavior and ability for pigs to breed successfully. As with most animal systems, systemic diseases can infect the reproductive tract and adversely affect fertilization and maintenance of pregnancy.

Congenital disorders

In all domestic species, reproductive tract development occurs during the early stage of pregnancy and developmental abnormalities can occur.[2] Intersex conditions are relatively common in swine and the majority of these animals are infertile and do not have the capability to obtain a successful pregnancy. Most commonly observed is the phenotypical female with retention of testes in the abdomen (formerly known as male pseudohermaphrodite) or true intersex where there are ovatestes connected to a rudimentary female reproductive tract.[3] Gilts may also have small vulvas and abnormal teats (pin nipples or inverted nipples) that would deter producers from selecting them for entry into the gilt pool.[4]

Another anatomical conditions that develop in gilts is cystic ovarian disease.[5] These cysts are generally discovered in postpubertal gilts and they may initially express abnormal estrous behavior that results in anestrus. After mating, the producer may decide that the female is pregnant; however, proper diagnosis at routine pregnancy diagnosis via B-mode ultrasonography is essential. During ultrasonographic pregnancy diagnosis, while normal uterine architecture is visualized, large, bilateral, and fluid-filled (anechoic) follicular cysts are also identified.[6] If these cysts are not imaged at this period, they are diagnosed when the females are processed at the abattoir due to their lack of estrus activity and nonpregnant status.[5]

Congenital conditions in boars are generally related to penis or testes. It is important to have complete development and maturity of a boar's penis. The most common disorder associated with boar penis is persistent penile frenulum. Frenulum is an epithelial attachment that runs from the mucosal covering of the penis to the base of the corkscrew behind penis tip.[6] This attachment does not detach normally at puberty in response to androgen production. Many times, the penis will not exteriorize during arousal and extension of penis and is diverted backwards. Normal intromission will not occur and surgical correction is the only treatment even though this condition is considered heritable and offspring from these sires should not be selected for breeding purposes.[7,8] Additionally, formation of an abnormal anatomical penis has been observed in boars selected for breeding. A boar with a hypoplastic penis will not be able to 'lock into' the cervix of the female during coitus. He may not be able to exteriorize the penis outside the preputial opening and many times gets stuck in the preputial diverticulum and the client describes the boar as 'balling up' in the prepuce. These animals should not be used for breeding and apparently this condition is heritable.

Other abnormalities identified in very young boars that are not selected for breeding include inguinal hernias and cryptorchidism. These conditions are observed in piglets ~ 6 weeks and surgical correction and castration eliminate them from the breeding pool.[9] Although a unilateral cryptorchid boar can produce sperm and breed a female, this condition is apparently heritable.

Metabolic conditions

There are various factors that affect the metabolism of breeding pigs; one of the most important factors is proper nutrition. Developing boars and gilts need proper nutrition for growth and hormone production to initiate puberty.[3] If they grow too slowly due to inadequate nutrition, they may exhibit delayed puberty. Additionally, if gilts and boars consume feed contaminated with zearalenone, they will succumb to the effects of hyperestrogenic syndrome. Gilts have reddened and swollen vulvas and may develop vagina prolapses and anestrus. If they are inseminated, early pregnancy loss will generally result. Boars are also negatively affected by the estrogenic effects of zearalenone and can have a reduction in size of the testes and a decreased fertilizing capacity. This is one of the most economically important reproductive condition related to feed that affects the swine industry.[10]

Sows suffer from nutritional deficits during lactation.[3,4,11] If they are nursing a large litter and are unable to consume enough nutrients to maintain their metabolic needs, breakdown of their fat stores occurs and body condition loss results. This generally affects the sow's 'weaning-to-service interval' and ability to conceive postweaning and subsequent litter size. Sow longevity in the herd is reduced and the producer may have to increase gilt replacement rates.

Another factor that affects breeding stock metabolism and longevity in the herd is heat stress.[1,3,4] Increased ambient temperature can have a detrimental effect on sperm production and conception rates.[7] Estrus expression and early embryonic losses can be adversely affected by extreme temperatures in the swine industry. They have assigned periods in a year in which they expect to breed 1.25 - 1.3 times, as many females as needed to fill farrowing crates to meet market demands. Pregnancy rates are affected by decreased sperm quality and embryonic losses caused by heat stress or any metabolic condition that causes an abnormally high increase in core body temperature. Boars appear to be much more sensitive to the effects of fever and high body temperature and increases in the abnormal morphology of sperm can be seen in the ejaculate up to 6 - 8 weeks. Ensuring that boars do not spend extended periods of lying down and potentially increasing the temperature of the scrotum is critical to breeding success. Medications to reduce fever should be used initially. Ventilation systems using cool cells and fans along with misters or sprinklers may mitigate the effects of heat stress. Also, check nipple waterers to ensure that animals are supplied with adequate amounts of water during the months with highest temperatures.[4]

Systemic disorders

As stated previously, any disorder that causes an increase in core body temperature can adversely affect gilts, sows, and boars. Systemic conditions that affect urogenital tract are generally infectious and raise the body temperature. These conditions are primarily diagnosed in gilts and sows. Cystitis and pyelonephritis can be a result of unhygienic insemination practices or restricted water intake in female pigs.[4,5] Organisms (e.g., *Escherichia coli* and *Streptococci* spp.) are common isolates and can be treated with broad spectrum antimicrobials and nonsteroidal antiinflammatories.

Majority of infectious diseases that affect breeding age pigs and their subsequent offspring are agents that cause infertility and abortion. These organisms (Table) continue to cause economic losses yearly in the swine industry.[4,12] Vaccination of breeding stock twice a year with combination products containing killed porcine Parvovirus, *Erysipelas*, and *Leptospira canicola, grippotyphosa, hardjo, icterohemorrhagiae, pomona,* and *bratislava* have been quite effective in alleviating clinical signs associated with these organisms. Vaccines have been developed against porcine reproductive and respiratory syndrome (PRRS) virus with limited efficacy. There are effective porcine circovirus type 2 (PCV2) vaccines that combat respiratory and reproductive outbreaks. Pseudorabies was eradicated by vaccination with a G1 gene-deleted product but infection may occur from the feral swine population. There is currently no vaccination or treatment for Brucellosis except to remove infected breeding stock from the herd.

Dystocia

Difficulty births are more common in gilts and older sows. Uterine inertia is the primary cause of dystocia.[4,13] Piglets are usually delivered every 15 - 30 minutes. If delivery is prolonged between piglets, examination of the birth canal is warranted. Oxytocin (30 IU) can be injected intramuscularly hourly and usually not more than 2 or 3 doses. Female should be monitored for abdominal contractions and delivery of piglets and passage of fetal membranes. If manual delivery is not successful then a Cesarean surgery may be warranted. This is not a common procedure performed in commercial swine operations.

Table. Organisms that cause reproductive failure and abortion in swine (adapted from Swine Disease Manual[12])

Disease condition and agent	Clinical signs	Diagnostic procedures and additional information
Parvoviral infection Parvovirus	Usually affects gilts. Depends on stage of pregnancy when infected. Increased returns to estrus, failure to farrow, stillbirths, mummies, and piglet death. Normal female with no signs of abortion.	Causes embryonic and fetal death, primarily in gilts. Infection is endemic and not obvious to the producer.
Porcine reproductive and respiratory syndrome Arterivirus	Sows can be sick and febrile from infection and abort or abort weeks later due to fetal infection. Notice decreased conception and farrowing rates. Increases in weak pigs, stillbirths, mummies, premature farrowing and late term abortion.	PCR in serum from infected sows and fluids from aborted piglets; identification of virus in fresh or fixed tissues of acutely affected neonates.
Leptospirosis *Leptospira species*	Initial outbreak: late term abortions and stillbirths Piglets are weak and may die within days of birth. Dams are not sick.	Immunity remains after initial abortion and can be bred successfully. Diagnosis by herd serology or PCR on fetal tissues.
Pseudorabies Herpesvirus	Depends on stage of pregnancy when infected; abortion initially. CNS signs or sudden death in piglets. Sows with immunity do not have clinical signs.	Less reproductive signs if endemic. Diagnosis by serology, virus isolation, and PCR. Eradicated in US in 2004.
Porcine circovirus type 2 Family Circoviridae	Can be associated with sporadic outbreaks of fetal death and/or mummification.	Lesions and virus detected in hearts of aborted and mummified fetuses.
Brucellosis *Brucella suis*	Infertility common. Any manifestation of reproductive failure may occur. Abortion at any stage of pregnancy. In boars, orchitis may occur.	Near eradication status in US. Diagnosis by serology. This condition is zoonotic.

If a swine producer suspects that the female has an increased risk of dystocia or has carried the pregnancy beyond 115 days, then induction of parturition with prostaglandins is the therapy of choice. Producers routinely induce parturition in pigs as a management tool. Pigs are given 10 mg of prostaglandins (Lutalyse®, Zoetis Animal Health, Kalamazoo, MI) intramuscularly or 5 mg in vulval lips. Farrowing usually commences in 30 - 36 hours. Some swine producers give prostaglandin injections 12 hours apart and add a single dose of oxytocin to hasten the process. It should be noted that stillbirths and mummies are considered normal in low numbers (< 5%) in large litters.

Postpartum vaginal discharge is normal; however, should be monitored daily and the body temperature of the sow. Prolapse of reproductive tissues have occurred in sows and gilts postpartum. Vaginal prolapses are typically treated with replacing the tissue and placing a retention suture and then removed from the breeding herd once the piglets are weaned. Sows with uterine prolapses are culled.

Miscellaneous conditions

Conditions that affect mating behavior, sperm quality, and mating timing can also result in reproductive failure. Lameness is one of the common causes of removal of breeding age pig.[4] Sows and boars are not able to exhibit normal breeding behavior and either cannot be mounted or unable to mount a phantom, respectively. Mishandling of sperm in the breeding barn can be a reason for poor semen quality. Additionally, the number, quality and mating timing can also decrease reproductive success and litter size.

Conclusion

Numerous conditions adversely affect reproductive success in pigs. Whether they are identified prior to selection for breeding stock or during mating process, it is critical to determine if there is a metabolic, systemic, or other condition that is disrupting reproductive success in the herd. Identification of the cause of the reproductive failure is necessary to implement a corrective measure.

Conflict of interest

None to declare.

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