Swine theriogenology: what you need to know
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Background
Thousands of small farms raise a few pigs, along with an assortment of other livestock. More significant is the number of 4-H and FFA youth who raise a pig or two to exhibit at county and state fairs and winter jackpot shows. Competition in these events is often intense, so when things go awry with a show pig, veterinarians are often called to the rescue.

Many of the veterinarians who receive these calls specialize in companion animal care. They have little field experience in medical management of pigs. This paper is written for these veterinarians and focuses on one aspect of swine health – reproduction.

But first, a word on vaccinations
Vaccinations are essential to all aspects of swine health, including reproduction. Recommended vaccinations depend upon the circumstances of a swine operation. For “closed” facilities, with no movement of pigs in or out, a minimal selection of vaccinations for reproductive performance may suffice. This should include a parvo-lepto combination. Location also affects vaccination choice. In many areas of the U.S., vaccinations for porcine reproductive and respiratory syndrome (PRRS) must be included as well as others such as circovirus and Mycoplasma sp. A resource for this information is the 10th edition of Diseases of swine (Zimmerman et.al.) or a field primer is Doc sanders goes whole hog!

Puberty and estrus
Gilts of European swine breeds enter puberty at about 25 weeks. Yorkshire breed females often require a couple months more. Factors affecting puberty include good nutrition, body weight of 120 kg., and exposure to a boar.

The porcine estrous cycle lasts 21 days – the same as for bovines. However, unlike the bovine, porcine females do not have a biphasic or diphasic follicular wave. As a gilt approaches puberty, hormone regulation occurs with a decrease of an estradiol negative feedback on gonadotropin releasing hormone (GnRH) synthesis with subsequent increase in both luteinizing hormone (LH) and follicle stimulating hormone (FSH).1 The number of antral follicles increases as estrus approaches.

Most consider observation an effective way to detect the onset of estrus and when a sow should be bred. Observation of a swollen, reddened vulva is often a useful anatomical indicator for a gilt in heat. Note this caution: it is also possible to have estrogenic mycotoxins causing prepuberal vulvar development prior to reaching puberty.

An effective way to induce estrus in gilts is to take them on a stressful trailer ride for a few miles, followed by placing them in a pen across the fence from a boar. This takes advantage of pheromones from the boar, which play an important role in estrus and ovulation. Most gilts treated to this technique will be in estrus in five to seven days. Other options for inducing estrus include:

- A luteotrophic drug, PG 600™, which brings mature sows into heat when the farm operator wants estrus to begin on a specific date.
- Oral altrenogest products – Matrix™ and Altresyn™. After one or the other of these products is incorporated into a sow’s diet for a couple of weeks, the product is removed from the diet, sending the sow into estrus.
- Prostaglandin F2α (PGF2α) administered to sows two weeks after they are bred. The treated sows will absorb their pregnancy and appear in fertile estrus in 72 hours. This program is useful in embryo transfer programs as it precisely synchronizes estrus of donor sows and recipient sows.
Diestrus refers to the luteal phase after the proestrus and estrus period. Signs of proestrus include a swollen reddened vulva, sometimes with a slight amount of mucus at the vulvar lips. Anatomical signs of estrus in sows are similar to that of other species, but in swine, the female’s behavioral changes are very useful. The sow seeks out the boar, contrary to most mammals in which the male seeks out the female.

Sows exhibit a characteristic stance in the presence of a boar. Their ears stand erect as they assume an immovable four-point stance, even when prodded. When breeding with an inexperienced boar, coaching and guidance are required, to line up the sow and boar for coitus.

**Breeding**

A sow will cycle back into heat within five to seven days after weaning her pigs, unless she is a “heavy milker” and loses significant body condition. Such a sow requires more time before her estrous cycle will start again. Sows are often weaned in groups.

Sows are usually in heat for 40 to 48 hours. Breeding twice, at 12 and 24 hours during this period, works best. This typically results in larger litters. Ovulation starts 36 to 44 hours after the LH surge, just prior to signs of estrus. While ovulation often occurs in two to four hours, the range can last from one to nine hours.

If natural service is used, a boar is typically required for each six sows. When “boar power” is lacking, litter sizes tend to be smaller in later breedings.

With the advent of successful artificial insemination (AI) protocols, small operations can implement AI protocols similar to commercial operation management practices.
As previously mentioned, the presence of a boar is extremely effective in stimulating estrus and ovulation. Large operations keep a boar or two on premises, running them up and down the aisles to circulate their pheromones. Unable to afford this luxury, small farms can substitute the natural pheromones of boars with a spray product, Hog Mate, to prepare sows for breeding by AI.

**Artificial insemination**

During insemination, downward pressure is put on the sow’s loin. Insemination may take up to 20 minutes. The technician must be patient. A rushed insemination results in reduced litter size, and in some cases, no pregnancy at all.

Most people are surprised that nearly 85 to 90% of swine breeding in commercial operations is by AI. Four distinct AI protocols are available:

1. Frozen semen, which impregnates a sow, but reduces litter size by as much as a third.
2. Fresh, chilled, extended semen inseminated into the cervix via an AI catheter which greatly improves the litter size over using frozen semen.
3. Fresh, chilled, extended semen inseminated caudal to the cervix. This technique has become popular because it results in a pig or two more per litter.
4. Fresh, chilled, extended semen introduced by deep horn insemination near each Fallopian tube. This protocol has been developed but not yet implemented outside research and development facilities. The technique, which greatly increases litter size, is being refined for easy use by technicians. Someday technicians will be able to fertilize over 40 ova in a sow via deep horn insemination. The question is how to manage this many embryos, as a sow’s uterus runs out of room at half this number. The technique also requires a much smaller insemination dose. This suggests that only the top genetic-merit boars would be used – by some predictions, only the top two percent.
A special adapted endoscope is used to thread the catheter near the Fallopian tube via fluoroscope. Utilizing this method the sperm dose can successfully be reduced to 2% of a normal 50 million sperm dose.

Yet another option – sexed semen – is being developed for swine, using similar technology developed for routine use in cattle. A genetics company is in the final stages of releasing this option in the swine genetics marketplace.

Sexed semen for swine is in final stages of development using flow cytometry. (Courtesy of Sexing Technologies, Navasota, Texas)

**Pregnancy examination**

Several methods are used to detect pregnancy in a sow. Real time B ultrasound examinations are the best option. Other choices, such as observing return to estrus in 21 days, lead to many missed non-pregnant sows. Estrone blood tests are considered too cumbersome for small commercial operations.

**Farrowing**

The old cliché “three months, three weeks and three days” pretty much predicts the swine gestation period of 114 days. But the exact time of a farrowing cannot be predicted with accuracy. This means farrowing can occur unsupervised, especially when farm management is spread thin or the owner has another job. A useful technique for ensuring adequate supervision is to induce farrowing at 110-112 days with PGF2α + oxytocin. Supervised farrowing results in fewer stillborn pigs, according to available data. Small doses of oxytocin are also very useful during farrowing when a sow is becoming noticeably fatigued. Managed obstetrics is often prevents the need for a cesarean section. Confirm the due date and verify that the sow has milk in her mammary glands. Milk usually can be stripped out of the teats in the last 12 hours prior to farrowing.
Obstetrics

Maternal-fetal mismatch – that is, piglets too large for the birth canal – is often the primary reason for dystocia in a sow. This situation is more common for first-litter gilts. When a sow carries only three or four pigs to term, the pigs are usually larger than normal.

A cesarian section is usually a salvage operation for these and other incongruities that occur in the farrowing process. Generally, cesarean sections are most successful when initiated early in the course of parturition. This reduces risk to the health of the sow and her babies.

If pigs are slow to be delivered, an aseptic vaginal and pelvic examination should be performed to determine what is delaying delivery. Due to risk of infection of the sow and piglets, bare arm examinations are not appropriate, nor is examination without a thorough cleaning of the vulva and perineal area.

A pelvic examination will help determine whether a sow’s pelvis is too narrow or the pigs are large relative to the size of the birth canal. In rare cases, a mal-positioned pig in the birth canal causes dystocia; for instance, a piglet positioned upside down. The geometry of the pelvic canal, 60 to 90 degrees opposite that of the pig, prevents any opportunity to deliver without turning the pig over 180 degrees.

Cesarian section is often recommended when dystocia is obvious or when the owner reports that the piglets are extremely valuable. Nothing is more discouraging than delivering a litter of dead pigs. The following are examples of sow anesthesia options that are useful in cesarean sections, depending on the judgment and experience of the surgeon:

1. Reconstitute 1 vial of telazol with 2.5 ml xylazine (100 mg/ml) and ketamine (100 mg/ml). Give 1 ml/50 lb IM. (G. Hubbell, Ohio State CVM)
2. Reconstitute 1 vial of telazol with 5 ml xylazine (100 mg/ml). Give 1 ml/50 lb IM. (F. Welker, Ohio State CVM)
3. Xylazine (100 mg/ml), ketamine (5 mg/lb), and butorphanol (0.1 mg/lb). Give IM. (F. Welker, Ohio State CVM)
4. Xylazine (100 mg/ml) IM. Mask halothane anesthesia to effect. (D. Sanders, UVC)
5. Dexmedetomidine (0.02 mg/kg) with ketamine (5 mg/kg) and butorphanol (0.2 mg/kg) IM. (Anesthesia and analgesia for veterinary technicians. 4th ed. p. 290, Thomas and Lerche)

The preferred site for a cesarean section incision is a few inches above and parallel to the mammary glands. Surgical preparation is essential for the well-being and comfort of the sow. The surgical site should be draped.
The uterine horns of a mature sow may be a meter or more long, each loaded with pigs. Often, each horn must be surgically opened to locate and remove every pig. Gloves should be rinsed in heparinized saline before entering the abdominal cavity. Hemostats should be used for hemorrhage control, rather than 4 X 4 gauze sponges. Sponges tend to create locations for adhesions to develop after surgery. Adhesions may not be critical if the sow is leaving the herd after surgery but use of gauze sponges should be avoided if future surgery is anticipated for a sow.

At least a couple of attendants should be on hand to take and revive pigs as they are removed from the uterine horns. A pitcher of 105°F water is very helpful for reviving newborn pigs. Insert each pig in the water up to its head. After they are revived in this way, they should be dried, the umbilicus should be clipped down to a couple of centimeters, and the stump should be dipped in two percent iodine or an equivalent disinfectant.

Each pig should be provided colostrum within a couple hours of birth. Stripping colostrum from the sow’s teats and administering it to each pig is very beneficial. If farrowing management is a significant part of a clinic’s work, additional colostrum should be collected from mature sows with a prodigious supply. This colostrum can be frozen in an ice cube trays so that a cube at a time can be thawed as needed for a low-vitality pig or to make up for a sow with inadequate colostrum. The colostrum should be administered by stomach tube, similar to administration in newborn puppies.

References