TEXAS A&M AGRILIFE EXTENSION

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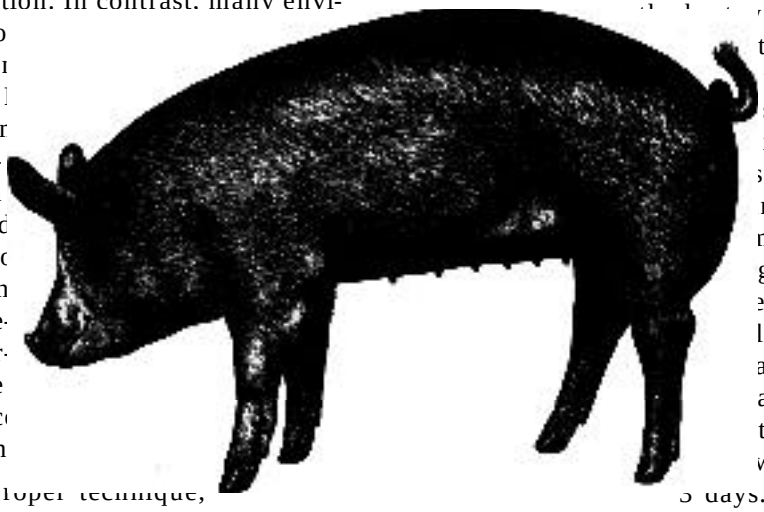
Artificial Insemination in Swine

Jodi Sterle*

Artificial insemination (AI) in swine, while not a new technique, is a tool that works only if managed and used properly. Artificial insemination requires a higher level of management than natural-service mating systems. Also, there is a greater chance of human error associated with AI than with natural service.

When a boar naturally mates a sow, the semen is not subjected to severe changes in environment and is deposited into the female more than once during the optimal time for fertilization. In contrast. many environmental changes can o collected, diluted, trai deposited artificially. tions must be perforr correctly and at the opti- mal times. To obtain a high conception rate and good litter size, estro detection (heat checkin must be performed care- fully and at regular inter- vals. At each step, there a potential to introduc affect conception rate an



However, with the proper technique, careful estrous detection and patience, artificial insemination has many advantages. Perhaps the greatest advantage is that AI permits more extensive use of new, superior genetics at a potentially lower cost. Additionally, AI can reduce the number of boars needed on an operation, can reduce (but not eliminate) the transmission of disease, and **could** decrease the overall cost of breeding sows (depending on the number of sows, price of semen, etc.)

*Assistant Professor and Extension Swine Specialist, The Texas A&M University System.

Swine estrous cycle

The pig's estrous cycle averages 21 days but can range from 17 to 25 days. The first day of standing heat, when the female is receptive to the male and will stand to be mounted, is referred to as day 0. The 2 or 3 days that the female is sexually receptive is termed *estrus*.

The standing reflex is stimulated by contact with a mature boar. The boar's submaxillary salivary glands produce pheromones that are secreted into the saliva. Direct physical contact between the male and female is ay to ensure that these stimula- tory chemicals are transmitted to the female. The pheromones signal to the female that a male is present and initiate the standing reflex if the female is n estrus. The female may or nay not exhibit other visible gns, including mounting or empting to ride other females, a llen red vulva, mucus from the a, "popping" of the ears, and ased vocalization and activity. ts, estrus may only last a day or while a sow may be in estrus for 3 days. ***Ovulation*** (release of the egg from the follicle on the ovary) usually occurs 23 to 48 hours after the onset of estrus, however, this event is extremely variable. In fact, a sow may ovulate before estrus occurs. It is because of this variability that females should be inseminated more than once.

Detecting estrus

Estrous detection in an AI system is vital to the success of each breeding. The producer must be accurate in estimating the onset of estrus. Twice-daily estrous detection can be more effective than once-daily detection, although it consumes more time and labor.

The benefit of accurately estimating the onset of standing heat with twice-daily estrous detection can only be realized if both checks are done properly and carefully and if checks are performed as close to 12 hours apart as possible. For greatest efficiency, perform estrous detection first thing in the morning, before feeding or at least an hour after feeding. If this is not possible, detection performed in the afternoon or early evening can work well if the ambient temperature will not induce heat stress. Check for estrus when the females are not frustrated or distracted. Use a mature boar (11 months of age or older) to induce the standing reflex necessary during the insemination process; this is a particularly important step when dealing with gilts. Take the females and the boar to a neutral pen for estrous detection to provide females with the greatest opportunity to express estrus. Generally, the boar will chant, salivate and attempt to mount most of the females. A female in estrus actually may seek out the boar and stand to be mounted. When a female is detected in estrus, she should be removed from the pen so the boar will move to the other females.

It is critical to mate the female within a few hours **before** ovulation. However, timing of ovulation varies. Generally, gilts will ovulate sooner after the onset of estrus than sows. There also is variation among farms, genetic lines and individual females. Sows stand longer than gilts and ovulation in both sows and gilts occurs towards the end of estrus. For these reasons, gilts should be inseminated 12 hours after the detection of estrus and sows should be inseminated 24 hours after detection of estrus when using twice-daily heat checks performed 12 hours apart. When using once-daily heat checks, the accuracy of estimating the onset of estrus decreases. In this instance, gilts and sows usually are bred when they are found in standing heat. All females should be mated at least once daily for each day they stand. This potentially results in some waste of semen, but it is the best way to ensure that at least one mating is optimally timed relative to ovulation. As patterns of expression and duration of estrus are established for a given farm, it may be possible to refine the time and number of inseminations.

The standing reflex is necessary during insemination. It helps promote uterine contractions essential to the transport of semen through the uterus and into the oviduct for insemination. Without the standing reflex, contractions do not occur and semen can backflow out of the female's reproductive tract for some time after insemination is complete.

The female reproductive system

The reproductive system of female swine is more conducive to AI than that of cattle or sheep. Therefore, the insemination process tends to be less time-consuming and easier to accomplish in swine.

For best results, it is important to use the proper technique and have an understanding of the reproductive system. Figure 1 shows the reproductive organs of the female swine. The vulva is the visible portion of the female reproductive tract and may be red and swollen before or at the time of standing heat. The vulva leads to the vagina, which tapers into the cervix. The cervix consists of multiple rings and ridges that act as a barrier to prevent bacteria, dirt and other foreign material from entering the uterus. During estrus, the cervix becomes swollen. This allows the AI spirette or catheter to be "locked" into it. A spirette is a spiral-shaped, plastic-tipped insemination rod; a catheter is a foam-tipped insemination rod. This locking prevents some semen backflow and initiates uterine contractions essential for sperm transport through the uterus to the oviduct, the site of fertilization.

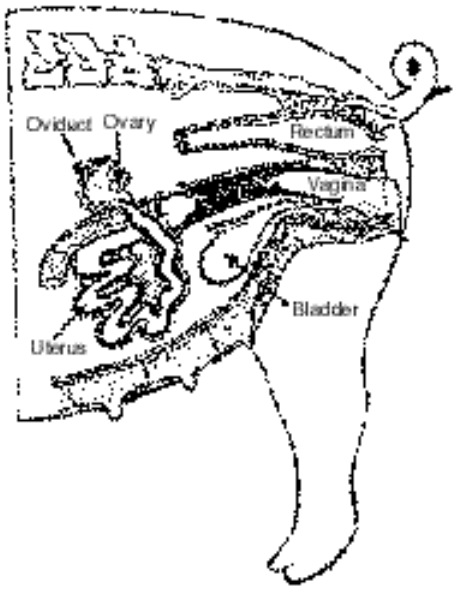


Figure 1. Reproductive anatomy of the sow. Source: University of Missouri. MU Guide G2312.

During natural mating, the boar's penis (which is corkscrew-shaped at the tip) fits into the rings and folds of the cervix, and the pressure causes the penis to begin ejaculation. The semen travels through the uterus and into the oviduct with the help of uterine contractions.

The ovary releases eggs (oocytes) during ovulation; the oocytes travel to the oviduct where they combine with the sperm in fertilization. Freshly ejaculated sperm are not capable of penetrating an egg and must be present in the female reproductive tract for 2 or 3 hours to undergo the biological changes necessary for fertilization. This process is referred to as sperm capacitation.

After fertilization, the embryos migrate into the uterus.

Inseminating the female

- Before using the semen, evaluate it under a microscope. Shipment, diluent, storage temperature, fluctuations in temperature and length of time since collection may all affect the shelf life, motility and viability of the semen.
- Before inseminating the female, use a paper towel to clean the vulva.
- Lubricate the tip of the spirette or catheter using any nonspermicidal lubricant or a few drops of extended semen. Avoid getting lubricant in the opening of the spirette/catheter.
- Gently guide the spirette/catheter, with the tip pointed up, through the vagina to the cervix (Fig. 2). The bottle of diluted semen is not attached to the spirette/catheter at this point. Keep the tip pointed up to reduce the chance of coming into contact with the bladder, which could cause a backflow of urine into the spirette/catheter. If this happens, use a new spirette/catheter because **urine kills sperm** . This is the primary reason the bottle of diluted semen should not be connected to the spirette/catheter until the cervix has been entered. Not connecting the bottle at this point also avoids exposing the semen unnecessarily to extremes of light or temperature. When using the cochette system instead of a bottle, it is common practice to attach the cochette before inserting the spirette/catheter because great dexterity is required.

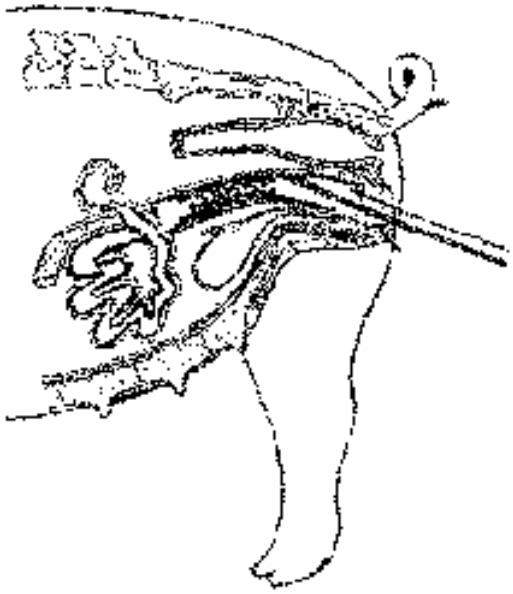


Figure 2. Insert the spirette or catheter at an upward angle to avoid coming in contact with the bladder.

- Use a **counterclockwise** rotation to insert the spirette into the cervix (Fig. 3). Resistance can be felt by gently pulling back on the spirette. A foam-tipped catheter is not always inserted into the cervix, but usually is positioned up against the cervix.

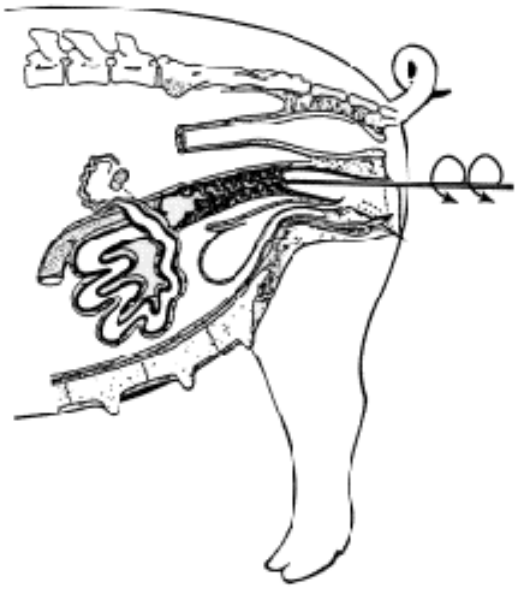


Figure 3. Use a counterclockwise rotation to insert the spirette into the cervix.

- Gently invert the bottle of diluted semen two or three times to mix the semen. Attach the bottle to the end of the spirette and discharge the semen ***slowly***. A gentle squeeze to start the process may be needed, but after that the semen should be allowed to be taken up by uterine contractions. This process takes at least 3 minutes. Because of the variation in intensity of uterine contractions, gilts often take longer to inseminate than sows. Depositing the semen too rapidly will cause a backflow of semen out of the vulva. Obviously, semen that flows out onto the ground is wasted. In natural service, the boar spends 5 to 10 minutes at each breeding.
- A small amount of semen backflow is expected. If an excessive amount of backflow occurs, **stop** the insemination. Either the semen is being deposited too rapidly or the spirette is not fitted properly into the cervix. A quarter-turn of the spirette might correct this. If semen flow stops, reposition the spirette by a quarter-turn or move the catheter back and forth a bit to reinitiate semen flow. Also, cut a small hole in the semen bottle if flow has stopped because of a vacuum buildup.
- If there is a great deal of resistance to the flow of semen, reposition the spirette because the tip may be lodged against a cervical fold.
- Semen transport and fertilization can be inefficient when females are frightened or disturbed. Females should always be handled calmly and gently. The breeder is trying to mimic the boar, and the breeder who takes the extra time and effort to imitate this well will have more success with AI. Have a boar

present, apply some back pressure and massage the female's flank during insemination to increase the number or intensity of uterine contractions that draw semen from the bottle and transport it into the uterus. This is especially important when breeding gilts. If the female is "locked down" and stands to be mounted for a long period of time, she can become refractory. She will become unresponsive to the standing reflex and refuse the boar. If this happens, simply remove the female from the boar's presence for at least an hour and then try again. It is important that the female initiate uterine contractions for sperm transport with the standing reflex.

- When all of the semen has been deposited into the female, remove the spirette by rotating it clockwise while gently pulling.
- A new spirette/catheter should be used for each insemination to eliminate the possibility of transmission of disease or infection from one female to another.
- Keep the female in quiet surroundings for 20 to 30 minutes. Distress at this time may still disrupt semen transport and fertilization.

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