Swine Artificial Insemination 1: Selecting the Right Boar

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Artificial Insemination (A.I.) can complement or replace traditional breeding programs for youth swine projects and other small swine operations. A.I. provides instant access to the nation=s top boars and allows rapid improvement of breeding stock and show pigs. It eliminates inbreeding problems, along with most of the health risks associated with buying a new boar. Best of all, even inexperienced producers can easily learn swine A.I. techniques.

Semen Sources

Semen can be purchased from commercial boar studs and many purebred breeders. Seedstock Edge, the publication of the National Swine Registry (765-463-3594, or http://www.nationalswine.com/), has an extensive listing of semen suppliers. Many other swine-related Internet sites also list semen sources.

Sire Selection

Consider your objectives when selecting an A.I. sire. Do you want to produce show pigs or breeding stock? Do you need to improve muscling, mothering ability or some other trait? How much are you able to spend on semen? After answering these questions, look for a boar that meets your needs. Here are some points to keep in mind:

Breed: Yorkshire, Large White, Landrace, and Chester White are Amaternal breeds@ known for their fertility and milking ability. Hampshire, Duroc, Spot, Berkshire, and Pietrain are Ameat breeds@ known for muscling and leanness. However, some maternal breed boars excel in carcass characteristics and some meat breed boars sire outstanding maternal ability.

Carcass traits: Pigs tend to look like their parents when it comes to muscling, backfat, length, and frame size. To improve these traits, select a boar that has superior carcass characteristics himself, regardless of which breed is used.

Growth and performance traits: Crossbreeding (mating pigs of two different breeds) is the quickest way to improve survival rate, growth and other performance traits. On average, crossbred pigs are more vigorous and grow faster than purebred pigs.

Maternal traits: When breeding for replacement gilts, use a boar from a large litter with a high weaning weight. Remember that feed, housing and health care affect a sow=s maternal performance more than genetics does.

The Swine Testing And Genetic Evaluation System (STAGES) at Purdue University ranks Yorkshire, Hampshire, Duroc and Landrace boars for terminal and maternal traits. To find trait leaders in these breeds or to look up Expected Progeny Differences (EPD=s) for any registered boar or sow, go to the STAGES web site: http://www.ansc.purdue.edu/stages/.

Don=t overlook the folks at the boar stud. They know their boars and want you to succeed. Describe your sow or gilt and tell them your goals. They can recommend boars that will work for you.

Understanding Catalog Terms

Boar stud catalogs and web sites provide photos, descriptions and performance data to help you select the right boar. Here are definitions for terms you might encounter:

Days to 230 or 250 pounds is a measure of the boar=s growth rate. Most boars reach 230 to 250 pounds in 140-170 days.

Loin Eye Area (LEA) tells the size of the pork chop at the tenth rib and is an indicator of the boar=s muscling. Unless otherwise stated, LEA is measured using ultrasound when the boar weighs 230 lbs.

Backfat (BF) is measured at the tenth rib using ultrasound when the boar weighs 230 to 250 lbs. This is an indicator of how lean the boar is, and how lean his offspring may be.

Stress Free, Stress Carrier, Stress Positive: These terms refer to the Porcine Stress Syndrome (PSS), which is an inherited condition present in all breeds. PSS is caused by a recessive gene. All genes work in pairs, with one gene coming from each parent. Normal, stress-free pigs have two dominant genes. Stress positive pigs have two recessive genes, and stress carriers have one dominant and one recessive gene.

Stress positive and stress carrier pigs are sometimes favored by showpig breeders because they tend to be leaner and heavier-muscled than normal pigs. However, about 15% of stress positive pigs have a metabolic disorder that causes them to overheat and die suddenly during routine activities such as walking, breeding, or showing. Pork from stress positive hogs is often pale, soft and watery when raw, and is tougher than normal pork when cooked. Studies indicate that half of the pork quality problems in America are caused by the stress gene.

Stress carriers are less likely to die suddenly than stress positive hogs, but have poorer meat quality than normal hogs.

The stress status of the boar becomes more important if your sow carries the stress gene. If two normal animals are mated, all the offspring will be normal. If two stress positive animals are mated, all the offspring will be stress positive. If a stress positive animal is bred to a normal animal, all the offspring will be stress carriers. If two stress carriers are mated, on average half of the offspring will be stress carriers, one-fourth will be stress positive, and one-fourth will be normal. If a stress carrier is mated to a normal animal, on average one-fourth of the offspring will be stress carriers, and the rest normal.

In a recent study, 193 hogs that were champions or class winners at four Texas livestock shows were tested for the stress gene. These were the very best of the 20,603 pigs exhibited at the shows. Results showed that 55% of the winning pigs were stress free, 40% were stress carriers, and 5% were stress positive. These results suggest that you do not need to use the stress gene to produce winning showpigs.

Sudden pig death and poor meat quality are serious concerns. Weigh the advantages and disadvantages before using a boar that is stress positive or a stress carrier.

Swine Artificial Insemination 2: Heat Detection

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Heat detection is the most important and time consuming part of an A.I. breeding program. The goal of heat detection is to determine when the sow or gilt reaches Astanding heat.@ Standing heat is the period when a female stands still and rigid when you put weight on her loin. Detection of standing heat is critical because it determines when the animal should be inseminated. Gilts should be bred 12 hours after standing heat is detected, and again 12 hours later. Sows should be bred 18-24 hours after detection of standing heat, and again 12 hours later.

Heat detection is a matter of observing changes in appearance and/or behavior that occur when an animal comes into heat. To be successful, you must know how a sow or gilt looks and acts when she is not in heat, and recognize changes that signal she is coming into heat. Physical signs of heat can be detected by checking animals at feeding time. Changes in behavior are best observed one or two hours after the animals have been fed, when they are not distracted by food. The key is consistent, daily observation of the animals. Signs that may be observed as a sow or gilt approaches standing heat are listed below in chronological order. Some animals do not show all the signs.

Unusual Noise and Activity: Sows and gilts that are coming into heat may Achant@, Agrowl@ or make other unusual noises. You may hear more squealing than normal as animals in heat attempt to ride other sows. Watch for animals that walk the fence line or nibble, sniff, nuzzle or ride other sows. Sows in heat show increased interest in boars and may stand near a boar that is placed in an adjacent pen or alley.

Reddening and Swelling of Vulva: As a sow or gilt begins to show increased activity, her vulva often reddens and swells. Swelling usually becomes evident two to five days before the animal is ready to breed. Reddening and swelling of the vulva usually begin to subside 12 to 36 hours before the animal reaches standing heat.

Reddening and swelling are most visible in gilts. Some older sows may show little or no swelling when they come into heat. To detect heat in these animals, watch for changes in behavior, a discharge of mucous or other signs described below.

Engorged Clitoris/ Sticky Mucous Discharge: The clitoris is a small, finger-like structure located inside the base of the vulva in a crease formed by the two lips. It can be seen by pulling the lips of the vulva apart and outward. When a female is in standing heat, the clitoris is engorged with blood, causing it to protrude outward and have a bright red color. When females are not in standing heat, the clitoris is flat and has the same pale, light pink color as the lining of the vulva. The clitoris may be difficult to see in gilts because of the small size of their vulva.

Females often have an increased discharge of mucous from the vulva as they approach standing heat. At first the mucous is clear, slick and slimy, but usually becomes cloudy and sticky during standing heat. To check the consistency of the mucous, wipe the inside of the vulva with the thumb. Press the pointer finger and thumb together and slowly draw them apart. The mucous is sticky if a strand of mucous connects the thumb and pointer as they are drawn apart. Straw or bedding stuck to the vulva is another sign that the animal is discharging sticky mucous.

An engorged clitoris and sticky mucous signal that the female is in standing heat, or that standing heat is only a few hours away.

Signs of Standing Heat: Once other signs of heat are noticed, the sow or gilt should be checked morning and night for standing heat. This is best done after the animal has finished eating. Check for standing heat by pushing down on the animal=s loin with both hands, or by sitting on the loin. A female in standing heat will stand still and rigid, and may Apush back@ by arching her back slightly when weight is applied to the loin. This is an instinctive response that braces her to support the weight of the boar.

The classic sign of standing heat is Aear popping,@ in which the female holds her ears erect with the tips nearly touching when weight is applied to her loin. Floppy-eared breeds like Durocs can=t hold their ears erect, but may twitch their ears or lift them part way. Ear popping is a sure sign that the animal is in standing heat.

Females show a much stronger response to loin pressure if allowed nose to nose contact with a mature boar that is in an adjacent pen. Females should have contact with the boar only during heat detection and breeding. Sows and gilts that have constant exposure to a boar may not react to loin pressure even if they are in standing heat. If no boar is available, Sex Odor Aerosol (also called SOA or Boar Scent) should be sprayed on the female=s nose during heat check to strengthen the standing response. SOA is a synthetic version of a pheremone found in boar saliva. It is available from many boar studs.

A nervous, frightened, or injured animal may not allow you to apply back pressure even if she is in standing heat. This can sometimes be overcome by allowing nose to nose contact with a mature boar in an adjacent pen. Handle animals calmly and humanely at all times so they will not be afraid of you during heat detection and insemination.

Swine Artificial Insemination 3: Ordering and Caring for Semen

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Two doses of semen are needed to breed a sow or gilt. A dose is about **2** cup, and contains three to six billion sperm cells. Swine semen is usually used fresh, although frozen semen is available from a few boar studs. Frozen semen produces smaller litters and lower conception rates than fresh semen. Fresh semen is packed in plastic squeeze bottles with an extender to keep sperm cells alive, and is shipped with cool packs in Styrofoam containers.

Semen is generally ordered by phone, and many boar studs have a toll-free number for this purpose. Disposable insemination rods and other supplies can be ordered along with the semen.

Most boar studs collect semen on Monday and Thursday and ship it via UPS overnight service for delivery Tuesday through Friday. Semen is usually ordered Monday through Thursday to coincide with the UPS delivery schedule. UPS will deliver semen on Saturday in some areas, for an additional fee. In these areas semen can also be ordered on Friday. In areas where UPS doesn=t make Saturday deliveries, you must place your order by Thursday morning if you plan to breed an animal on Saturday, Sunday, or Monday.

If it is not critical that a particular boar is used, you can order semen when you notice that a sow or gilt is in heat. In this situation you can choose from whatever boars are still available, or ask the boar stud to select a boar for you. Having catalogs from several boar studs improves the chances of finding a boar you like on short notice.

If it is important that a particular boar be used, semen should be ordered weeks or months in advance to ensure availability. To do this, you must predict when the sow or gilt will be in standing heat. The swine estrus cycle ranges from 18 to 28 days but averages 21 days. By watching an animal through two estrus cycles you can predict when she should be in heat again and place your order. This doesn=t always work, since some sows and gilts have irregular cycles. You may be able cancel the order if the animal does not come into heat as expected. Ask about the boar stud=s cancellation policy when you order the semen.

Weaning is the most reliable way to predict when standing heat will occur. Healthy sows reach standing heat three to seven days after pigs are weaned, with four or five days being most common. Semen can be ordered in advance for delivery four days after the intended weaning date. Plan weaning so that day four occurs on Tuesday or Friday, which are normal delivery days for semen. This insures that fresh semen will arrive on the day the sow is most likely to be in standing heat. If the semen will be collected on Monday and arrive on Tuesday, wean the pigs on the previous Friday. If the semen will be collected on Thursday and arrive on Friday, wean the pigs on the previous Monday.

Semen from a boar you specify may cost $25 to $500 per dose. Mixed semen or semen from a boar selected for you by the boar stud may cost $6 to $20 per dose. UPS overnight shipping costs $30-$40. Some firms offer semen at a discount or half-price during the low-demand

months of June thru August, and December thru February. Most offer volume discounts and discounts on day-old semen. Some offer discounts for 4-H and FFA members.

Storing and Handling Semen

Fresh semen is best used within four days of collection but will remain viable for a week or more if held at 60-65 degrees Farenheight (16-18 degrees Celsius). Check the temperature of the semen when it arrives by slipping a thermometer into the Styrofoam container. Call the boar stud if the semen is much above or below the recommended temperature. The fertility of the semen might be affected and the company may be willing to replace it.

For short-term storage, wrap a quilt or sleeping bag around the Styrofoam shipping container and place the container in a cool room in your home. Since sperm cells gradually settle to the bottom of the squeeze bottles, gently turn the bottles over two or three times a day to keep the sperm cells suspended in the extender.

To store semen for a longer period, fill several plastic soda pop bottles with 60 degree water and place the bottles in an insulated picnic cooler. Put the semen bottles, a thermometer and any cool packs shipped with the semen into the cooler. Wrap a quilt or sleeping bag around the cooler and place it in a cool room in your home. Check the temperature every time you turn the semen bottles, and change the water in some of the pop bottles as needed to maintain 60 degrees. Another alternative is to fill the picnic cooler with cool packs that are shipped with semen. A few cool packs can be cooled or warmed as needed to maintain the proper temperature in the picnic cooler.

Some boar studs and insemination supply companies sell small refrigerators that will keep semen at the proper storage temperature.

Some key points to remember when storing and handling semen:

1. Do not refrigerate the semen. The proper storage temperature is 60 to 65 degrees.
2. To the extent possible, maintain a constant storage temperature.
3. Do not expose semen to sunlight.
4. Turn the semen bottles over two or three times a day, but do not shake the bottles.
5. If the semen is more than a week old, or has been subjected to temperature extremes, have its viability checked by a veterinarian before using it.

Swine Artificial Insemination 4: The Insemination Process

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The following equipment is needed to artificially inseminate a sow or gilt:

1. Semen. Keep the semen in the storage container until you are ready to use it.
2. Knife or scissors to cut off the tip of the semen bottle.
3. Damp paper towel or rag to clean the vulva.
4. An insemination rod. Disposable rods are available from semen suppliers.
5. A mature boar in an adjacent pen, or Sex Odor Aerosol (Boar Scent or SOA).
6. KY Jelly or similar lubricant
7. Optional: Oxytocin, a syringe, and needle. Oxytocin is a prescription drug available from veterinarians. In some situations (described below) an injection of Oxytocin is helpful.

Step one. Make sure the sow or gilt is in standing heat: You cannot breed a sow or gilt that is not in standing heat. Put weight on the animal=s loin and watch her response to make sure that she is standing. Some animals stand like a statue during insemination. Others stand, take a step or two, then stand again. To confirm standing heat, look for secondary signs such as ear popping, sticky mucous, and an engorged clitoris.

Step two. Clean the animal: Clean the vulva with a damp cloth or paper towel so that no dirt or manure is pushed into the reproductive tract when the insemination rod is inserted.

Step three. Stimulate the animal: Semen is not injected into a sow or gilt. Rather, it is pulled into the animal by uterine contractions. To stimulate uterine contractions, allow nose to nose contact with a boar in an adjacent pen or spray SOA on the sow=s snout. Rub the animal=s flanks and put some weight on her back before and during insemination.

Oxytocin can be used to stimulate uterine contractions that aid semen intake. Inject one cc of Oxytocin intramuscularly or subcutaneously into the animal=s neck about two minutes before beginning insemination. This has been shown to improve conception rates and litter size for novice inseminators. Always use Oxytocin if the semen is more than 72 hours old.

Step 4. Insert the rod: Disposable swine insemination rods come in a variety of shapes and sizes. All are designed to Alock@ into the cervix of a sow or gilt that is in heat. The two most common styles are rods with counterclockwise threads on the tip, and foam tipped rods.

When using threaded rods, lubricate the tip with semen or a little K-Y Jelly before gently inserting it into the vulva. Angle the rod tip upward (toward the backbone) to avoid the opening to the bladder. Gently twist the rod counterclockwise as it is being inserted. The rod can usually be inserted eight to ten inches before reaching an obstruction, which is the cervix. Push the rod gently and continue to twist counterclockwise until the tip is Alocked@ into the cervix. When the tip is locked, the rod will spring back into place when you pull gently on it. Another test of cervix lock is to twist the rod counterclockwise and then let go of it. The rod will rotate clockwise 1/4 turn or so if the tip is locked. If you have trouble getting the tip to lock, reposition the rod and try again.

Foam tipped rods are inserted like threaded rods, but do not need to be rotated. Gently push on the rod until you feel the foam tip catch in the folds of the cervix. To test for lock, pull back gently on the rod.

What if you can=t get the rod to lock? Check to make sure that the animal is truly in standing heat. If using a threaded rod, make sure that you are rotating the rod counterclockwise. Be sure that the rod tip is angled upward as you insert it, so that you do not insert the rod into the bladder.

Step five. Insemination: Cut the tip off the semen bottle and insert it into the end of the rod. Apply gentle pressure to the bottle. Short, pulsing squeezes often work better than continuous pressure. The semen will begin to flow into the animal if she has been properly stimulated. There will be times when the animal Aaccepts@ the semen, and times when semen flow slows or stops. Be patient. Do not try to force semen into the animal. It may take five minutes or more to empty the bottle. Work with the sow or gilt by applying gentle pressure to the bottle when she is accepting semen. Continue to stimulate the animal by putting weight on her back and rubbing her flanks.

A bit of semen backflow at the vulva is normal. If much backflow is seen, reposition the rod tip and try again. When the bottle is becoming empty, it may be helpful to remove the semen bottle from the rod and draw some air into the bottle. Re-attach the bottle and use the air to gently force the last of the semen from the rod. Then turn the rod clockwise and withdraw it. Keep pressure on the bottle while withdrawing the rod to keep semen from flowing back into the rod. Continue to rub the flanks and apply back pressure for a couple of minutes after the rod has been withdrawn.

Insemination with Absolute Rods

A new type of insemination rod was recently introduced by Absolute Insemination. The rod has a standard foam tip, but attached to the tip and inside the rod is a rubber Asleeve@ that is four to six inches long. During insemination, the sleeve is forced out of the tip of the rod. The sleeve turns inside out, much as a shirt sleeve might be pulled inside out, extending through the cervix and depositing semen directly in the uterus.

Absolute rods are positioned in the cervix the same as a regular foam-tipped rod. After attaching the semen bottle to the rod, the inseminator squeezes the bottle with great force, while holding the rod in position with the other hand. A great deal of pressure must be applied to the semen bottle to turn the sleeve inside out. The inseminator will feel the pressure release when the sleeve is completely extended. The inseminator can then remove the bottle from the rod, draw a little air into the bottle, reattach the bottle and force any remaining semen out of the bottle and rod before withdrawing the rod. The entire process takes thirty to forty five seconds.

Absolute rods are available in gilt and sow models. Gilt rods have four inch sleeves, while sow rods have six inch sleeves.

Swine Artificial Insemination 5: After Insemination

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You selected a boar, ordered the semen, stored it at the right temperature and rotated the bottles at least twice a day. You paid close attention to the sow and inseminated her twice, based on your detection of standing heat. Now it=s time to relax, right?

Wrong. The care and attention you give the sow in the hours and days following insemination can affect the success of this and future matings. Here are a few suggestions:

Record Keeping/Heat Detection

Record information about the insemination on a calendar. As a minimum, list the date and time of insemination and identify the sow and boar. It is also helpful to Arate@ inseminations using the 5-point rating system below, or a system you devise.

Continue to check the sow or gilt for signs of standing heat by applying back pressure twelve hours **after** the last insemination, and again twelve hours later. Rate the animal=s response to back pressure using the 3-point system suggested below, and record it on the calendar.

Ideally, the sow or gilt will **not** still be in standing heat 12 hours after the last insemination. If the animal is still standing 24 hours after you have used the second dose of semen, you probably inseminated too early. Chances of success are greatly reduced. Knowing how the sow or gilt responded to back pressure hours after you finished insemination might help you adjust timing the next time you try to inseminate the animal.

Suggested Rating System for Insemination:

5. The animal stood still with ears popped during the entire insemination. There was little or no semen backflow.
4. The animal stood, but moved from time to time. Little or no backflow.
3. The animal showed other signs of heat but did not stand well and/or there was moderate semen backflow.
2. The animal stopped standing partway through the insemination. Insemination was difficult.
1. A complete wreck. The animal would not allow the insemination to be completed and/or moved considerably, and/or had substantial backflow, and/or would not lock onto the breeding rod.

Suggested Rating System for Post-Insemination Heat Checks:

A. The animal would not stand for back pressure 12 hours after the last insemination.
B. The animal stood when back pressure was applied 12 hours after insemination, but would not stand 24 hours after the last insemination.
C. The animal was still standing when back pressure was applied 24 hours after the last insemination.

A sample calendar entry might be as follows:
AJanuary 23: Bred Ritz gilt to Sweetness, P.M., rating 4.@
AJanuary 24: Bred Ritz gilt to Sweetness, A.M., rating 5A.@

This tells you that the gilt stood well for the first insemination, even better for the second, and was not standing by the afternoon of January 24. Chances of success are good.

If you rate a second insemination 2A, that suggests that the animal was going out of heat at that time (a good sign). However, if you rate the second insemination 2C, you probably inseminated much too early. If she doesn=t catch (and she probably won=t), next time wait longer after detecting standing heat to inseminate this animal.

Single Dose Inseminations

The usual recommendation is to give a sow or gilt two doses of semen, 12 hours apart. What if the animal won=t stand to receive the second dose? Use two doses whenever possible, but don=t despair if a sow or gilt only stands for one dose. Here=s why:

Only 10 to 12 sperm cells are needed to produce a full litter of pigs. A dose of swine semen contains three to six billion sperm cells. Simple arithmetic suggests that one dose is more than enough to get the job done. So why use two doses?

The second dose is given to overcome bad timing. Most sows and gilts ovulate near the end of standing heat. Viable sperm cells must be present at ovulation if the animal is to become pregnant. Sperm cells become capable of fertilizing an egg about 4 hours after being placed in the female, and remain alive for about 24 hours. Since it=s impossible to predict when standing heat will end and ovulation will occur, two inseminations are used to improve the odds of having viable sperm present at the right time.

If the sow or gilt receives the first dose of semen and is no longer standing 12 hours later, chances are that the timing was perfect. Trying to force a the animal to receive a second dose will not improve the chances of conception.

Confirming Pregnancy

While you=re recording information on the calendar, make a note to begin checking the animal twice a day for signs of heat beginning 16 days after the last insemination. If she doesn=t show signs of heat through two heat cycles (by day 45), it=s safe to assume she is pregnant. Ultrasound can also be used to detect pregnancy in swine. Your veterinarian may have an ultrasound unit, or you can purchase a small preg tester through a veterinary supply store for about $200. Home pregnancy test kits for humans do not work on swine.

Care of the Bred Sow

The care that you give a sow or gilt in the four weeks following insemination has a major effect on conception rate and litter size. Don=t stress the newly bred animal by rough handling or by mixing her with a different group of sows. Feed the sow or gilt no more than four to six pounds of a balanced swine ration per day. Overfeeding at this time will result in smaller litters.