Objectives

1) To introduce students to the collection of semen from the boar by the hand-glove technique.
2) To introduce students to the process of extending semen collected from a boar for use in on-farm artificial insemination.

Semen Collection

1) Physical Examination

a) Health  Boars must be disease free. Newly received boars are isolated for a minimum of 21 days before exposure to the breeding herd and tested for infectious diseases such as pseudorabies and brucellosis. They are also tested for prior exposure to parvovirus, leptospirosis, *Haemophilus pleuropneumoniae*, transmissable gastroenteritis, mycoplasma infections and eperythrozoonosis. The boar is evaluated for external and internal parasites and treated accordingly. All of these factors could affect herd reproductive performance.

b) Body condition  Boars need to be in proper body condition (fat deposition) for their age and weight. Overly fat or thin boars can have a negative effect on reproduction.

c) Conformation and body structure

Boars need to have proper structure for locomotion primarily in the hind legs so that sexual performance is not affected (*Figures 1a and 1b*). Improper structure in the hind legs can severely limit the ability of the boar to mount and service the female or to mount the dummy during semen collection.

*Figure 1a*) Desirable conformation for the breeding boar. The top line and rump are level with a proper shoulder angle (A). The shoulder (B) and elbow (C) joints are pressure-absorbing joints. The pasterns (C) are sloping and long (60%) and also provide a cushioning effect. The rear legs and joints are properly angled to also provide a cushioning effect (E, F, G). The Boar in Figure 1b) is of undesirable conformation. The back is arched and the rump is steep. The front and hind limbs are straight resulting in no cushioning effect of the joints (B, C) while the hip, stifle and the hocks (E, F, G) are in a straight line.
2) Genital Examination

a) Palpation of the testicles Palpated for size, tone, consistency, symmetry and pathologic changes. Testis should not have any nodules, soft masses and/or any incidence of swelling. The boar should be capable of breeding by 8 months of age.

b) Penis and prepuce Examined for abnormalities and proper extension of penis.

c) Libido or mating ability Any abnormalities should be observed when a boar mounts an estrus female or dummy. Watch for things such as non-aggressive vs. over-aggressive behavior, incomplete erection, and failure to mount. These factors can be influenced by psychological, genetic and physical factors.

3) Semen Collection

a) Artificial Vagina Consists of a hard tubular casing with a rubber lining filled with warm water. Not typically used for semen collection of the boar.

b) Electroejaculation An electric current is applied to the pelvic nerves and muscles via a rectal probe, which is attached to an external power source. This method is only used under extreme collections when it is difficult to obtain a sample.

c) Gloved Hand Technique Most common method of semen collection in boar.

- No special equipment required.
- Although, the boar must be trained to use a phantom (Figure 2B).
- Provides for observation of the seminal fluid and penis at collection.
- Involves grasping of glans penis during mounting, which mimic the actions of the cervix to stimulate ejaculation (Figure 2A).
- Boar ejaculate consists of three fractions.
  - First - usually a clear fluid; some gel, which is usually discarded.
  - Second - sperm-rich fraction (creamy white) and may also contain some gel.
  - Third – possibly a clear sperm-free fraction; a greater percentage of gel.
  - There may be alternating phases of sperm-rich and sperm-free fractions.

Preparation and Technique for Collection - Gloved Hand Technique

1. Collection container is filled with warm water (38°C) and kept in a styrofoam container until needed. The collection container contains a plastic sterile collection bag with the top of the collection container being covered with cheesecloth to filter out the gel portion of the semen. Remember that the gel portion comes from the cowper’s gland and causes seminal plasma to coagulate following ejaculation.

2. The boar is allowed to mount the phantom or a sow that is in estrus (Figure 2B). Any urine he may expel is not collected.

3. As the boar initiates extension of the penis, the end of the penis, which is cork screw shaped is grabbed firmly with a gloved hand. The collection process is initiated with firm pressure to the spiral end of the penis with the hand so that the penis can’t rotate in the hand (Figure 2A). As previously indicated, this process imitates the pressure applied by the sow’s cervix.

4. The collector observes for the different fractions of semen as it is ejaculated into the collection container. Observe for any contaminants or blood that may be in the sample.
5. Ejaculation usually lasts for 3 to 6 minutes but may continue for up to 15 minutes. Anywhere from 100 to 500 ml of semen will be collected. After collection the semen is ready to be processed and extended.

6. Collection frequency will affect the total number of sperm in an ejaculate. Twice per-week collections appear to have no negative effects on sperm concentrations. Age can also influence sperm concentrations. Young boars will have low concentrations and should reach 40 to 50 billion sperm per ejaculate between 8 to 12 months of age.

![Figure 2](image.png)

**Figure 2.** A) Gloved-hand method of semen collection in the boar as it mounts a phantom (B). Notice the location of the hand over the spiral end of the penis. It is important that constant pressure be placed on the end of the penis, which simulates the pressure of the cervix. The top of the collection chamber is covered with cheesecloth to strain the gel portion of the ejaculate. The gel must be kept separate from the sperm rich portion of the semen to prevent coagulation of semen.

### 4) Evaluation of Boar Semen

Upon collection of the semen a visual examination of the semen is made. The sperm rich fraction of the semen should be milky-white in appearance and free form any blood, pus, dirt, hair and any other contaminants. Contaminated sperm should be discarded.

As with all semen evaluations the sample will be evaluated for motility, morphology and concentration, which was discussed in detail in the semen evaluation lab.

The normal ejaculate of a boar is 100 to 500 mL with a total sperm concentration of 10 to 100 billion sperm cells per ejaculate. Boar semen has a high percentage of progressively motile cells (70 – 90%) and is typically very low in abnormalities.
Extension of Boar Semen

In the commercial swine industry, boar semen is rarely frozen and almost all semen collected is used fresh. Although “neat” or “fresh” boar semen can be used within a couple of hours after collection, most boar semen is extended and used within several hours and (or) days after collection.

Extending boar semen has several advantages:

1. It allows the producer to increase the number of sows/gilts that can be inseminated from a single collection. A single collection can be used to inseminate 8 to 12 sows without having a negative effect on fertility.

2. Reduces the number of boars that are necessary in breeding operations. Since mature boars can be collected 2 to 3 times a week the number of females that can be inseminated is easily increased by 4 to 6 fold compared to natural service. This is a large economic savings to the producer.

3. Extending boar semen allows the semen to be kept several days without having a negative effect on fertility.

4. Allows producers’ access to semen from genetically superior sires from across the United States, which can be delivered overnight. Boars of superior genetic quality are typically too expensive for commercial producers to purchase so being allowed to purchase semen removes this financial constraint.

Function of extenders

1. Lengthens the viability of undiluted semen by protecting it against cold shock, acts as a buffer against lowered acidity, provides proper osmotic pressure and electrolyte balance, inhibits bacterial growth, and supplies nutrients to the sperm.

2. Extends the use of the ejaculate so more sows/gilts can be inseminated per ejaculate.

Types of extenders

1. Commercially available extenders are the most popular. They are purchased in a powder form and are mixed with distilled water. They allow for long term (6 to 7 days) storage of semen and typically contain:

   - Energy source (D – glucose)
   - Organic buffers (Tri-Sodium citrate, Sodium EDTA, Sodium Bicarbonate)
   - Antibiotics (Streptomycin Sulfate, Penicillin-G).

2. Homemade extenders can also be used such as skim milk and egg-yolk-glucose mixtures, which serve as short-term extenders (48 – 72 hours).

Process of Extending Semen

1. The process should be done in a warm room (68 - 70°F) with clean and sterile equipment.

2. Determine the number of inseminations required. A normal ejaculate usually contains enough sperm to inseminate 8 - 15 sows.
Example of extending freshly collected semen:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insemination dose concentration</td>
<td>5 billion sperm / sow</td>
</tr>
<tr>
<td>Motility</td>
<td>90%</td>
</tr>
<tr>
<td>Sperm concentration</td>
<td>350 million / mL</td>
</tr>
<tr>
<td>Ejaculate volume</td>
<td>200 mL</td>
</tr>
</tbody>
</table>

\[
\frac{200 \text{ mL} \times 350 \text{ million/mL} \times \left( \frac{90\% \text{ motility}}{100} \right)}{5 \text{ billion sperm / sow}} = 12.6 \text{ sows}
\]

\[12 \text{ sows} \times 100 \text{ mL / sow} = 1200 \text{ mL total volume}\]

\[1200 \text{ mL total volume} - 200 \text{ mL semen} = 1000 \text{ mL of extender needed.}\]

3. An ejaculate is typically extended at a ratio of 1 part neat semen to 4 - 5 parts extender. If the number of inseminations is known prior to processing, do not process it beyond that point. It is recommended that a total volume of 100 mL be used for each insemination to maximize conception rates.

4. Temperature of semen and extender should be the same (70°F). The extender is usually a dry powder that is mixed with distilled water.

5. Add liquid extender to the semen.

6. Mix thoroughly and aliquot into a 100 mL bottles (3 - 5 billion sperm/bottle).

7. Ready to inseminate.

Storage of extended semen

1. Semen is typically stored no longer than 3 days, after which sperm fertility starts to decrease.

2. Optimal storage temperature is 60 - 65°F.

3. Bottles are gently turned 1 to 2 times a day to prevent sperm agglutination.

4. The semen is warmed to room temperature before insemination.
Additional Notes: