



Proper Semen Handling During an Artificial Insemination Program

Michael W. DuPont
Department of Human Nutrition, Food and Animal Sciences

The use of artificial insemination (AI) can greatly enhance the production potential of both the dairy and beef industries in Hawai'i. However, improper semen-handling techniques and equipment maintenance during the breeding process can lead to decreased conception rates and will diminish the chances of a productive AI season. Semen quality can be damaged during storage, thawing, and handling prior to insemination. The purpose of this publication is to help producers develop a simple routine for proper semen handling and equipment maintenance while implementing an AI program.

Care and maintenance of equipment

Liquid nitrogen storage tank

The most important investment a producer makes to improve herd genetics is the semen storage tank. This tank (Figure 1) is a large, vacuum-sealed, aluminum refrigerator encased in an extremely efficient insulation system. To ensure maximum liquid nitrogen holding times, the tank should be stored away from direct sunlight in a cool, clean, dry, dust-free, well ventilated environment that can easily be reached daily. *Never* store a tank directly on a concrete floor; always elevate it on a wooden pallet or pieces of thick cardboard to prevent acids in the concrete from corroding the bottom of the tank. With proper handling, most tanks will last for years; however, all liquid nitrogen tanks will eventually fail due to aging and loss of vacuum. The first indication of tank failure is an accumulation of thick, icy frost around the neck or vacuum fitting at the top of tank, caused by liquid nitrogen evaporation. Even a well maintained tank eventually will need to be refilled or recharged with liquid nitrogen. Monitor the level of nitrogen in the tank with a dip-stick twice a month, and keep a simple log to

detect any drastic changes in nitrogen levels. The rule of thumb is that to avoid damage to stored semen, refill the tank before the liquid nitrogen level falls below 2 inches. A tank that is allowed to "go dry" requires almost twice as much liquid nitrogen when recharging.

The AI kit

A well maintained insemination kit or box should always be clean and free of dirt, dust, and manure. Unsanitary equipment increases the chances of introducing infection into a cow's sterile uterus. The basic kit should contain the following:

- a warm-water thaw unit with thermometer
- scissors or cito cutter
- tweezers
- two stainless-steel inseminating guns with o-rings
- plastic disposable split sheaths with green adaptor
- plastic disposable shoulder-length gloves
- paper towels
- AI lubricant in small squirt bottle (detergents or soaps are spermaticides)
- 95% alcohol in small plastic jar
- pen and writing paper
- eye-protection glasses

Any deviation from this basic AI equipment will impede a trained technician from practicing proper semen handling techniques. Always check to ensure that the AI kit is completely stocked before proceeding with thawing the semen.

Proper semen handling for AI technicians

The primary objective of proper semen handling is to optimize conception by preserving sperm fertility until insemination has taken place. A technician's goals

include minimizing the time of exposure of semen to extreme fluctuations in temperature and direct sunlight (ultraviolet light destroys semen) and preventing contamination with manure, water, detergents, and other substances. The most common technical mistakes that compromise the quality and fertility of sperm include the following.

Improper thawing temperature and thaw time for frozen semen

Thaw semen straws in warm water (**95–98°F**) for a minimum of **45 seconds**.

Always check the water temperature in the thawing device **BEFORE** pulling a frozen straw from the liquid nitrogen tank.

Monitor thaw time with a watch or timer that has a second indicator.

Never thaw semen in your shirt pocket

Improper retrieval of frozen straws from a liquid nitrogen tank

Always keep the canister **BELOW** the frost line when locating a straw of semen. Avoid lifting the canister too high or too long during this process. If the semen unit cannot be located within 5–10 seconds, drop the canister back into the tank and try again.

Keep a frequently updated semen inventory with the tank for quick location of bull numbers.

Use monitor ampules available from some AI companies to determine whether semen handling is impacting conception rates. The set consists of two colored ampules that “trip” at different temperatures, one at exposure time of more than 30 seconds (blue) and the other suggesting semen damage (red). If the blue ampule is tripped, the technician needs to be retrained in semen handling procedures. If both ampules are tripped, have semen checked immediately because damage due to improper thawing of frozen semen may have occurred (Figure 2).

Thawing too many straws at once or taking too long to inseminate cows

Thaw only **ONE** straw at a time. Research conducted in Hawai‘i has shown that thawing multiple straws lowered conception rates (C.N. Lee et al. 1997). Once a straw is thawed, it is recommended that the semen be deposited into the cow within 15 minutes.

Straws not properly dried after removal from warm water thaw

Always wipe the straw completely dry with a clean paper towel before loading it into the inseminating syringe. Water is extremely lethal to semen.

Semen not protected from direct sunlight

Whenever handling semen always protect straw from ultraviolet light with a clean paper towel to prevent sperm cell damage.

Failure to warm up syringe gun on cold days or to keep cool on hot, sunny days

Cold or hot shock to semen results in damage to morphology and motility of sperm.

Using bare hands to retrieve straws from liquid nitrogen tank

Use tweezers rather than fingers to pull semen from canes. This is primarily for the safety of the technician. Liquid nitrogen can cause severe “cold burns” or frostbite.

Semen straw not properly cut open or not fitted correctly into green adaptor

Straws need to be cut at a straight across, not at an angle, at the crimped sealed end and snapped snugly into green adaptor of a plastic split sheath to prevent semen back flushing into breeding gun during insemination.

Use of soap or detergent as a lubricant

Soaps and detergents are lethal to semen. Always use an approved non-spermicidal AI lubricant when breeding cattle.

Plunger not pulled back before loading insemination gun

Always pull back the plunger approximately 6 inches before loading a straw into a semen gun. Not doing so will cost a unit of semen.

Fast or rough depression of plunger to deposit semen into the cow

Use a slow, gentle motion to depress the plunger on the inseminating gun. Complete depression should be accomplished in no shorter than 5 seconds.

Failure to use an o-ring on the inseminating gun

Always lock the split plastic sheath into place on the inseminating gun with an o-ring. Otherwise, the sheath will slip, leading to improper semen placement during insemination of the cow.

Sheaths left out in hot weather

Always store plastic sheaths in a cool place out of direct sunlight to avoid irreversible shrinking and curling of plastic sheaths, which renders them unusable.

Taking shortcuts during insemination

It is highly recommended that all technicians attend an annual refresher course before the breeding season begins.

Check that all equipment is functioning properly and all supplies are stocked to avoid makeshift improvisations that may undermine a successful AI program.

Always wear covered shoes when working with cattle.

Figure 1. Liquid nitrogen tank.

**Summary**

The following goals are essential for ensuring a successful artificial insemination program by improving conception rates, decreasing the number of open days, and optimizing production in both beef and dairy herds:

- proper use and maintenance of the insemination equipment
- proper semen handling
- improving the technical skills of the inseminator
- keeping accurate herd records.

References

- ABS Global. 1996. Artificial insemination management manual. DeForest, Wisconsin.
- Lee, C.N., T.Z. Huang, and A.B. Sagayaga. 1997. Conception rate in dairy cattle is affected by the number of straws thawed for breeding. *J. Dairy Sci.* 80 (Suppl 1) p. 151.

Thanks for review go to Andrew Kawabata and Glenn Sako.

Figure 2. Thawed monitor ampoules.

