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G96-1278 Use of Cooled Stallion Semen

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Anderson, Kathleen P., "G96-1278 Use of Cooled Stallion Semen" (1996). *Historical Materials from University of Nebraska-Lincoln Extension*. 238.

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Use of Cooled Stallion Semen

This NebGuide discusses the benefits of using cooled stallion semen for horse breeding.

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Using cooled, transported stallion semen is quickly becoming a viable breeding option for many horse producers. An increasing number of breed associations are recognizing the benefits of cooled semen and making it an option for producers. Mare owner's who are able to use cooled semen experience less expense related to breeding, if the program is properly conducted. Transporting cooled semen from the stud farm to the mare allows owners to reduce mare care and transportation costs. Furthermore, because the mare will remain on-the-farm, there is less chance for illness and/or injury when exposed to an unfamiliar environment and horses. Owners may also be more willing to breed to superior stallions if all other costs are reduced and the stallion, for the most part, comes to the mare.

Mare Owner Responsibility

Participating in a cooled, transported semen program places more responsibility on the mare owner. At the breeding farm, an experienced breeding manager oversees teasing mares, monitoring a mare's estrous cycle, is familiar with various reproductive disorders which may keep a mare from conceiving, and is a skilled technician in either live-cover or artificial insemination. When the mare is kept at home, the owner assumes responsibility as the breeding manager. Owners unfamiliar with the specifics involved in equine reproduction need a veterinarian with equine reproduction and artificial insemination expertise. As with any breeding program, success depends on the reproductive health of normal cycling mares. Mares must be inseminated at the correct stage of their estrous cycle.

Preparing and Breeding the Mare

Preparation for a mare to be inseminated with cooled semen is no different than any other mare trying to conceive. The mare must be in good body condition, vaccinated, and on a regular deworming schedule. If mares are to be bred early in the year (February or March), they should be placed under artificial lights starting in November. Most mares will have shed their winter hair coats upon entering the breeding season which begins in late April and continues through August. Typically a mare will cycle every 21 days and be in heat for 5 to 7 days.

The very best indicator of a mare's cyclicity is to have access to a teasing stallion. Mares should be teased every other day to detect heat. Once a mare begins to show signs of heat, her ovaries and cervix should be palpated and ultrasounded. Producers unable to tease a mare are at a disadvantage and must rely on periodic palpation and ultrasound exams to detect when she is cycling. A mare continually develops follicles on her ovaries throughout her estrous cycle. Thus ovarian activity may be detected, but the mare may be weeks away from actually being in heat. Without access to observing the typical behavioral changes of a mare in heat, it may take several examinations to determine where she is in her cycle. Postpartum mares will have a "foal heat" 7 to 14 days following foaling, and a second cycle approximately 30 days later. Therefore owners of lactating mares should have some indication as to when reproductive exams should be initiated.

It is critical that the mare owner and stud farm routinely communicate to be aware of each other's schedule. Most stud farms collect each stallion on a every-other-day schedule. However, depending on the stallion and farm, this may occur more or less frequent. Furthermore, many popular stallions will have several cooled semen customers, and scheduling of shipments with adequate semen may become a problem. The stud farm should be notified the first day the mare comes into heat so any preplanning can be done.

Pregnancy rates from cooled stallion semen are the highest when mares are inseminated within 24 hours following semen collection. Some stallion semen is still highly viable up to 48 hours following collection. Semen stored up to 72 hours may appear to have good motility, but fertilization capabilities are poor. Mares will ovulate 24 to 48 hours before the end of heat, so frequent examination of their ovaries is important to predict ovulation, yet not miss it. If a mare has not ovulated following the initial insemination, a second semen shipment may be necessary. Mares should be teased regularly following insemination, and can be ultrasounded for pregnancy 14 days following ovulation. As with any breeding program, mares should continue to be teased through 40 days of pregnancy and ultrasounded a second time to ensure a viable pregnancy. The stud farm should be kept notified of the mare's early pregnancy progress.

Stallion Farm Responsibility

The stallion manager participating in a cooled semen program must be very efficient in organizing the various mares, distributing quality semen, and ensuring sufficient supply of equipment at all times. The most important responsibility of the stallion manager is to provide mare owners with quality semen which survives the cooling process. Some stallions produce sperm cells which remain viable for extended periods of time after being cooled. However, some stallions' semen does not survive the cooling process at all.

At the start of each breeding season, and periodically throughout, the semen should be evaluated for concentration and motility of viable sperm cells. Additionally, each stallion's semen should undergo a 24-hour viability check to ensure it is a candidate for a cooled, transported semen program. The 24-hour viability test is important to determine not only if the semen is capable of being stored for transportation, but also which extender and antibiotic mixture works best for each particular stallion's semen. This

viability check simply involves the same collection and processing as if it were to be transported, but the semen is reevaluated on-the-farm after being cooled for 24 hours. Stallion managers may also wish to evaluate the viability of the semen after a 36 and 48 hour cool storage.

Semen production capabilities between stallions can be highly variable. Some stallions produce highly concentrated, large volume ejaculates and can be collected every other day and others may need longer intervals between collections to produce quality ejaculates. The stallion manager must be familiar with the capabilities of each stallion and collect them to optimize their production of usable semen. The manager who continually monitors their stallions, should be able to give an accurate report on each stallions semen production capabilities.

Basic Program: Stud Farm to the Mare

Once the mare owner has determined a shipment of semen is needed, the stallion manager oversees the processing of the semen. It is critical the stallion be collected, semen processed, and placed in the cooling container within 15 minutes of collection. Unextended semen, maintained at its collection temperature (99° F) for over 15 minutes results in markedly reduced sperm motility at 24 hours. Therefore, the semen must be collected, filtered, analyzed for volume, motility, and concentration, mixed with extender, and placed in the shipping container within 15 minutes. Use of an extender with semen processed for storage and transport is critical in its survivability. Extender provides nutrients to the sperm cells and contains antibiotics to destroy harmful bacteria. Because of reduced viability, mares should be inseminated with 1 to 2 billion sperm cells and a volume of not more than 40 ml of semen. If a stallion has a sufficient concentration, the ejaculate may be split and several shipments obtained from a single collection. Additionally, if there are mares to be bred on-the-farm, collections with sufficient concentrations may be split for on-the-farm use and shipment.

Careful evaluation and calculations must be done to ensure proper concentration of the packaged semen. Recent research recommends semen to be packaged with no more than 20 to 25 percent seminal plasma. A dilution of 1:3 (semen to extender) results in 25% seminal plasma and 20% seminal plasma is obtained through a 1:4 dilution. Additionally, there should be a minimum of 25×10^6 motile cells/ml but not more than 75×10^6 motile cells/ml (motile cells/ml = % motility X concentration cells/ml). The most accurate evaluation and semen packaging is done if the stallion manager evaluates concentration of each ejaculate prior to processing. If not, the ejaculate should be extended using the above guidelines. If the concentration of the ejaculate is very low, the sample may need to be centrifuged to obtain the minimum concentration.

Once packaged, the container is sent via commercial carrier. The most common routes are a overnight mail service (UPS, Federal Express). Arrangements can be made with these companies for door-to-door service. Most commercial airlines will accept the shipping containers as unaccompanied baggage on a designated flight. However, containers must be taken to, and picked-up from the airport. Because most overnight services do not operate on weekends, commercial airlines are a viable option.

Once the container is received at the location of the mare, it should be kept in a safe place, and **DO NOT OPEN** until ready to inseminate the mare! Anyone skilled in equine artificial insemination has the techniques to inseminate with cooled semen. The mare should be prepared for insemination, semen removed from the container, swirled to mix, drawn into a slightly warm syringe, and inseminated as soon as possible. The semen need not be warmed prior to being placed into the mare as she provides the most desirable environment and best warmer for the semen. Following insemination, motility of the semen must be evaluated. A drop of semen should be placed on a warm slide (99° F) and examined under a microscope for forward motility. The shipping container must then be returned to the stallion

farm for future use.

Shipping Containers

Shipping containers have been developed which cool stallion semen at the correct, prescribed rate (*Table I*). Semen cooled at a rate too fast will result in irreversible damage to the spermatozoa or cold shock. Semen can be cooled relatively quickly from 37° C (99° F) to 20° C, but must be slow cooled at a rate of .05 C°/min from 20° C to 5° C (47° F). These containers cool semen over a 10 hour period, and hold the semen at 5° C (47° F). A common refrigerator cannot be used to cool semen because the cooling rate will be too fast.

Table I. Transported semen containers

<i>Container</i>	<i>Company</i>	<i>Cost</i>	<i>Reusable</i>
Equitainer	Hamilton-Thorn Beverly, MA 800/367-0266	\$250	Yes
Semen Transport System	Lane Manufacturing Denver, CO 800/777-2603	\$30	Yes

On-The-Farm Use

Although the most common use of cooled semen is to transport the stallion to the mare, there is the potential to realize its benefits from use on-the-farm. A stallion manager may elect to collect the stallion, breed the necessary mares, then cool and store the remaining semen for use the following day. Utilizing this approach can reduce the collection frequency, labor, and stress on the stallion.

Potential Problems

Success of a cooled, transported semen program requires careful attention to detail and much coordination between the mare owner, stallion manager, and veterinarian. The purpose of a transported semen program is to preserve the fertilizing ability of sperm for a prolonged period of time. Cooling and storage will not improve semen quality.

The most common pitfall in failure to obtain pregnancy through cooled semen is associated with the mares reproductive cycle. Various aspects such as failure to recognize her heat cycle, or missing her expected ovulation by more than 24 hours will often result in an open mare. Owners should realize more than one semen shipment may be required. One study reported overall conception rate of 91 percent over three heat cycles (n = 55). However, the first-cycle conception rate was only 65 percent with an average of 1.7 inseminations per cycle and an average of 1.8 cycles per conception.

Correct handling of the semen is of utmost importance. The effects of subtle errors in semen handling are magnified when semen is stored, rather than used immediately following collection. There is the potential of damage to the spermatozoa during the collection, processing and shipment. Semen must be handled from collection to insemination in such a manner as to not shock nor damage the sperm. If collection or storage devices are contaminated by bacteria, chemicals, or even soap residue, the survivability of the sperm cells can be severely diminished. Proper temperature control of semen prior to

cooling and prior to insemination is crucial. For example, if semen is initially mixed with extender which is too cool or too warm, damage will likely occur. Furthermore, the stallion manager must be conscientious enough to follow the correct packaging and cooling instructions.

Breed Association Restrictions

Breed association restrictions are continually changing. Horse breeders interested in pursuing use of cooled semen should contact their breed association for the most current guidelines. *Table II* lists several associations which do and do not allow mares to be bred with cooled semen as of October, 1995.

Using cooled semen in a breeding program is becoming a much more viable option for many horse producers. It does involve more coordination and organization between mare owner, stallion manager and veterinarian. However, it is a fairly simple method to reduce the costs, yet breed to more superior stallions. If procedures are correct, and mares are managed properly, success rates should be the same as if bred in a traditional artificial insemination program.

Table II. Breed associations allowing cooled or frozen semen^a.

<i>Association</i>	<i>Cooled Semen</i>	<i>Frozen Semen</i>
American Donkey & Mule Society	Yes	Yes
American Hackney Horse Society	Yes	No
American Hanoverian Society	Yes	Yes
American Holsteiner Horse Association	Yes	Yes
American Miniature Association	No	No
American Morgan Horse Association	Yes	Yes
American Warmblood Registry	Yes	Yes
American Paint Horse Association	Yes	No
American Quarter Horse Association	Yes--1997	No
American Saddlebred Horse Association	Yes	Yes
American Shetland Pony Club	No	No
American Suffolk Horse Association	Yes	Yes
American Trakehner Association	Yes	Yes
Appaloosa Horse Club	No	No
Arabian Horse Registry Of America	Yes	Yes
Belgian Draft Horse Corporation of America	Yes	Yes
National Show Horse Registry	Yes	Yes
North American Sporthorse Association	Yes	Yes
Paso Fino Horse Association	Yes	Yes
Peruvian Paso Horse Registry North America	Yes	Yes

Pinto Horse Association of America	According to Gov. Breeding Register	According to Gov. Breeding Register
Standardbred	Yes	?
Swedish Warmblood Association of North America	Yes	No
Tennessee Walking Horse Breeders & Association	Yes	Yes
The Jockey Club	No	No

^aAccording to an October , 1995 survey

***File G1278 under: ANIMALS, GENERAL
B-2, Breeding & Reproduction
Issued April 1996; 2,500 printed.***

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Elbert C. Dickey, Director of Cooperative Extension, University of Nebraska, Institute of Agriculture and Natural Resources.

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