ASC-264

Artificial Insemination in Beef Cattle

Les Anderson, Darrh Bullock, Katie VanValin, Jeff Lehmkuhler, and Kevin Laurent, Animal and Food Sciences

Successful artificial insemination (AI) breeding programs depend on adequate facilities, good herd health programs, sound nutritional management, using experienced and well-trained technicians, high fertility semen, and the ability to observe or synchronize a fertile estrus. Most problems and(or) failures in AI programs are associated with poor nutritional development in replacement heifers, inadequate body condition of cows at and after calving, failure to identify or control estrus in females, and/or failure to breed them at the proper time. Rarely is infertility the result of poor-quality semen or technician error.

Estrus Detection

Most of the beef industry incorporates AI into their breeding program using estrus synchronization protocols suitable for fixed-time AI. A fixed-time AI means that all the females are bred at the same time regardless of estrus (heat). Even though these systems do not require estrus detection, the success of these systems depends on the ability of the protocol to synchronize estrus in most females. Protocols for AI are considered efficient when all females exhibit estrus and are inseminated at an optimal time for fertility. AI programs that include fixed-time AI are inefficient since 20-40% of cows may not have been in estrus at insemination. To improve efficiency, estrus detection is important. Accurate estrus detection and recordkeeping are perhaps the most time-consuming and least-interesting jobs associated with an AI program. However, in many respects, they are the most important to the overall success rate. Heat detection requires skilled observation, patience, and a general familiarity with the reproductive processes of cattle. Data from Colorado State University demonstrates the importance of accurate heat detection. In this trial, cows were observed for estrus either twice daily, four times daily, or continuously. As heat detection intensity increased, conception rates to AI were 67%, 75%, and 90%. Inadequate heat detection can affect herd profitability in the following ways:

- Undetected heats result in longer calving intervals and decreased weaning weights of calves.
- Breeding cows that are not ready to be inseminated or inseminated too late results in decreased conception rates, wasted time, and semen. See Figure 2 for the best times for breeding to occur.
- Inseminating already pregnant cows that were mistakenly identified as being in heat can result in abortion.

Standing to be mounted (Figure 1) is the sign of estrus that is most accurate in selecting cows for insemination. Because pregnant cows will on occasion exhibit heat, it is important to keep thorough records and use a skilled technician.

The efficiency of estrus detection may depend on the proportion of animals in heat at the same time. This is usually not a problem in larger herds but may present problems in smaller herds.

Figure 1. Cow in standing estrus.

Synchronization of estrus becomes a valuable alternative in these situations (Figure 2). Other physical and behavioral signs that may signal that a cow is either coming into estrus or is in standing estrus include mounting of other cows, swelling of the vulva, strands of mucus discharged from the vulva (Figure 3), and chin resting.

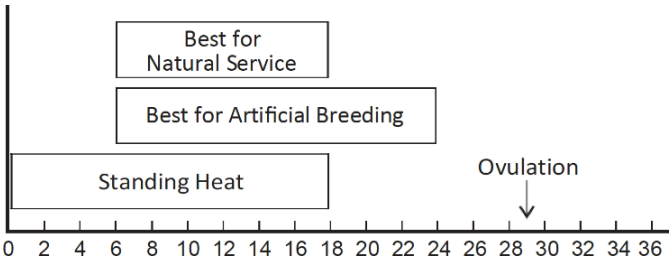

Figure 2. Best time to breed.

Figure 3. During estrus, the vulva is swollen and mucous is often discharged.

Cows that are isolated or with cows that are not sexually active may exhibit signs of estrus that include hyperactivity and movement, bellowing, tail raising and switching, and frequent urination. Extremes in weather, including periods of extreme cold or heat, can disrupt or diminish estrus behavior and make accurate heat detection difficult. Estrus detection can be assisted using estrus detection patches or electronic devices. Estrus detection patches (Figure 4) are placed perpendicular to the spine on the highest part of the tail head. The patches adhere more tightly when the skin is dry, and the temperature is above 50 F. When the animal comes into estrus and is mounted by either another cow or a bull, the grey is rubbed off by the chest of the mounting animal.

The more often an animal is mounted, the more the grey covering is removed until the patch is completely devoid of the grey material. Figure 4 illustrates a patch that is new and is completely covered in grey scratch-off material.

Figure 4. Proper placing of estrus detection patch. Courtesy of Estrotect, Inc.

Figure 5 can be used to help understand how to evaluate estrus and determine when a female should be inseminated. Patch A and G are examples of cows that are not yet in estrus. Some rubbing of the material has occurred, but it is streaky and is the result of the tail switch. Patch B is a cow that has been ridden one or two times and is at the very onset of estrus. For optimum fertility, breed 10-14 hours from observation. Patch C and F illustrate females that have been ridden 4-5 times and have likely been in estrus 3-4 hours. Time insemination similarly to Patch B. Patch D and E are observed when the females have been in estrus for several hours and have been mounted more than 10 times. Assume these females have been in estrus for 6-10 hours and breed relatively quickly. As an example, if a female has a patch that looks like Patch E at 8 a.m., assume she likely first came into estrus between midnight and 4 a.m. The optimum time to breed her is between noon and 4 p.m. Patches can also be used for pregnancy determination. If the patch remains grey for 21+ days after breeding, the cow is likely pregnant. Pregnancy can be validated by scheduling palpation/ultrasonography with your herd veterinarian or by blood sampling.

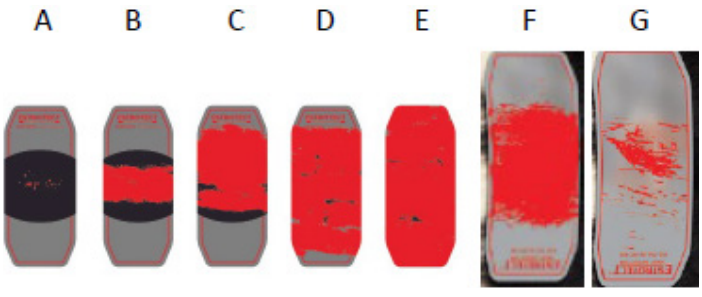

Figure 5. Examples of estrus detection patches. Pictures A-E illustrate how the patch gets rubbed off as the animal progresses from nonestrual to the beginning of estrus and after several mountings. F illustrates a cows that has been ridden 3-4 times and is at the beginning of estrus while G is indicative of the tail switch rubbing off the grey and a cow that is not yet in heat. Courtesy of Estrotect, Inc.

Semen Storage

Frozen semen is stored in plastic straws maintained in liquid nitrogen (-320°F). Semen should be transferred from one container to another carefully and swiftly—the transfer should be completed within 10 seconds. Semen tanks should be routinely checked to determine if the level of liquid nitrogen is sufficient to ensure proper storage of semen.

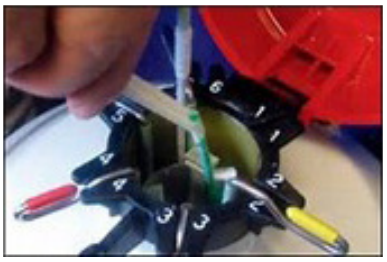

Figure 6. Removing a straw of semen from a semen tank.

Semen Thawing

Frozen semen should be thawed in a warm water bath at 95°F for a minimum of 30 seconds. Extreme water temperature can kill the sperm. It is important to routinely check the accuracy of the thermometer used to determine water temperature.

Figure 7. Placing a straw of semen from a semen tank into a heating unit.

Insemination procedure

Use semen within 20 minutes of being thawed. Once the semen is thawed follow this procedure:

1. Remove the straw from the thaw bath and thoroughly dry with a paper towel (Figure 8).
2. Quickly flip the crimped end of the straw to push the air bubbles to the end of the straw. Cut the straw across the crimped end and place the straw into the AI gun with the cut end up.
3. Pull a sheath over the gun to lock the straw into place (Figure 9). The model of gun determines the type of sheath used (Figure 10). Thawed semen should be protected against temperature shock, preferably by wrapping the front end of the gun with a paper towel.
4. Protect the loaded AI gun from heat and cold shock by placing it inside clothing (Figure 11).

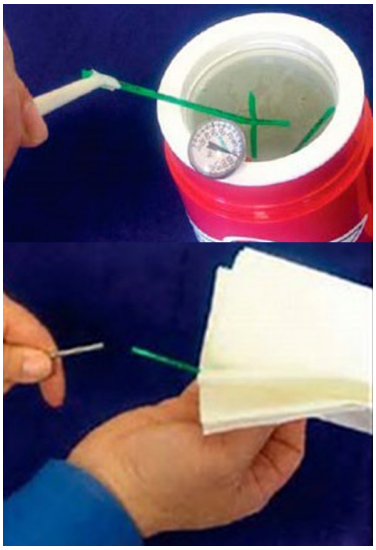

Figure 8. Removing a straw of semen from a thermos, drying it with a paper towel, and placing it in the AI gun.

Figure 9. Pulling the sheath over the straw of semen and the AI gun.

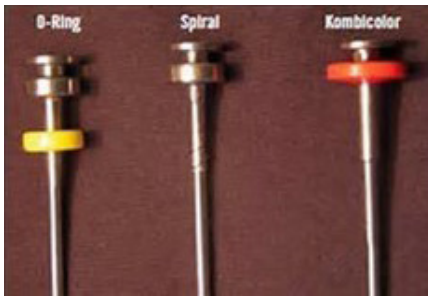

Figure 10. Several distinct types of AI guns can be used. The original style is the O-ring gun and the spiral gun. The Kombicolor is the most recent design of the AI gun. The spiral and Kombicolor guns use the blue-tipped sheath while the O-ring style gun uses the green-tipped sheath.

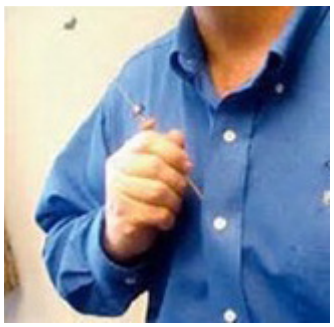

Figure 11. AI gun protection inside clothing.

5. The insemination is accomplished via rectal palpation (Figure 12). One hand with a protective sleeve is inserted into the rectum and the reproductive tract of the cow is manipulated across the colon. Once the cervix of the cow is located, it is pushed away from the vulva to straighten out the vaginal wall.
6. Wipe the external genitalia clean with a paper towel then the inseminating rod may be inserted into the reproductive tract. It is important that the cervix be worked over the rod and not vice versa. To ensure proper placement of semen in the body of the uterus, the tip of the technician's index finger should run over the front edge of the cervix to enable the technician to feel the tip of the gun as it protrudes into the uterus as shown in Figure 13. Placement too far into the uterus may result in damage to the uterine lining. The body of the uterus is the preferred site of semen deposition; however semen may be deposited in the cervix on second and later services. This method is to prevent disrupting pregnancy if a pregnant cow is accidentally reinseminated.

Summary

Incorporating AI into a breeding program can result in more rapid genetic progress especially if the producer chooses bulls that have high accuracy EPDs (Expected Progeny Difference). Often the cost of AI is like natural service but the rate limiting factor is labor and how much time is available for the producer. Learning to AI takes time for most producers but many quality training opportunities are available in Kentucky and the Southeast. Contact your local ANR agent for more information on AI training schools.

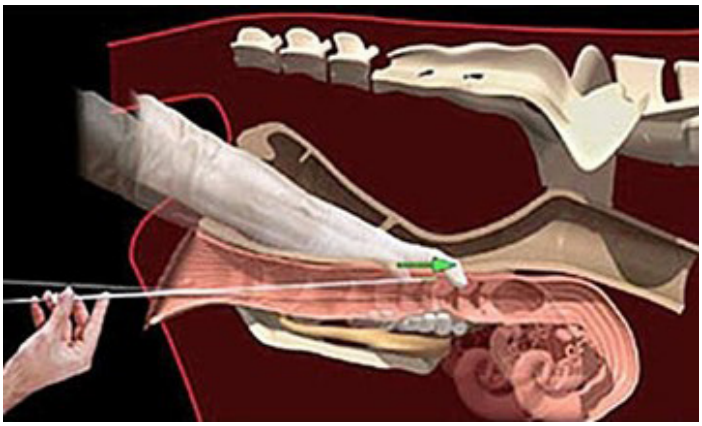

Figure 12. Push the cervix away from the vulva and slide the AI gun to the cervical os (ostium; opening in the cervix). You can use your thumb to guide the gun into the opening. Manipulate the cervix with gentle pressure forward on the gun to guide it through the cervical rings.

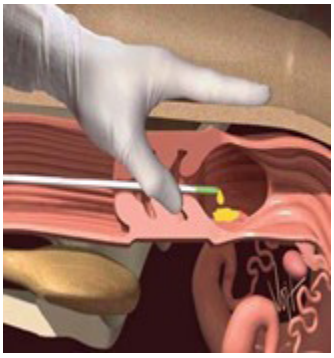

Figure 13. Deposit semen into the uterine body. Courtesy of Select Sires, Inc.

Cooperative Extension Service

Agriculture and Natural Resources
Family and Consumer Sciences
4-H Youth Development
Community and Economic Development

MARTIN-GATTON COLLEGE OF AGRICULTURE, FOOD AND ENVIRONMENT

Lexington, KY 40506 Issued 07-2024