

Tips for a Successful Estrus Synchronization and Artificial Insemination Program

Do you know if your herd is a good candidate for synchronization of estrus and ovulation? Can you identify potential problems if pregnancy rates to artificial insemination (AI) are lower than expected in an existing program? The following information addresses these issues.

Natural Service Reproductive Response

Pregnancy rates (number pregnant/number exposed) after a 60-day breeding season should be 85 to 90 percent or higher before implementing a synchronization and AI program. Lower fertility may indicate suboptimal health, nutrition, or some other aspect of management that may be compromising the success of the AI program.

Calving Distribution

The greater the proportion of cows calving the first 21 days of the season, the greater the response to an estrus synchronization and AI program. One study found that cows calving at least 71 days before breeding were more likely to be cycling and to become pregnant to AI (Figure 1).

Although some synchronization protocols can induce estrus and ovulation in non-cycling cows, cows calving within 30 days of the breeding season are less likely to respond. Using a synchronization protocol every year gradually increases the proportion of cows calving during the first 30 days of the breeding season, and, subsequently, pregnancy rates to AI. In one herd, the first year of synchronization increased the cumulative percentage calved by the third week by 22 percent (Figure 2).

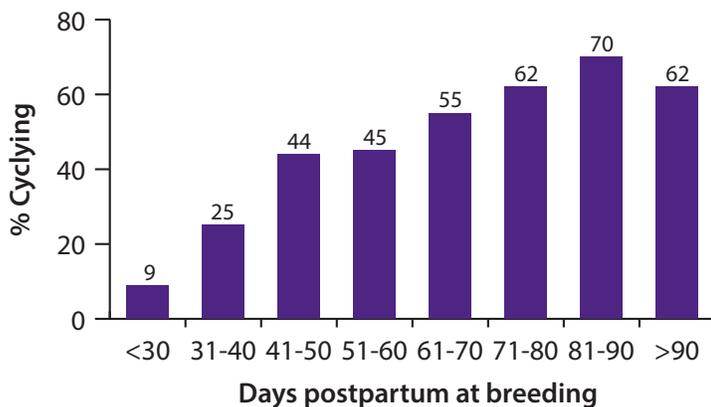


Figure 1. Relationship of days postpartum at breeding to proportion of cows cycling before estrus synchronization (Stevenson et al., 2003).

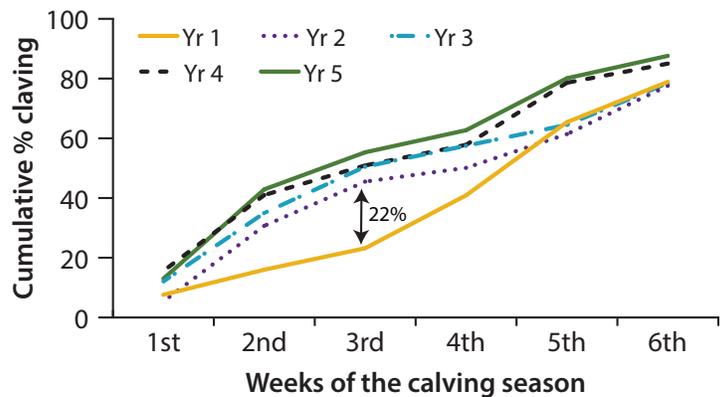


Figure 2. Calving distribution for the same herd over five calving seasons. No synchronization in year 1; synchronization in years 2 to 5.

With longer breeding seasons (>70 days) and less than 60 percent of the herd calving during the first 42 days of the calving season, AI pregnancy rates, will be much lower and timed AI of the entire herd would not be recommended. To shorten a long calving season, two synchronization periods 20 to 30 days apart will help to move up late-calving cows.

Cow Age

Duration of postpartum anestrus averages 20 days longer for two-year-olds than for mature cows. Even in herds that calve replacement heifers ahead of cows, the proportion of two-year-old cows cycling at the start of the breeding season was found to be 9 percent less than for mature cows (Figure 3).

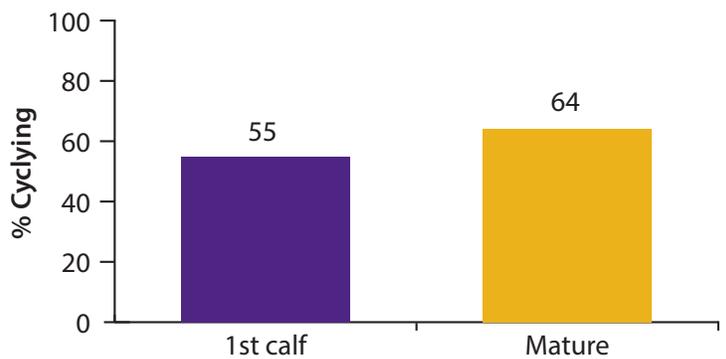


Figure 3. Effect of cow age on proportion of cows cycling before estrus synchronization (Stevenson et al., 2003).

Body Condition

Body condition influences the duration of postpartum anestrus and thus the proportion of cows cycling at the start of the breeding season. Cows should be in a positive energy balance to resume normal estrous cycles. Over a range of body condition scores (BCS) of 4 to 5.5 (1=thin to 9=fat), research shows that the proportion of cows cycling increased 18 percent for a one unit increase in body condition (Figure 4). This response would likely plateau for cows with BCS greater than 6.5. The cow's ability to conceive early in the breeding season has been shown to follow the same pattern.

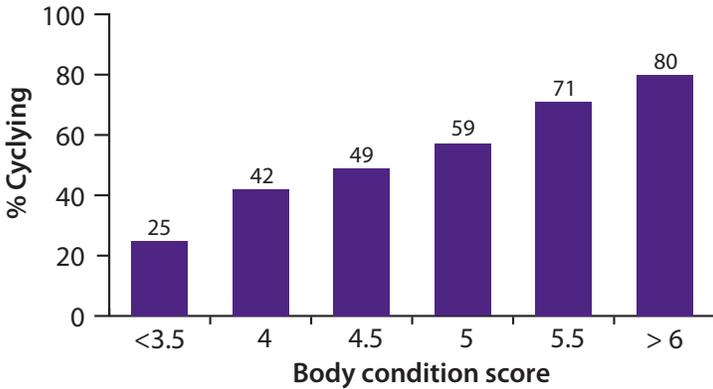


Figure 4. Effect of body condition score at breeding on proportion of cows cycling before estrus synchronization (Stevenson et al., 2003).

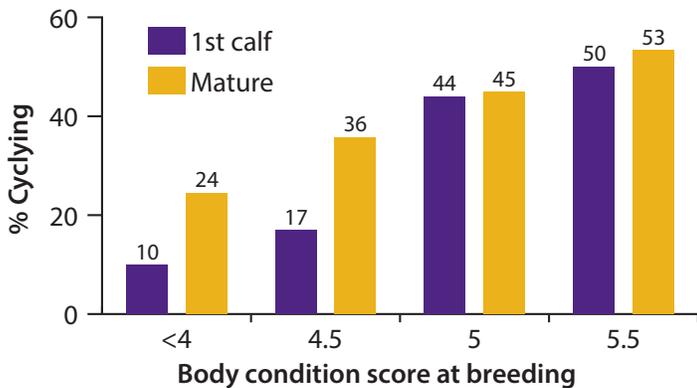


Figure 5. Proportion of non-cycling cows induced to ovulate by GnRH (Stevenson et al., 2003).

Protocol Selection

Protocols for synchronization of estrus and ovulation are described in MF2573. Diagrams of these protocols can be found in major sire catalogs and at www.beefrepro.info and KSUBeef.org. Recommendations were developed by the Beef Reproduction Task Force based on extensive research and field trials. Before using a protocol not listed, ask for comparative data with large numbers of observations.

Treatment Administration

Injections

Double and triple check to ensure GnRH and prostaglandin products are used on the correct day and time. Gather the

Evaluating body condition score and suitability for AI

BCS	Mature Cows	First-Calf
≥5	Good candidates for estrus synchronization and AI	Good candidates if calved 2 to 3 weeks ahead of mature cows
4 to 4.5	Expect lower AI pregnancy rates Increase nutrition 3-4 weeks prior to breeding season to improve response Timed AI is risky	Higher risk Response to induction of ovulation with GnRH is about half of that in mature cows at similar BCS (Figure 5). Consider using multiple methods to induce anestrus cows to cycle (e.g., calf removal and a progestin).
<4	Poor candidates for synchronization Timed AI not recommended	Not suggested

proper equipment and sufficient supplies, including at least one needle for every 10 to 15 cows and a place to dispose of old needles. Follow label directions and Beef Quality Assurance guidelines. Use appropriately sized syringes and needles. Accuracy, not speed, is the goal. If using a breeding box, make injections before animals enter the box if at all possible. Do not inject animals in the top butt. Change needles between each animal if bovine leukosis or anaplasmosis are of concern.

Intravaginal Progesterone Insert (CIDR)

Follow package directions. Wear plastic gloves when handling, focusing on cleanliness during insertion. In feedlots or confined housing, especially with heifers, you may want to cut the CIDR tail, leaving approximately 2½ inches exposed to keep pen mates from removing the insert early. Reuse of CIDRs is not recommended.

MGA

Uniform, consistent daily MGA consumption improves with adequate bunk space (18–20 inches for heifers). Gather animals if in a pasture setting or make sure they are all up to the bunk before feeding MGA. Feed MGA mixed with a small amount (3–5 lbs) of grain, which can be consumed in a relatively short time, yet allows each animal to receive the proper dose. When feeding MGA in a high-volume, total mixed ration, deliver the entire MGA dose with half or less of the daily ration at first feeding and feed the remaining ration later in the day. This method encourages females with lower intakes to consume the entire daily dose. Females grazing spring grass may not show an interest in supplements. To improve consumption, remove free-choice salt from the pasture before MGA feeding and include ½ ounce of salt per head per day in the MGA supplement.

Timing

Do not administer synchronization drugs with routine vaccinations, especially modified live vaccines. Check with your veterinarian about the appropriate type of vaccine and timing. Most vaccinations should be completed at least 30 days before initiating a synchronization program. Give the recommended synchronization treatment on the appropriate day and time. Missing the date by even a day can seriously affect results.

Consult the Iowa Beef Center Estrus Synchronization Planner (www.iowabeefcenter.org/estrussynch.html) for recommended protocols and print a calendar showing treatment days for the system of your choice. The mobile version can be found at www.estrussynch.com. When using fixed-time AI, do not synchronize more animals than you can inseminate in 3 to 4 hours.

Heat Detection

Synchronized Estrus

Heat detection for 2 hours every morning and evening and 1 hour at noon (intensive) has been shown to identify 40 percent more cows in estrus than checking for 30 minutes twice a day (Figure 6). Many successful operations have someone watching cows during all daylight hours of the synchronized observation period.

During peak estrus, females found to be in estrus should be sorted off several times a day. This makes it easier to identify animals coming into heat, increases estrus detection in timid animals, and may prevent injury due to aggressive mounting. In large pastures, it is nearly impossible to do an adequate job of identifying estrus females. Facilitate heat detection by gathering cattle into a smaller pasture or move them into a corner of a pasture or large pen. Moving and sorting animals stimulates estrus activity, especially when calves are sorted off cows.

Animals should have legible individual ID that permits identification from a reasonable distance and accurate recording of information. Plan for at least one person to observe heat per 100 head during peak hours. In large herds, animals should be divided into smaller groups for more effective heat detection. A number of heat detection aids are available that vary in cost, ease of use, and effectiveness. Some make excellent sorting aids but still require twice daily observation.

Natural Estrus

Detect heat for a minimum of 30 minutes twice a day. The frequency of mounting activity is considerably less for naturally occurring estrus than for synchronized estrus, increasing the need for diligent observation. Heat detection aids may be useful, but effectiveness depends on examining each animal two times a day for signs of standing estrus.

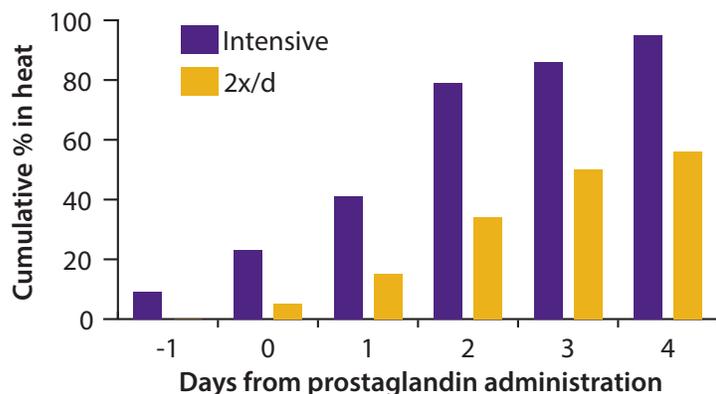


Figure 6. Effect of time spent checking heat (Geary, 1999).

Heat Detection Patches

Pregnancy rates are higher for females in estrus before insemination. Proven, rub-off heat-detection patches can be used in several ways. When more than 50 percent of the patch is rubbed off, an animal is considered to be in heat. Patches enable you to:

- determine which females get higher value semen in a fixed-time AI program;
- sort females in heat easier, supplementing visual detection;
- monitor response to synchronization when inexperience, body condition, or nutritional status are of concern;
- save GnRH cost in a fixed-time AI program where females with more than 50 percent of the patch rubbed off at fixed-time AI do not require GnRH;
- decide when to inseminate in a split-time AI program where only females with more than 50 percent of the patch rubbed off at the time of normal fixed-time AI are inseminated (no GnRH required) and AI on the remaining group is delayed for 20 to 24 hours; and
- give GnRH to females without activated patches at timed AI.

AI Timing

The highest conception rate to AI was 4 to 12 hours after the onset of standing estrus as detected using the Heat Watch 24-hour monitoring system. The a.m./p.m. rule is a good guideline for vigilant producers with an accurate estimate of when standing estrus began. If animals continue to exhibit standing estrus 12 to 14 hours after initial insemination, the conservative approach is to reinseminate. Sexed sperm degrades more quickly than nonsorted sperm. It should be reserved for females known to be in estrus, inseminating 6 to 12 hours later than nonsorted.

Semen Quality and Handling

A thorough breeding soundness exam (BSE) assessing concentration, motility, and morphology of sperm should be performed before semen is frozen. Small, independent collection operations may not offer a complete semen analysis as part of the freezing process. It is recommended to have semen processed at a Certified Semen Services (CSS) lab such as the Kansas Artificial Breeding Service Unit in Manhattan, Kansas.

Canes or canisters should not be exposed for longer than 8 seconds above the frost line in the neck of the tank. Start AI season with a full tank of liquid nitrogen to raise the frost-line and minimize semen exposure to damaging temperatures during high use. Implement a semen inventory system to minimize exposure to elevated temperatures when locating straws. If using an electronic thaw unit, test the temperature with a calibrated thermometer before the season begins. Replace card thermometers annually.

Thaw only as much semen as you can inseminate in 10 to 15 minutes. Do not allow straws to touch while thawing. Follow provider recommendations for semen thawing temperature and time. Use a timer and do not guess. Keep the thaw box, AI gun, scissors, and equipment clean. Straw cutters can be difficult to clean, but do not use a dirty straw cutter.

Technicians

Track conception rates by technician, making adjustments when problems arise. When inseminating large numbers of females during timed AI, have enough technicians on hand to complete the job. If it is your first large group, do not underestimate how long it will take your arm to fatigue if you do not palpate regularly. Alternate tasks to minimize fatigue.

Facilities

Well-designed facilities in good repair minimize stress on animals and people. If breeding on observed estrus, have designated areas for animal sorting and holding. Cows bred on observed estrus are often moved immediately after AI to make it easier to detect heat in the remaining group. If cows can be moved to an adjacent pasture, a creep gate that lets calves sort themselves can save considerable time and effort.

Evaluate the need for water and shade in holding areas given your breeding schedule and environmental conditions. Plan for rainy weather. Cows usually stand quietly in a breeding box

without head restraint. Thaw and handle semen out of direct sunlight. As a synchronized group of cows begins to show signs of estrus, even the best fence may not deter neighboring bulls. If fence line contact with bulls cannot be avoided, an electric fence set back a reasonable distance from the permanent fence may discourage unplanned matings.

Advice for Beginners

- Make sure females are in adequate body condition.
- Start with a smaller group (heifers or early calving cows).
- Consider synchronizing and using natural service the first year. A single injection of PG provides some synchronization and often does not require additional bull power. Seek advice on the best synchronization and bull management approach for your situation. Consult an expert before selecting a synchronization system.
- Trade labor with an operator experienced in AI and synchronization. You will learn how they do things and have expertise on hand when it's your turn.

Checklist for a Successful Estrus Synchronization and AI program

Herd Management

- Pregnancy rate after 60 days > 90% mature cows, > 85% first calf heifers
- Body condition at calving \geq 5 cows, 5.5-6 first-calf heifers
- Body condition at breeding \geq 5 cows, 5.5 – 6 first calf heifers, 5-6 yearling heifers (fatter is not better)
- Majority of herd > 40 days postpartum at start of breeding, 20 days postpartum earliest time to insert CIDR in 5 to 7 day CIDR protocols.
- Steady to increasing plane of nutrition before and during breeding season
- Nutrient analysis of forages used to balance rations
- Scale used to monitor body weight
- If grazing, appropriate stocking rate for available forage
- Dry feed/forage available when grazing lush forages
- Appropriate mineral supplementation for water and feed resources
- No modified live vaccinations < 30 days before breeding (45-60 days better)
- Functional facilities for sorting, treatment administration, and AI. Skilled labor that minimizes handling stress.
- Transportation and nutritional stress minimized day 5 to 45 post breeding
- Complete and accurate records to assist with troubleshooting

Synchronization

- Synchronization system implemented according to Beef Reproduction Task Force recommendations as shown in all major sire catalogs

- GnRH and PG products administered using correct dose, proper technique, day, and time
- Uniform daily MGA consumption
- Dedicate sufficient time and skill to heat detection when used

Semen

- Breeding soundness exam performed before semen collection
- Semen received from CSS certified lab
- Minimal and correct semen handling at all times
- Straws not above frost line more than 8 seconds during handling
- Semen inventory system in place
- Appropriate type of sheaths on hand for AI gun
- Clean AI gun, scissors, thaw unit and other equipment
- Use clean thaw water, temperature monitored (94-98° F)
- Thaw semen according to provider's instructions or not less than 45 seconds and not more than 10 to 15 minutes
- Avoid temperature shock and exposure to UV rays when moving straws from the liquid nitrogen tank to the cow

Insemination

- No contaminants introduced during insemination
- Deposit semen slowly in the uterine body; push plunger forward and don't pull the gun back

Sandy Johnson, reproductive physiologist, Colby; Jeff Stevenson, reproductive physiologist, Manhattan; and John Jaeger, reproduction physiologist, Hays

Publications from Kansas State University are available at:
www.bookstore.ksre.ksu.edu

Brand names appearing in this publication are for product identification purposes only. No endorsement is intended, nor is criticism implied of similar products not mentioned. Contents of this publication may be freely reproduced for educational purposes. All other rights reserved. In each case, credit Sandy Johnson et al., *Tips for a Successful Estrus Synchronization and Artificial Insemination Program*, Kansas State University, December 2018.

Kansas State University Agricultural Experiment Station and Cooperative Extension Service

K-State Research and Extension is an equal opportunity provider and employer. Issued in furtherance of Cooperative Extension Work, Acts of May 8 and June 30, 1914, as amended. Kansas State University, County Extension Councils, Extension Districts, and United States Department of Agriculture Cooperating, J. Ernest Minton, Interim Director.