Repro Tracks

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Heat detection aids and timing of AI

Success of an AI (artificial insemination) program depends on each link in a chain of events. Two important links in that chain are heat detection and proper insemination technique. Heat detection aids can be a useful tool in identifying cows in heat, and understanding the flexibility allowed in proper timing of insemination can make AI more user-friendly without compromising success rate.

Breeder question No. 1

This week we have been using an AI technician that tells me the "new school of thought" is that you can successfully AI beef cattle three hours after "first standing heat." In the past I have strived to breed cows nine to 12 hours after the first standing heat, and no later than 24 hours after the first standing heat. Can you tell me the earliest beef cattle could be bred after the first standing heat, and the latest they should be bred?

Response: Let's begin with a physiology lesson. Beef cows and heifers routinely ovulate about 30 hours after the beginning of standing heat. It doesn't matter if they are in heat for six, 12 or 18 hours; the timing of ovulation appears to be most related to the beginning of heat. The reason being that the pre-ovulatory surge of luteinizing hormone (LH) from the pituitary gland occurs coincidentally with the onset of standing heat. It is the LH surge that causes ovulation. Completion of the series of events that culminates in ovulation requires about 30 hours after being initiated by the LH surge.

The goal for proper timing of insemination is to deposit the semen in the tract long enough prior to ovulation to allow changes needed in the sperm head for penetration and fertilization of the ovum (egg), but not to deposit semen so long before ovulation that a large proportion of the sperm die. Hence, the perfect "window" for breeding a cow has traditionally been considered to be from about six hours to 18 hours prior to ovulation (12 to 24 hours after the beginning of standing heat). That is why the "a.m./p.m. rule" (observe heat in the a.m. — breed in the p.m.; observe heat in the p.m. — breed the next a.m.) has worked well. Based on the physiology and our traditional understanding, you have been breeding your cows correctly to achieve the optimum timing of insemination.

With that said, I think the success of timed breeding programs has "opened our eyes" about the possibility of breeding cows earlier than we have traditionally believed was acceptable. For example, in a Co-Synch timed breeding program, all the animals receive an injection of gonadotropin-releasing hormone (GnRH) to cause an LH surge and are inseminated at the same time. The induced LH surge is intended to cause ovulation 30 hours later (assuming the animal has not been in heat prior to the GnRH injection).

In this scenario, the semen deposited at the time of the GnRH injection must last at least 30 hours before it can fertilize the ovum. Originally many researchers (including me) doubted that pregnancy rates in a Co-Synch program would be satisfactory, but the pregnancy rates have turned out to be only slightly less than when breeding 12 hours after seeing a heat. Bottom line, the "lasting power" of high-quality semen was greater than many of us expected.

Another argument for achieving acceptable pregnancy rates when breeding earlier than traditionally accepted is the results of several once-a-day breeding trials. Typically once-a-day breeding occurs in the morning (for example, 10 a.m.) and all animals in heat the previous afternoon and any animal in heat that morning are inseminated.

When compared to breeding twice daily, using the standard a.m./p.m. rule, many researchers have reported the difference in pregnancy rates were not statistically significant. Hence, those animals found in heat in the morning and bred the same morning have had a decent chance of becoming pregnant. The timed breeding and once-a-day breeding data would support the opinion of your AI technician, namely that acceptable pregnancy rates can be achieved when cows are bred less than 12 hours after heat detection.

The "take home message" here is that there is some flexibility in the timing of insemination in single ovulating beef cows when excellent-quality semen is used by a skilled inseminator. I believe the "old rules" still apply and the optimum window for breeding is 12 to 18 hours after the onset of standing heat. However, everything in the world isn't optimum, and there is some leeway in the timing of insemination without seeing huge changes in pregnancy rate.

Breeder question No. 2

We are considering the use of an estrus detection aid, like Kamar® or Estrotect,™ when we synchronize estrus in our cows. Do you think it is worth the extra cost to use heat detection devices?

Response: Estrotect heat detection patches and Kamar heatmount detectors are two of the more popular heat detection aids. Both are placed on the tailhead of a cow or heifer and are activated by pressure from the brisket of another animal mounting during standing estrus. Painting the tailhead and watching for removal of the paint when the animal is mounted can also be used as a heat-detection aid. Research using dairy cattle has demonstrated that the use of heat-detection aids in conjunction with twice daily visual observation significantly improved estrus detection over use of visual observation alone.

Heat-detection aids may not be as useful or even necessary when using estrus synchronization. The frequency of mounting activity is directly proportional to the number of animals in heat at the same time. A cow in heat at the same time as several herdmates will be mounted more frequently and be more likely to be observed than one that is in heat alone. Hence, with the use of estrus synchronization techniques, heat detection becomes much easier due to the greater likelihood of animals in heat being mounted during the observation period.

At Virginia Tech we have used numerous types of heat-detection aids in conjunction with estrus synchronization. While the aids have assisted in identifying cows in heat and in identifying cows to be sorted from the group for insemination, perhaps the most useful benefit has been to identify those animals that have *not* been in heat following the synchronization treatment. After finding the majority of the synchronized cows in heat, it is reassuring to see only those animals with inactivated detectors or undisturbed tailhead paint left in the group. In this way the detectors or tail paint ensure that you have not "missed" a heat during the time when so many cows were in heat.

The cost of heat-detection aids like Estrotect heat detection patches and Kamar heatmount detectors usually is around $1 per head. Tail paints such as Detect-Her tail paint can be applied one time for around 25¢ per head. Typically, the cost of estrus synchronization drugs and semen is between $30 and $35 per head. Therefore, adding an estrus-detection device or painting the tailhead would increase the cost per cow by 3% or 0.7%, respectively. The value of the extra investment will be a matter of each user's opinion.

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Editor's Note: *Bill Beal is a beef cattle reproductive physiologist at Virginia Tech. He conducts research involving estrus synchronization, AI, embryo transfer and the use of ultrasound technology. This column is designed to provide answers to questions about reproductive management commonly posed by breeders. If you have questions or comments related to the reproductive management of cows or bulls, e-mail them to wbeal@vt.edu or mail them to him at the Dept. of Animal & Poultry Sciences, Virginia Tech, Blacksburg, VA 24061-0306.*