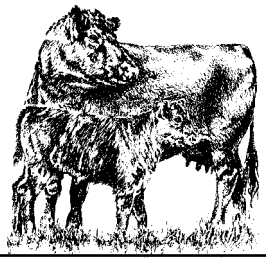

Western Beef Resource Committee *Fourth Edition*

Cattle Producer's Handbook

Reproduction Section 406

Tips to Improve A.I. Pregnancy Rates

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Numerous factors contribute to the success of an artificial insemination (A.I.) breeding program. The four factors that affect A.I. pregnancy rate include percentage of females detected in heat and inseminated, inseminator efficiency, fertility level of the herd, and fertility level of the semen. Attention to detail in each of these factors is important for obtaining high pregnancy rates.

With A.I., we assume the role of the bull and should focus our efforts on breeding and settling each female within the herd. Listed below are some of the little things that improve our odds of consistently obtaining high pregnancy rates.

The percentage of females that are inseminated within a herd depends on the efficiency and accuracy of heat detection as well as the percentage of females that are cycling. Proper development, genetics, sound herd health, adequate nutrition, and the time interval since calving will dictate the percentage of heifers and cows that are cycling. As long as females are individually identifiable, our accuracy at heat detection (percentage of cows exposed to A.I. that were actually in heat) is usually quite high. However, our heat detection efficiency (ability to accurately detect all heats) can vary greatly between operations, and is dependent upon the intensity and duration of estrous behavior exhibited by the cow and the amount of time we spend observing cows for signs of estrus.

Heat Detection Efficiency

Synchronization of estrus increases estrous behavior among cows and increases our heat detection efficiency. When the estrous cycles of beef cows are synchronized, the average number of times a cow stands to be mounted per heat at least doubles (Table 1). In addition, the average duration of estrus (defined as the time interval between the first and last time a cow stands to be mounted) increases from 8 to 12 hours.

By dividing the total time spent displaying standing behavior by the duration of estrus, we find that the average cow exhibits standing behavior only .005 to .04 percent of the time she is in estrus (natural and synchronized heats, respectively) (Table 1). It is no wonder that so many heats go unnoticed.

The net effect is that cows whose estrous cycles are synchronized spend 10 percent more time each estrous cycle exhibiting signs of estrus, and thus, producers have a 10 percent greater chance of detecting each cow in heat. Also, estrous synchronization decreases the number of days that producers must observe cows for signs of estrus, so it is easier to allocate sufficient time for this important task.

A Colorado study showed that 10 percent fewer cows exhibited estrus only during hours of darkness if their estrous cycles were synchronized (3 vs. 28 percent, for

Table 1. Estrous behavior intensity of natural and synchronized heats in beef cows.

Measurement	Natural heat	Synchronized heat
No. of mounts/cow (Range)	22 mounts (2 to 68)	48 mounts (2 to 211)
Duration of mounts (Range)	4.5 seconds (2 to 22)	3.5 seconds (2 to 24)
Duration of estrus (Range)	8 hours (.02 to 22)	12 hours (.1 to 27)
Total time spent displaying standing behavior (Range)	99 seconds (9 to 306)	168 seconds (7 to 739)

synchronized and natural heats). The Colorado study also showed that compared to 24-hour electronic heat detection, 30 minutes of heat detection each morning and evening resulted in 80 percent of natural heats being missed, whereas only 22 percent of synchronized heats were missed. Thus, a combination of factors associated with estrous synchronization improves our ability to detect cows in estrus. All estrous synchronization protocols are not equal, so choose the program that best fits your operation (see 405).

Spending more time observing cows for signs of estrus increases heat detection efficiency, conception rates, and pregnancy rates. Electronic heat detection (HeatWatch® system) was used in another Colorado study to evaluate the effects of intense vs. casual observation of cows for signs of estrus. Intense heat detection was defined as 2 hours of heat detection each morning and evening and an additional hour of heat detection around noon. Casual heat detection was defined as observing cows each morning and evening for approximately 30 minutes.

Cows from both intense and casual groups were from the same herd and synchronized using the same protocol and bred by the same technician. Intense heat detection increased the percentage of cows observed in estrus by 30 percent. As a result of more accurate and efficient heat detection, conception rates were 20 percent higher and pregnancy rates doubled (Fig. 1). The higher conception rates among intensely observed cows may have been the result of more appropriate timing of A.I. relative to the onset of estrus.

In the study, the electronic heat detection system was no more effective than intense visual observation of estrus for identifying cows in heat. We need to remember that heat detection aids can be used to increase our heat detection efficiency but should not be used to replace intense visual observation.

When a cow is observed in heat, remove her from the rest of the herd as soon as possible. We all learned to leave cows in heat with the rest of the herd so they will form sexually active groups that help us find other cows in heat. We now know that these cows distract us from detecting other cows in heat in two ways. First, when we are detecting heat, each time a cow stands to be mounted, we must try to get her number. If the cow being mounted is an individual we have already identified as being in heat, then we are distracted from watching other cows. Second, there are always some timid cows that avoid the pushing and shoving that goes with estrous behavior and often go through estrus without being detected. By removing the more dominant cows, the timid cows are more likely to exhibit estrous behaviors.

Sorting "hot cows" into a pen that is adjacent to the pasture where you are heat detecting is helpful, as timid cows and cows coming into estrus usually ride the fence trying to get in and are easily identified and sorted off as they are detected in heat. The only time one should consider leaving "hot cows" in the heat detection pasture to help identify other cows in heat would be when estrous synchronization is not used or when only one or two cows are expected to be in heat per day.

Timing of A.I.

Cows should be inseminated 12 hours after the observation of estrus or earlier. A Virginia study involving 2,661 inseminations in 17 dairy herds revealed that conception rates were greatest among cows that were inseminated between 4 to 12 hours after the onset of estrus (Fig. 2). This study utilized the HeatWatch® electronic estrous detection system to pinpoint the onset of estrus. This study has yet to be duplicated in beef cattle, but results should be similar since the timing from the onset of estrus to ovulation is similar between beef and dairy cattle.

Further studies have shown that fertilization rate is actually higher when inseminations occur closer to the time of ovulation, but embryonic death loss is greater. This embryonic death usually occurs before maternal recognition of pregnancy, so the length of the estrous cycle is not altered.

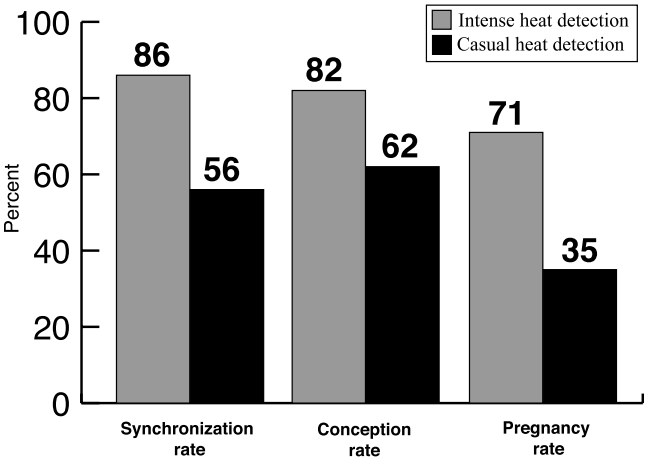

Fig. 1. Effects of intense (2 hours morning and evening and 1 hour around noon) versus casual (30 minutes morning and evening) observation of estrus.

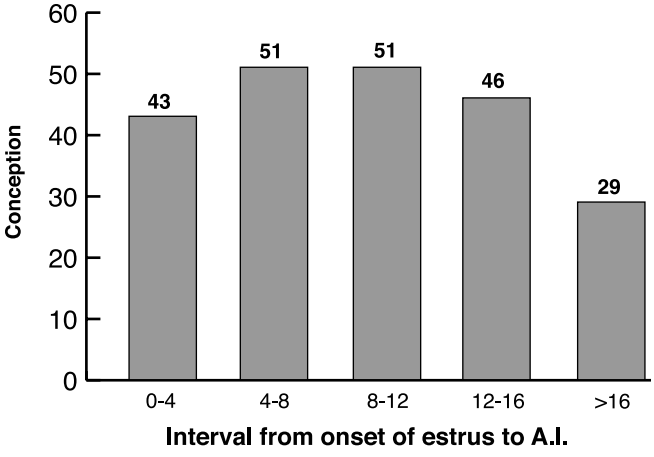

Fig. 2. Conception rates by time of insemination from the onset of estrus.

Fertilization rate is actually a little lower when inseminations occur early during estrus, but embryonic mortality is also lower. It is a case of more sperm being at the site of fertilization when the insemination is closer to the time of ovulation that results in higher fertilization rates, but there is less natural selection for the healthiest sperm fertilizing the egg, so the embryo quality may be compromised. Inseminations closer to the onset of estrus result in fewer sperm still being viable when ovulation occurs, but the sperm that fertilizes the egg appears to be healthier, resulting in less embryonic death. Thus, there is a tradeoff with the time of insemination between optimal sperm and egg viability. Proper semen handling becomes even more important when we move to earlier inseminations, as we are expecting the sperm to remain viable for a longer period of time.

These findings provide a clearer answer to two common scenarios. When cows are detected in estrus around noon, they should be inseminated that evening rather than the next morning. We also have believed that when a cow that was detected in estrus in the morning was still in estrus in the evening that we should wait to inseminate her the next morning.

The Virginia data suggests this thinking is incorrect. The cow should be inseminated as close to 12 hours after the onset of estrus as possible, realizing that it is better to error earlier rather than later. Studies that revealed intense estrous detection was as efficient as electronic estrous detection also revealed that the onset of estrus was detected 5 hours later with visual detection than with the electronic system.

Inseminator Awareness

Use clitoral stimulation to increase pregnancy rates of cows only. Research has shown that clitoral stimulation or massage for 3 to 5 seconds after A.I. increases pregnancy rates in cows 4 to 15 percent. However, pregnancy rates of heifers decrease by 3 to 5 percent when clitoral stimulation is used.

The presumed method by which clitoral massage increases pregnancy rates in cows is by increasing the retention of semen in the uterus after insemination. The reason that it does not help in heifers is unclear but may be due to semen being deposited at the wrong site in a higher percentage of heifers than cows. It is critical that semen be deposited in the uterus and not in the cervix.

Technicians also need to be sure when they deposit semen that they are pushing the plunger toward the inseminating rod rather than pulling the inseminating rod toward the plunger. It is probably better to deposit semen a little further into the uterus than to risk depositing any of it in the cervix.

Stress may be more harmful to the technician than the cow. We have all believed that stress affects pregnancy rates. A Washington study showed that stress around the time of A.I. has no effect on pregnancy rates. On the other hand, when we become stressed, we tend to perform poorly at relatively routine tasks. Thus, limiting stress around the time of A.I. may be more important for us than the cow.

Stresses that are applied to the cow at certain times after insemination may, however, affect pregnancy rates. A Colorado study used trucking stress (approximately 7 hours) to evaluate the effects of stress on pregnancy rates during defined periods after A.I. (Table 2). There are large windows between these experimental time intervals that we don't really know about, but it would probably be best to truck or move cattle as soon after A.I. as possible, or more than 40 days after breeding. Embryo implantation is generally complete by 40 days after A.I., and transportation stress applied after 40 days would not be expected to affect embryonic survival.

Semen Fertility

The fertility level of sperm varies not only between bulls but can also vary between collection dates from the same bull. Sperm morphology is the best indicator of healthy sperm that will ensure fertilization and proper embryonic development. Sperm morphology is evaluated at collection studs for fertility traits that are compensatory or non-compensatory. Compensatory traits are generally minor abnormalities that decrease fertility and are compensated for by adding more sperm per straw. Non-compensatory traits are usually major abnormalities that would decrease fertility no matter how many sperm are added to a straw.

Ejaculates that are classified as non-compensatory are usually discarded and never frozen. It may be wise to record semen collection dates (printed on the straw of semen) for each insemination so that the correct problem might be identified if pregnancy rates are low.

There is nothing a producer can do if he/she starts with poor quality sperm. Obtain semen from a reputable source that is certified for processing semen by the National Association of Animal Breeders (NAAB). The best way to know if semen came from a certified source is to look for the initials "CSS" stamped on the straw.

Artificial insemination has been available for producers for a long time. We need to remember that some of the progress that has been made with A.I. comes from improvements in semen handling. Semen is now pack-

Table 2. Effects of trucking stress after A.I. on pregnancy rates.

	Day transported after A.I.		
Trait measured	**1 to 4**	**8 to 12**	**29 to 33**
Synchronized pregnancy rate	74%	62%	65%
Breeding season pregnancy rate	95%	94%	94%
Mean day of conception	9.6 d	13.4 d	13.6 d

aged in 1/4 to 1/2 cc straws because they are easier to handle. Straws should be thawed at 98°F for a minimum of 30 seconds. It is sometimes easy to get caught up in a race and inseminate females so quickly that we are not thawing semen sufficiently. More errors occur in all aspects of A.I. when we go too fast. A study conducted in Washington revealed that sperm are still viable for more than 4 hours when kept at 98°F. We can only assume that they are still capable of fertilization. The point is not to have producers thaw semen and then eat breakfast and do their morning chores before inseminating cows, but that the semen is still good if problems arise after the straw has been placed into the water bath that delay the time to insemination.

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