Repro Tracks

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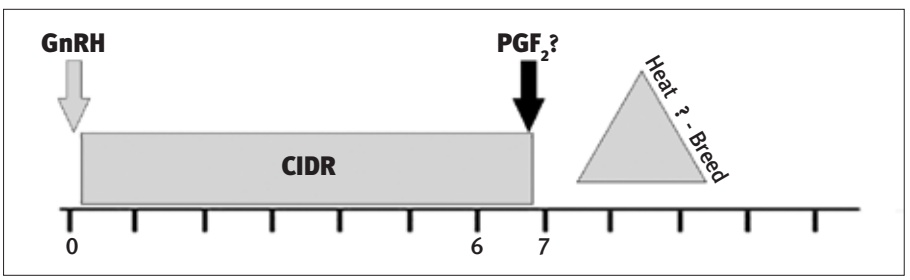
Breeding problem diagnosis

Objective analysis of breeding procedures and results can uncover the cause(s) of a disappointing artificial-insemination (AI) or natural-service breeding season. The analysis needs to extend beyond the obvious targets for breeding failure because the causes are often indirect effects of other management decisions.

Scenario

Example Angus Ranch is a family-owned, purebred operation with 90 cows calving in the spring. The ranch numbers their calves with a letter to represent the year born and a number representing the order in which the calves are born during the calving season. They sell 18-month-old bulls to commercial breeders and market their females through consignment sales. Each year they retain 20 replacement heifers to replenish the purebred herd. Twenty other heifers are sold after weaning as open commercial heifers. The 20 purebred replacement heifers are synchronized and bred AI at the beginning of the breeding season using the treatment shown below.



If the heifers are detected in heat within the first seven days of the breeding season, they are bred AI by one of two brothers (Mike or Joe) with semen from a variety of Angus bulls. Heifers not detected in heat are not bred AI. Ten days after the last AI the heifers are turned out with a single Angus clean-up bull for 75 days. The bull is semen-checked 30 days prior to use and must pass a complete breeding soundness exam.

The breeding data is presented in Table 1. It shows the breeding and pregnancy information for the Example Ranch heifers in 2010.

The family members are disappointed in the breeding results they achieved this year and have the following questions:

Table 1: Breeding and pregnancy data for Example Angus Ranch 2010

Tag #	AI-bred to	AI breeding	Clean-up	Preg. status
A1	P457	6/10 (Mike)	w/bull 75 days	AI
A9	7401	6/12 (Mike)	w/bull 75 days	Bull
A12	FDI	6/10 (Mike)	w/bull 75 days	AI
A16	EG187	6/10 (Joe)	w/bull 75 days	AI
A18	YG	6/10 (Mike)	w/bull 75 days	AI
A21	N12	6/10 (Joe)	w/bull 75 days	Open
A23	YG	6/11 (Joe)	w/bull 75 days	AI
A25	7401	6/11 (Joe)	w/bull 75 days	Bull
A26	FDI	6/11 (Joe)	w/bull 75 days	Bull
A32	J9011	6/11 (Joe)	w/bull 75 days	Bull
A41	J9011	6/10 (Joe)	w/bull 75 days	Bull
A43	R-P	6/10 (Joe)	w/bull 75 days	Bull
A55			w/bull 75 days	Bull
A57	EG187	6/12 (Joe)	w/bull 75 days	AI
A60			w/bull 75 days	Open
A62			w/bull 75 days	Bull
A73			w/bull 75 days	Open
A74			w/bull 75 days	Open
A75	EG187	6/11 (Joe)	w/bull 75 days	Open
A87			w/bull 75 days	Open

Question Set No. 1: Note the AI conception rate (number of pregnancies ÷ number inseminated ×100) was only 43% (6 ÷ 14), and the ranch is scheduled to get only six AI-sired calves from their 20 replacement heifers next year. They want to know what went wrong with the synchronization and AI part of their breeding program.

a. Should they have used a different estrous synchronization treatment?
b. Was there a problem with the semen they used?
c. Should they change something else about their AI program?

Question Set No. 2: Example Ranch ended up with six open heifers out of 20 (30%) at the end of the AI and natural-service breeding season. That's three times more than they have had before.

a. What is the reason for such a high percentage of the replacement heifers being open?
b. Was there a problem with the fertility of the clean-up bull?

Response and recommendations

Question 1a: The estrous synchronization method used on the ranch is a popular one that the Beef Reproduction Task Force (*http://*

beefrepro.unl.edu/pdfs/2010protocols.pdf) refers to as "Select Synch + CIDR®." The treatment is known for providing excellent synchrony of estrus with high fertility following AI. It can be used with a single, timed AI or AI can be performed after detection of estrus as was done on this ranch.

The estrous response (number of heifers in heat ÷ the number treated ×100) was 70%, and the synchrony of estrus among the heifers that showed heat was very "tight" (12 of 14 in heat within two days). Based on the timing of estrus in those heifers that exhibited estrus, the treatment appeared to be successful. However, some attention should be directed at why the treatment was unsuccessful in those heifers that failed to show heat.

Question 1b: The AI conception rate was low, 43%. This signals the need to reconsider *everything* related to the AI process as a possible source of variation, including heat detection, timing of AI, semen handling, semen quality and insemination technique. While the semen quality was not tested in a lab, it seems unlikely that it is the source of the disappointing AI results. Semen from eight different sires was used to inseminate the 14 heifers detected in heat. No sire provided semen to breed more than three heifers. Therefore, it is very unlikely that poor semen quality caused the low AI conception rate.

Question 1c: Two inseminators were responsible for the AI conception rate. One brother, Mike, only bred four heifers, but three of those heifers (75%) became pregnant to the AI breeding. Joe, the other brother, bred 10 heifers, and three of those conceived to AI (30%). Obviously, this places the spotlight on Joe's ability to handle semen and/or to deposit semen in the appropriate site.

However, before Joe receives all the blame, remember that with such a small number of heifers being bred by either brother, a change in pregnancy rate by one or two heifers could make the results look very different. The chance of inseminator technique being a partial cause of the disappointing results is great enough that Joe (and Mike) should probably seek some retraining from an AI trainer. However, the small number of inseminations performed makes it impossible to place all the blame for poor results on this factor. Furthermore, poor insemination technique does not explain why some heifers failed to exhibit a synchronized heat and never had the opportunity to be inseminated.

Question 2a: If only six heifers became pregnant to an AI breeding, this means 14 nonpregnant heifers entered the breeding pasture to be bred by the clean-up bull. The heifers were with the bull for 75 days. However, only eight of the 14 (57%) became pregnant during the clean-up period. Although the bull had passed a breeding soundness exam within 30 days prior to the breeding season, the low pregnancy rate places the fertility of the clean-up bull in question.

Allowing the clean-up bull 75 days to breed heifers that did not become pregnant to AI implies that each nonpregnant heifer would have three chances (heat cycles) to come into heat and be serviced by the bull. However, this presumes that the heifers had all reached puberty and were cycling prior to being turned in with the bull.

Perhaps a better way to assess the performance of the clean-up bull is to consider the bull's ability to impregnate only those heifers that were detected in heat after the synchronization treatment. Of the eight heifers that failed to become pregnant after showing a synchronized estrus, six (75%) became pregnant after breeding by the bull during the clean-up period. Conversely, only two of six heifers (33%) that had not exhibited estrus after the synchronization treatment became pregnant during the clean-up period. This points to those heifers that failed to show heat after the synchronization treatment as a "problem" that reduced both the estrus response to synchronization and the overall pregnancy rate.

Note that most of the heifers that failed to respond to the synchronization treatment and failed to become pregnant are the younger heifers in the group (based on tag number). This suggests that these heifers may have been prepuberal (noncycling) prior to the beginning of the breeding season. This may have been the reason they failed to exhibit a synchronized estrus and did not become pregnant to AI or to a natural-service breeding.

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