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CENTERPIECE

Making what's good even better: New AI protocols for beef cattle

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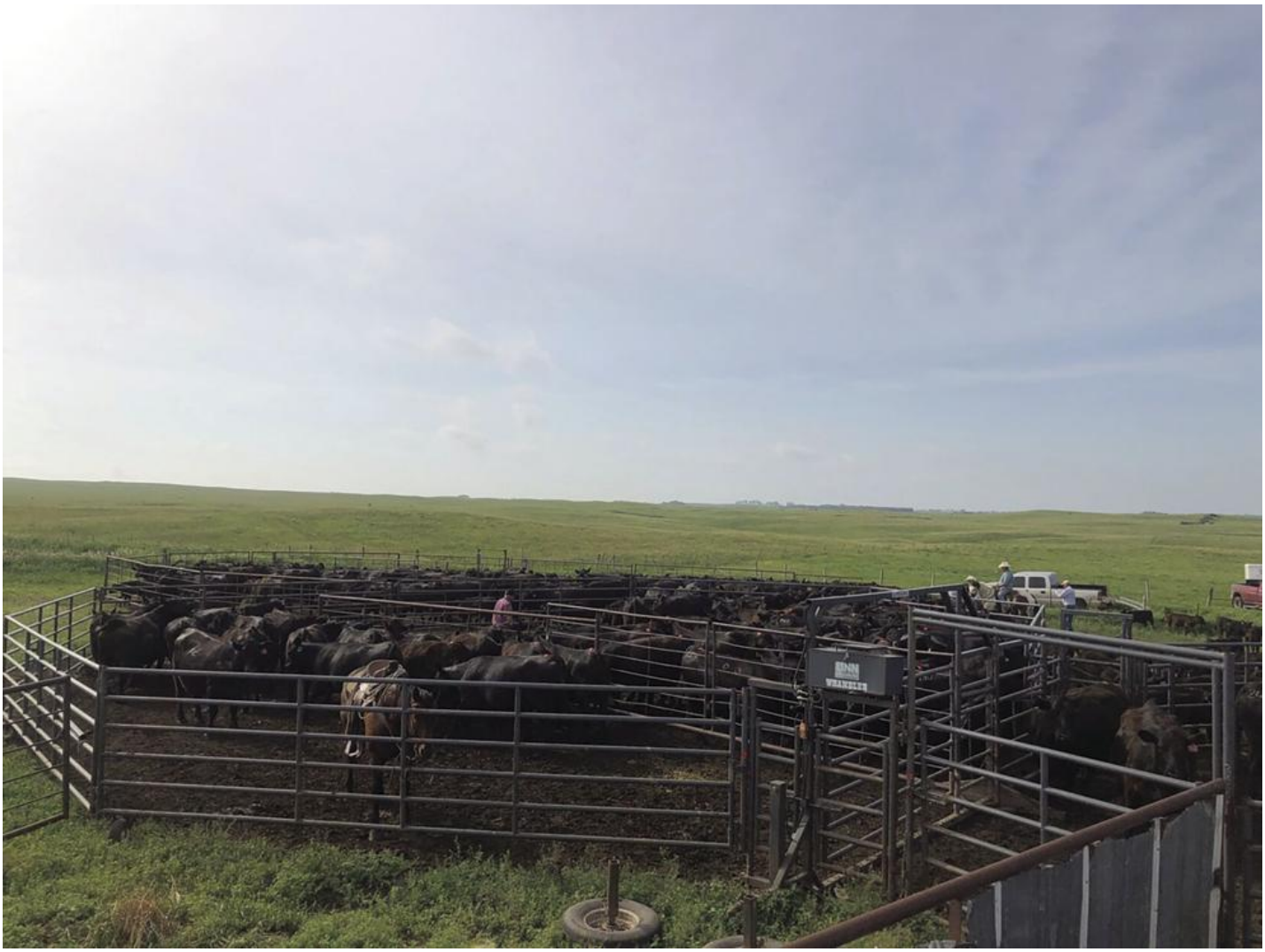
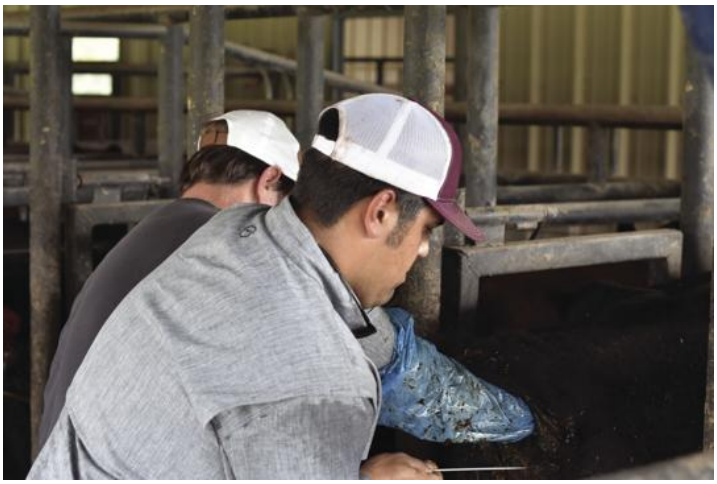


Sorting cows to be artificially inseminated. Photo courtesy of Dr. Jordan Thomas.

Advances in artificial insemination (AI) technology help increase conception rates, and research continues to make progress in AI protocols.

Dr. Jordan Thomas, state beef reproduction specialist at the University of Missouri, said the existing protocols for timed AI work well. "We've had amazing improvements in the past 20 years. Most commercial producers get 50 percent to 60 percent conception rates with single fixed-time AI." This can make a big difference in shifting the time frame when cows conceive for early calving.



Cow being inseminated. Photo courtesy of Carl Rugg.

Having cows set up to calve earlier gives them more time to recover from calving and be ready to breed for an early calf again. "It's a snowball effect, working better and better as time goes on," he said.

Well-managed herds have a high percentage of calves born in the first part of the calving season. Making this happen takes selection and culling, selling open and later-conceiving cows.

"Synchronization is just an additional tool to help move a herd toward those goals. Now the question is how to take something that's already good and make it better. That's what we've focused on with our research here in Missouri," Thomas said.

Researchers have already developed highly effective strategies for timed AI in heifers and cows. John Hall, Extension beef specialist at the University of Idaho Nancy M. Cummings Research, Extension and Education Center, said many of the fixed-timed AI systems that synchronize ovulation in a group of cows resulted in improvements in AI pregnancy rates. This reduced the need for heat detection, which saved a lot of time for ranchers.

"There are still some advantages to heat detection, along with fixed-time AI, but we have some new protocols that work very well in cows, like the seven-day CO-Synch with CIDR [controlled internal drug release]. We've learned more about timing—and the fact that when we use fixed-time AI, the timing from when we pull the CIDR and give the prostaglandin, until we AI the cow, is important. We've figured out what the optimum times are to maximize pregnancy rates," said Hall.

Thawing semen. Photo courtesy of Carl Rugg.

"Even so, animals that have shown estrus prior to fixed-time AI have much higher pregnancy rates than those that haven't. Estrus detection aids like Estrotect and Kamar Heat Mount Detectors have been very helpful. Even in a fixed-time AI scenario these can give us confidence or help us question whether to proceed with the fixed-timed AI (since cows respond better if they've already begun to cycle)."

Split-time AI

Researchers at University of Missouri looked at the question of what to do with animals that have not shown estrus prior to fixed-timed AI. "They came up with what they called split-time AI, a protocol we tend to use more with sexed semen," said Hall. "We don't have any great fixed-timed AI protocols that work as well for sexed semen, but with split-timed AI, the animals that have not shown prior estrus are given another 20 to 24 hours before insemination—resulting in better pregnancy rates," said Hall.

Thomas has been one of the leaders in this research. He became interested in working with sexed semen as a graduate student. "We developed alternative timed AI strategies to use it more effectively. Up until 2013, people felt success rates with timed AI were poor when using sexed semen, and that heat detection was required. We tried to challenge that assumption because heat detection is not practical in many cases," he explains.

"A few years ago we worked on a slightly different timed AI approach called split-time AI, which helped improve pregnancy rates with sexed semen and conventional semen for cows. We did not have enough uniformity among cows after standard estrus synchronization protocols to allow us to do well with just a single service with sexed semen at an appointed time. We

A straw of semen. Photo courtesy of Carl Rugg.

thought that if we could control the estrous cycle better, maybe we could create a better opportunity to use sexed semen effectively with fixed-time AI," said Thomas.

It does require more handling because Estrotect patches are put on the animals, and the timing of insemination is split, based on when those patches become activated. "It's not as laborious as heat detection, but still requires more work than a true fixed-time AI, since we put the cows through the chute one more time," Hall said.

"In heifers it's no big deal because you sort out the ones with activated Estrotect markers and put them through the chute that day, and leave the others behind. But for cows with calves, this means another sorting away from the calves," Hall explains.

"There isn't a big problem, however, in leaving calves away from the cows for a day. Years ago we used to do what we called 48-hour calf removal to stimulate cows to cycle. So for fixed-timed AI, one strategy is just to leave the calves off for 24 hours and not have to sort them twice," he said.

New 7 & 7 protocol

In recent trials, the Missouri researchers gave prostaglandin and inserted a CIDR a week prior to the start of what would typically be a seven-day CO-Synch + CIDR protocol. "By giving prostaglandin, you cause corpus luteum (CL) regression in cows that are cycling and have a prostaglandin-responsive CL," said Thomas. "Their progesterone production will then decline. By then treating with a CIDR, which is another source of progesterone but at a lower level than they would be making themselves, you achieve an odd situation: The follicle that would have turned over at some point is maintained."

This creates a situation in which most of the animals that are then given GnRH (gonadotropin-releasing hormone) have a follicle capable of responding to that GnRH. "This is advantageous, because in a normal seven-day CO-Synch + CIDR protocol or in similar protocols that begin with GnRH, there's a large proportion of cows that don't respond to the GnRH simply because they don't happen to have a follicle capable of responding." They are in the wrong phase of their cycle.

Carson Anderson, a student at University of Missouri involved in the 7 & 7 protocol. Photo courtesy of Dr. Jordan Thomas.

"This is like a pre-synchronization treatment. Dairies use pre-synchronization approaches, but those usually involve a series of injections that would not be practical for most beef operations. Our approach is a simple, one-trip-through-the-chute approach that offers significant improvement." This creates more consistency in a group of cows, and a greater proportion come into standing heat before the fixed-time AI. Cows that express standing estrus have better conception rates, even with fixed-time AI.

"With this protocol, which we've been referring to as 7 & 7 Synch, we had 82 percent express standing heat before the fixed-time AI, which is extremely good. That sets you up for high pregnancy rates, if insemination occurs at the right time," said Thomas.

In this trial, pregnancy rates to fixed-time AI with the standard seven-day CO-Synch + CIDR protocol were 61 percent with conventional semen and 44 percent with sexed semen. With the new 7 & 7 Synch protocol, pregnancy rates were improved to 72 percent with conventional semen and 52 percent with sexed semen.

"In 2018, we worked with small numbers of cows doing ovarian ultrasounds and collecting blood samples to see if they were responding the way we thought they should. They did, and now we're seeing good results with on-farm pregnancy rates in commercial herds," Thomas said.

If it's a producer's first time using synchronization in a set of cows with a long calving season, some won't be ready to respond, however. "There are good candidates in the herd for timed AI, and some poorer candidates. The first year may be challenging. There may be cows in the herd that you don't synchronize for AI, or maybe some you just use light synchronization to help with natural service. The goal is to make more of the herd become good candidates, and ultimately all of them will be after doing this for a couple of years," Thomas said.

> "The seven-day CO-Synch CIDR protocol is a 10-day protocol and the 7 & 7 is a 17-day protocol; it's an extra seven days,"

He is excited to see what this approach might allow producers to do. "When I see 72 percent of a group of cows conceiving to single service on the first day of breeding season, I start wondering how short we can make that breeding season. Can I move toward a 30- or 40-day calving season? Maybe we leave bulls with them a little longer than that, but check for pregnancy and market those later-bred cows," he said.

Hall said this new heat-synch protocol looks like the increase in pregnancy rates would be worth the extra trip through the chute if a person can get another 10 or 11 percent pregnant to AI. "One challenge with this 7 & 7 protocol, in herds that have not already been using synchronization programs, is that they may not have optimum success if their calving season is still strung out and some of the later-calving cows are not yet cycling.

Inseminating a cow. Photo courtesy of Travis Olson.

"By contrast, after a producer has used protocols like seven-day CO-Synch + CIDR a couple years, and the herd has shifted to shorter calving (more time to recover after calving) these longer-term protocols become easier to use and more successful. The seven-day CO-Synch CIDR protocol is a 10-day protocol and the 7 & 7 is a 17-day protocol; it's an extra seven days," Hall explains. This may eliminate more cows from being in the optimal time frame if they didn't calve early enough.

Continual progress

"As researchers develop new protocols or tweak the ones we're already using, the fact that the Beef Reproductive Task Force works together across many states/locations in different types of animals and environments to test those systems is helpful. They test

new protocols to see whether they work well enough to put in the back of the AI book," said Hall.

"Another thing we're learning about—with work by Reinaldo Cooke and George Perry at Texas A&M University—is importance of nutrition of those animals right after AI, during those next few days until the pregnancy is recognized by the animal and established in the uterus. This is a crucial period. Dr. Perry is looking at changes in nutrition post-AI and what that effect might have on pregnancy rate. Dr. Cooke is doing work with essential fatty acids in the diet. Their research is providing more good information."

Separated calves from cows being artificially inseminated. Photo courtesy of Dr. Jordan Thomas.

Researchers continue to tweak synchronization systems and/or look for better ones, but also focus on looking at management procedures we can do either before or after AI to optimize pregnancy rates. This may be an area where we can now make the most progress, going forward.

Hall has been involved in multiple studies; his research facility is one of many locations, working together with University of Missouri, Washington State University, Texas A&M and/or Colorado State University on some of these projects. "Texas A&M did some work we collaborated on, looking at pre-synchronization, especially when using sexed semen, and finding advantages," he said.

The protocols developed over the past 20 years have helped beef producers do a better job with AI pregnancy rates, and shortening their calving season. "We've learned a lot but have not exhausted new possibilities. Current protocols are doing a good job of what we want them to do—which is synchronize follicular growth and ovulation. We'll probably continue to tweak some of these things, but some of the management options we're looking at now will also be critically important," said Hall.

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