

Tools to Enhance Reproductive Success

Symposium featuring reproductive strategies in beef cattle provides wealth of practical information.

Story by

KINDRA GORDON, MEGHAN RICHEY & TROY SMITH

“This is the best conference I’ve ever been to,” one of the attendees of the 2010 Applied Reproductive Strategies in Beef Cattle (ARSBC) Symposium remarked while waiting to talk to one of the speakers after a session. We never expected any less, which is one of the

reasons Angus Productions Inc. (API) provides coverage of the event among our suite of meeting sites available through www.api-virtuallibrary.com.

The ARSBC program was developed by the Beef Cattle Reproduction Task Force to improve understanding and application of reproductive technologies, including artificial insemination (AI), estrus synchronization and factors affecting male fertility. Following are synopses of some of the presentations that

we hope will entice you to seek additional information — including additional summaries, proceedings, PowerPoints and audio — available in the newsroom at www.appliedreprostrategies.com. The site also contains more information about the Task Force and its mission.

Physiological Principles Underlying Synchronization of Estrus

Estrus synchronization and AI rank

high among technologies for genetic improvement of beef herds. However, according to University of Missouri (MU) animal scientist Mike Smith, their development and application depend on an understanding of the physiological and hormonal mechanisms controlling the estrous cycle.

Smith reviewed the characteristics of the estrous cycle, which may vary from 17 to 24 days in length. He also noted

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Steps for Synchronization Success

Kansas State University livestock production specialist Sandy Johnson shared an update on the efforts of the North Central Region Bovine Reproductive Task Force as she addressed participants at the Applied Reproductive Strategies in Beef Cattle (ARSBC) workshop hosted in conjunction with the 2010 Cattle Industry Annual Convention and NCBA Trade Show in San Antonio, Texas. The Task Force has spearheaded the ARSBC workshops conducted across the country during the past several years.

Johnson reported that the Task Force has developed a “short list” of basic recommendations for timing of artificial insemination (AI) and protocols that work specifically for heifers and a separate list for cows (see the proceedings to Johnson’s presentation in the newsroom at www.appliedreprostrategies.com for the two lists). Johnson explained, “These are the protocols that the Task Force believes will work in a majority of situations and are reasonable to apply.”

Johnson further explained that the Task Force has divided most protocols into one of three categories:

- strictly heat detection and AI;
- a combination of heat detection and timed AI; and
- strictly fixed-timed AI.

“The first decision producers need to make in selecting a protocol for their operation is ‘How much heat detection do you want to do?’,” she said.

“There are a lot of protocols out there,” Johnson said. “This is a short list. If you choose to use a different protocol, make sure you have data to support it;

otherwise, the cost and extra steps may add up.”

“Within product category, all products are equally effective, so choose the system that works for you,” she said, citing labor, facilities and timeline as important factors to consider, as well as the support provided by the supplier of the product.

Additionally, Johnson offered these tips to ensure a successful synchronization and AI protocol:

- Make sure to give the correct injection on the day specified in the protocol.
- Use at label dose.
- Follow Beef Quality Assurance guidelines for all injections.

To help producers in implementing synchronization protocols, Johnson provided a working demonstration of the Estrous Synchronization Planner software developed by Iowa State University. Features of the software include:

- 24 estrus synchronization systems, in three categories, including fixed-timed AI, estrus detect with clean-up AI and estrus detect AI;
- 13 recommended systems for heifers and cows, including the use of CIDR®s;
- 11 less preferred systems for heifers and cows;
- a daily calendar of activity once the system and

date of breeding have been established by the producer; and

- a budget cost analysis of the various synchronization systems.

“I think most valuable is the calendar, particularly with longer systems,” Johnson said. She explained how the software allows for a date to be plugged in and automatically schedules all injection and breeding dates for the system. “The planner allows you to figure out the times that will work and then generate a list of daily activities to communicate with your labor team, as well as calculate cost per AI pregnancy comparing three systems,” she added.

The Estrous Synchronization Planner software is available to producers for a nominal fee by contacting the Iowa Beef Center (beefcenter@iastate.edu or 515-294-BEEF), or by downloading an order form from the center’s web site, www.iowabeefcenter.org.

— by Kindra Gordon



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Editor’s Note: To listen to Sandy Johnson’s presentation, obtain the proceedings containing the Task Force recommendation or to view the PowerPoint she presented during the ARSBC symposium, visit the newsroom at www.appliedreprostrategies.com. Coordinated by Angus Productions Inc. (API) and the event hosts, the site provides coverage of the symposium, as well as archived coverage of the 2008 ARSBC symposium.

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the variability of the duration of estrus, or standing heat, which typically ranges from 10 to 18 hours. Some cows, however, exhibit estrus for less than 10 hours. Ovulation occurs approximately 28-32 hours after the onset of estrus, or 12-20 hours following the end of estrus.

Following an explanation of the estrous

cycles' three phases (follicular phase, estrus and luteal phase) and the cycle's regulation by hormones, Smith discussed specific protocols for administering hormones [progestins, prostaglandins and gonadotropin-releasing hormone (GnRH)] for estrus synchronization. Smith also cited management considerations for

selecting and preparing heifers or cows for synchronized AI. He advised producers to consider genetic and environmental (management) influences that may affect reproductive development and readiness for breeding.

“What has the pregnancy rate of your heifers been over the past few years? Have your heifers received growth-promoting hormones? Have heifers achieved adequate



“It is essential to pay attention to details throughout an estrus synchronization and artificial insemination program,” Mike Smith warned. “Success hinges on many factors and a fault in one area cannot be made up by success in another.”

target weight for breeding? And what proportion of your heifers have a reproductive tract score of 4 or higher?,” Smith asked, noting how these factors can affect breeding success.

When contemplating synchronized AI of cows, Smith said producers should also consider historical pregnancy rate, the proportion of cows that are cycling by the start of breeding season, the body condition cows exhibited at calving and at the start of breeding season, and whether sufficient time has elapsed between calving and the time a synchronization protocol is begun. Producers should also consider time necessary for detection of estrus and whether their working facilities allow for low-stress handling of the number of animals they intend to breed.

“It is essential to pay attention to details throughout an estrus synchronization and artificial insemination program,” Smith warned. “Success hinges on many factors and a fault in one area cannot be made up by success in another.”

— by Troy Smith

Understanding Puberty and Postpartum Anestrus in the Beef Female

Getting cows pregnant isn't always as easy as it sounds, but understanding puberty and postpartum anestrus can make it a bit easier, Gary Williams, Texas A&M University, told ARSBC participants.

Puberty in heifers. “Lifetime productivity is heavily dependent on a female's ability to reach sexual maturity, conceive early and calve as a 2-year-old,” Williams said, noting however that many heifers do not reach puberty early enough to conceive early.

Sexual maturation begins in the brain, specifically in the hypothalamus, Williams said. Factors affecting maturation include:

- breed, breed type and body weight;
- pre- and postweaning nutrition, time of weaning and type of diet; and
- critical body weight/adiposity.

“We can develop heifers for reaching puberty by using the concept of targeted body weight,” he said, providing the following scenario: A suckling calf gains 2 pounds (lb.) per day, then when the calf is weaned at 7-9 months of age there is a small dip in daily gains. If she is fed to gain 1.5-2 lb. per day, then we can expect her to reach puberty at 12-14 months. However, if she is fed to gain 0.5-1 lb. per day, then puberty will more likely be achieved at 14-16 months. By getting the heifer to reach puberty earlier, she will have more cycles, thus more opportunities, to get bred earlier than the rest of the cow herd, thus giving her a better opportunity to rebreed on time.



Protein and mineral supplementation to maximize forage utilization is an investment worth making, Gary Williams said. “Yes, it costs a bit of money but it will make you more.”

“Feeding to develop to a targeted body weight does work. It has a cost associated with it, but it works,” Williams said.

The postpartum cow. “Twenty years ago we used to think that the sensory stimulation of suckling affected nerves that signaled the body to remain anestrous, but we now know that it is actually the maternal bond that prevents a female from returning to cycling,” Williams explained.

In instances of adverse environmental conditions, such as drought, Williams said that early weaning can markedly enhance reproductive performance. Also, temporary weaning (48 hours) or alien cohabitation (also 48 hours) of cows during estrus synchronization may enhance synchronization efficiency and fixed-time AI conception rates.

“If you take away the calf, the cow will often be in estrus within 48-72 hours, but certainly within one week,” he said. He also clarified the myth that time of suckling during the 24-hour day influences return to estrus, saying that “restricting calves to day-only nursing or night-only nursing has no effect on post-calving reproductive efficiency.”

Aside from suckling, Williams also said that nutrition is a major factor. Specifically, cows with lower body condition scores (BCSs) have fewer large follicles, making rebreeding more difficult.

He cautioned against viewing fat supplementation as a “silver bullet” to improving reproductive efficiency,

saying that there is a “narrow margin of opportunity for cows that would benefit from fat supplementation. Only those that are in thin condition already may benefit, but even then it may not be anything more than we would expect to see with any other dietary supplement for a thin cow.” Fat supplementation has no significant effect if cows are already in appropriate body condition, he emphasized.

Protein and mineral supplementation to maximize forage utilization is an investment worth making, he said. “Yes, it costs a bit of money but it will make you more.”

— by *Meghan Ricbey*

Estrus Synchronization Protocols: Heifers

University of Missouri (MU) reproductive physiologist David Patterson

reviewed methods for synchronizing estrus prior to AIing breeding heifers. Patterson’s presentation focused primarily on progestins, including orally delivered melangestrol acetate (MGA) and vaginal inserts (CIDR®s) used to suppress estrus prior to a planned breeding period.

Patterson said MGA-based protocols have seen more widespread use for

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synchronizing estrus in heifers. Used most simply with natural service, heifers are fed MGA for 14 days and exposed to bulls 10 days after withdrawal of MGA. A second method, used with AI, involves feeding of MGA and administration of prostaglandin hormone 19 days after MGA withdrawal. This treatment shortens the synchronized period and maximizes conception rate.

It is not uncommon for heifers to receive MGA for longer periods if, for example, replacements are selected from a larger group of heifers in a backgrounding program. Patterson warned that evidence suggests long-term feeding of MGA may result in higher than normal incidence of follicular cysts and reduction in estrous response after prostaglandin is administered. Re-injection with prostaglandin typically results in satisfactory breeding performance.

Patterson said a third MGA-based protocol involves injecting heifers with gonadotropin-releasing hormone (GnRH) 12 days after MGA withdrawal, followed by injection of prostaglandin in another seven days. The addition of

GnRH to the protocol has been shown to increase the proportion of heifers with synchronized follicular waves at the time prostaglandin is administered.



"Pregnancy rates resulting from fixed time AI of beef heifers are expected to be higher following treatment with long-term CIDR-based protocols because of improvements in synchrony of estrus following treatment," David Patterson told ARSBC participants.

Patterson described multiple alternatives to MGA-based protocols, which introduce progesterin by inserting CIDRs for a period of seven days or for 14 days, followed by administration of prostaglandin and GnRH according to the chosen CIDR-based systems involving insemination after heat detection or timed insemination. Patterson noted that CIDR-based protocols may be applied to synchronization of mature cows as well, while MGA use is restricted to heifers.

Patterson said the various methods have been used successfully, but evidence suggests better results may be achieved with protocols involving insertion of CIDRs for the longer time period.

"Long-term CIDR-based protocols enhance synchrony of estrus, compared to short-term CIDR-based or MGA-based protocols," Patterson stated. "Pregnancy rates resulting from fixed-time AI of beef heifers are expected to be higher following treatment with long-term CIDR-based protocols because of improvements in synchrony of estrus following treatment."

— by Troy Smith

Synchronization Protocols for Cows

"Forty years ago the beef industry did not have any of the products for synchronization that we have today," pointed out University of Florida associate professor Cliff Lamb as he addressed participants at the ARSBC workshop.

There is more semen available today to AI beef cows than ever before, Lamb noted. "The progress in the industry has been amazing to me. Many of the synchronization systems available today have eliminated the need for heat detection."

Traditionally, 5%-8% of beef females are bred by AI, but it is moving closer to 12%-14% today, Lamb said. "I credit that to the fixed-timed AI protocols."

Before giving an overview of some of the most applicable synchronization protocols, Lamb said it is important to understand three definitions:

- Synchronization rate: the percentage of females detected in estrus compared to the total number synchronized.
- Conception rate: the percentage of females pregnant compared to the number of females inseminated.
- Pregnancy rate: the percentage of females pregnant compared to the total number synchronized.



"Many of the synchronization systems available today have eliminated the need for heat detection," Cliff Lamb said.

He emphasized that in comparing protocols, pregnancy rate is the best indicator of reproductive success.

And, to achieve optimal pregnancy rates with estrus synchronization, cows should be in good body condition (BCS \geq 5) and treatments should be initiated only when cows are at least 50 days postpartum. Lamb said protocols that utilize the CIDR can help kick-start non-cycling cows, but no protocol can help get thin cows bred.

Lamb provided an overview and research on the following synchronization systems:

- two injections of prostaglandin
- Select Synch
- Ovsynch
- CO-Synch
- Select Synch and Timed AI
- five-day CO-Synch + CIDR
- seven-day CO-Synch + CIDR
- adding the CIDR and timed AI to the prostaglandin and Select Synch systems

Lamb discussed the advantages and drawbacks for each system. For instance, in only using the prostaglandin injections, he pointed out that it only works in females that are cycling. "So it has lost some favor," he said. Lamb also said a drawback of the Select Synch and CO-Synch systems (which use GnRH followed by a prostaglandin injection) is that 10%-20% of females will show heat before the prostaglandin injection is given, so heat detection becomes important.

That said, Lamb showed research that indicates systems that use timed AI can have increased pregnancy rates. As one example, the CO-Synch system — in which a second dose of GnRH is given and cows are AI'd at the same time — had no difference in pregnancy rate compared to the Ovsynch system where the second GnRH injection was given and cows were bred 48 hours later.

"It's a no brainer to use the CO-Synch system so you don't have to run the cows through the chute 48 hours later," Lamb said.

In discussing the CIDR, Lamb said it can be a useful tool in the Select Synch and CO-Synch systems to prevent females from coming into heat early — as well as to kick-start non-cycling cows.

"Adding the CIDR increases pregnancy rates by about 11%," Lamb said. He also shared information from a large study that showed that heat detection alone will miss about 10%-12% of cycling cows. Thus, he suggested, "Heat detection followed by timed AI or clean-up timed AI is better than heat detection alone."

Lamb also compared the seven-day Co-Synch and five-day CO-Synch systems, each using the CIDR and timed AI. Lamb said there are pros and cons with each system. Presently, the seven-day system appears to be the most used, but he said more and more producers are embracing the five-day system.

"You have to run the cows through the chute twice in one day with the five-day

A commercial producer's experience with fixed-time AI

"All estrus synchronization systems work, but none has worked as well for us as fixed-time artificial insemination (AI). In terms of the cost, the results and my time input, it offers us the best solution," said Mike Kasten, 4M Ranch, Millersville, Mo.

Kasten shared his experience with synchronization and AI at the Applied Reproductive Strategies in Beef Cattle (ARSBC) Symposium in January. The workshop was hosted in conjunction with the 2010 Cattle Industry Annual Convention and NCBA Trade Show in San Antonio, Texas.

The number of times cows go through the chute seems to be a major sticking point for a lot of people in selecting a synchronization system, Kasten observed, so he started recording the actual time spent on each female. Cows make three trips through the chute, with a total of 10 minutes spent hands-on. Heifers make four trips through the chute, with a total of 11.2 minutes spent hands-on.

"Considering we get up to 80% success rate with the cows and 60% success rate with the heifers, that's a time investment I'm willing to make," Kasten said.

The timing of the system is both its biggest blessing and curse. Kasten said the biggest economic benefit is that they have achieved a 65-day calving season. However, the most



"You have to trust the system and stick to the protocol, especially knowing what we know now about how many females don't exhibit heat. We don't heat detect at all anymore," Mike Kasten said.

challenging aspect of the system is that you have to be 100% committed to the rigid time schedule. And you have to trust that it works.

"Don't get stupid and start ignoring the protocol," he advised.

"How many times have you heard someone say, 'We didn't see many of them in heat so we didn't want to waste the semen,'? I have news for you people: Do you really think you're going to get more females bred by leaving the semen in the tank rather than putting it to work? You have to trust the system and stick to the protocol, especially knowing what we know now about how many females don't exhibit heat. We don't heat detect at all anymore," he said.

Fixed-time AI is the best tool for a commercial cow-calf producer, Kasten said. "It gives you access to genetics that are pretty much guaranteed to improve your herd. There's real money to be made in premiums if you improve your genetics with AI."

There is wide variation in conception rates among AI bulls, even among the top-name bulls, he cautioned. "Be sure to ask your semen rep which bulls work in a fixed-time AI system. Then choose your EPD profiles from those suggestions."

— by Meghan Richey

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system,” he explained, but because cows are already separated from calves, it does not appear to pose too much concern for producers.

In concluding his presentation, Lamb said the bottom line is that several studies are showing very good pregnancy rates with timed AI (58%-63%). Results of the most recent CIDR-based studies indicate that for a timed-AI (TAI) protocol the five- or seven-day CO-Synch + CIDR protocols yield the most impressive pregnancy rates for a TAI protocol, whereas the Select Synch + CIDR and TAI treatment yields the best overall pregnancy rates.

As an additional point, Lamb talked about a tighter calving distribution by using synchronization systems, and he said he wanted to dispel the myth that the CO-Synch plus CIDR system delays estrus and changes calving distribution. “That is not true,” Lamb said, citing a recent study he completed that showed it does not delay estrus.

View Lamb’s Power Point presentation for a copy of the Protocol Sheet highlighting specifics for each of the recommended synchronization systems listed above.

— by *Kindra Gordon*

Nutrition and Reproduction

“Fertility and reproductive traits are lowly heritable, so we need to manage for them,” said Rick Funston. “You can do everything right with genetics in your program, but if you manage poorly you can change all that potential very rapidly.”

He shared a few tidbits for successful nutritional management of a cow herd:

- Body condition score (BCS) is important, but even more important is the females’ current weight trend. “I would much rather breed a thin cow on an increasing plane of nutrition than try to breed a fat cow on a declining plane of nutrition,” he said.
- When dietary protein falls below 7%, the cows can’t eat enough to meet their requirement so you have to supplement. However, excessive protein, either degraded intake protein (DIP) or undegraded intake protein (UIP), can also be a problem if total energy is inadequate. You need balanced protein and energy.
- A mineral supplement is best given

45 days before calving and again before weaning. Feeding ionophores offers real benefits to cows.

- Try feeding dried distillers’ grains (DDGs). “I’m convinced there’s something in DDGs that has a positive effect on fertility,” Funston said. “I don’t yet know what that something may be, but I truly believe there’s something there we haven’t learned yet.”

- Feeding fat is not a cure-all. “If your repro rates are poor to begin with, you probably have a better chance of seeing a beneficial difference from feeding fat than if your repro rates were acceptable,” he explained. “However, that beneficial effect still probably would not be anything more significant than would be experienced by feeding any supplement to cows in poor

condition. If you’re trying to decide if you should supplement fat, the bottom line should be its affordability and the current condition of your cows. If you have low repro rates and you can get fat cheap, go ahead and feed it. Otherwise you can probably skip it.”

— by *Meghan Richey*

