

Grasp the Fundamentals

Reproductive specialists share keys, tools to succeed with synchronized AI programs for heifers and bulls.

by *Lynsey Meharg, intern; & Troy Smith, field editor*

Advancements in estrous-synchronization protocols continue to raise the bar in successfully synchronizing estrus and getting more females to calve earlier in the breeding season. Fundamental to using the programs successfully is understanding the physiological factors affecting pregnancy rates to artificial insemination (AI), understanding the protocols themselves and implementing the protocols correctly. Speakers at the 2013 Applied Reproductive Strategies in Beef Cattle (ARSBC) Symposium hosted in Staunton, Va., Oct. 15-16, addressed those fundamentals Tuesday morning.

Physiological factors affecting AI pregnancy rates

When producers consult University of Missouri (MU) animal scientist Michael Smith about using synchronized AI for the first time, they commonly want to know what they might expect with regard to pregnancy rate. Smith said he explains that pregnancy rate depends on both estrous-detection rate and AI-conception rate, and many factors can affect each.

At the ARSBC Symposium, Smith discussed those factors, including

- ▶ management practices that increase the probability of success with synchronized AI;



▶ The first management consideration is to determine if heifers or cows are suitable candidates for synchronized AI, said Michael Smith, MU.

Reproductive Strategies

- ▶ the importance of the expression of estrus to establishment of pregnancy;
- ▶ physiological mechanisms that influence pregnancy rate following synchronized AI; and
- ▶ reasons why pregnancy rate may be lower than expected.

“The main thing I want to emphasize,” said Smith, “is when it comes to reproductive management, the things you do well will not compensate for the mistakes you make. Instead, the mistakes you make cancel out all the things you do well.”

Success with synchronized artificial insemination takes attention to detail, adherence to protocol.

Smith said the first management consideration is to determine if heifers or cows are suitable candidates for synchronized AI. Herds that have experienced poor pregnancy rates during recent years — in heifers or cows — probably aren’t ready. Neither can optimum results be expected among heifers that have received growth implants. Heifer candidates must have been developed to an appropriate target weight and a minimum of 50% of heifers should have reproductive tract scores of 4 or better.

Smith said mature cows should have had an appropriate body condition score (at least BCS 5; see www.cowbcs.info) at calving, as well as at breeding time. Producers must also allow for sufficient time postpartum before initiating a synchronization protocol.

Smith advised careful selection of a synchronization protocol appropriate for the producer’s goals. He said it is helpful for producers to have a basic understanding of how protocols work and emphasized the importance of implementing protocols precisely.

Care should also be taken in choosing AI sires, and semen should be obtained from a reputable source, he added.

“The success of any estrus-based artificial

insemination program requires detecting animals in standing estrus and inseminating them at the correct time relative to detection of estrus,” stated Smith. “Failing to detect estrus or errors in accurately detecting estrus can result in significant economic losses.”

Smith emphasized adherence to recommended times of insemination following heat detection or with timed AI. He noted that if insemination occurs too early, semen quality might be compromised before fertilization takes place. If performed too late, egg quality may have deteriorated. Both situations jeopardize success.

“Meeting expectations requires careful attention to details,” said Smith. “Understanding principles of why synchronization protocols work helps us see why we need to do it right. It can also help us troubleshoot when results aren’t as successful as expected.”

— by *Troy Smith*

Control of estrus and ovulation in heifers

When Dave Patterson, MU animal science professor, first began studying synchronization protocols for heifers, he was skeptical, he told cattlemen gathered for the ARSBC Symposium. However, after studying the subject extensively, he said he is now confident that the advantages offered are well worth the effort.

“What we know from large data sets gathered over the last 40 years is heifers that conceive earlier in their first breeding season typically stay in the herd longer and produce more pounds of beef over their productive lifetimes,” said Patterson. Estrous synchronization can be used to get more heifers pregnant during the first 21 days of the breeding season.

Patterson shared the current status of research on synchronization protocols for beef heifers, detailing the pros and cons of several MGA- and CIDR®-based protocols suggested by the Beef Reproduction Task Force (see Fig. 1). Significant progress has been made during the last 10-15 years, he said, moving away from systems that require heat detection toward opportunities for fixed-time

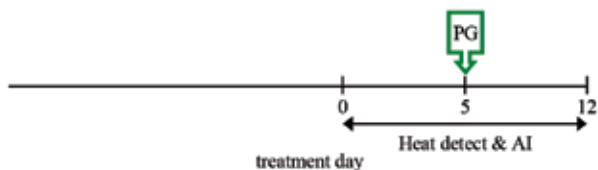
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Fig. 1: Estrous-synchronization protocols for heifers recommended by the Beef Reproduction Task Force for 2014

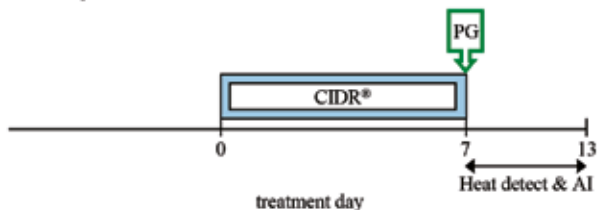
BEEF HEIFER PROTOCOLS - 2014

HEAT DETECTION

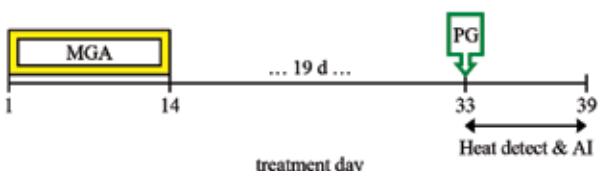
1 Shot PG



7-day CIDR®-PG



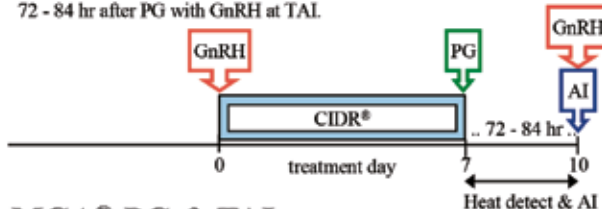
MGA®-PG



HEAT DETECT & TIME AI (TAI)

Select Synch + CIDR® & TAI

Heat detect and AI day 7 to 10 and TAI all non-responders 72 - 84 hr after PG with GnRH at TAI.



MGA®-PG & TAI

Heat detect and AI day 33 to 36 and TAI all non-responders 72 - 84 hrs after PG with GnRH at TAI.



14-day CIDR®-PG & TAI

Heat detect and AI day 30 to 33 and TAI all non-responders 72 hrs after PG with GnRH at TAI.

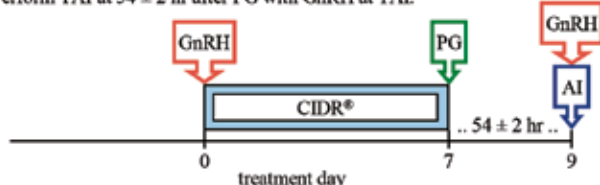


FIXED-TIME AI (TAI)*

Short-term Protocols

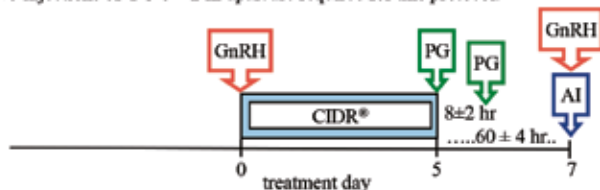
7-day CO-Synch + CIDR®

Perform TAI at 54 ± 2 hr after PG with GnRH at TAI.



5-day CO-Synch + CIDR®

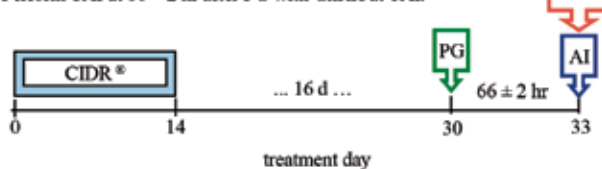
Perform TAI at 60 ± 4 hr after CIDR removal with GnRH at TAI. Two injections of PG 8 ± 2 hr apart are required for this protocol.



Long-term Protocols

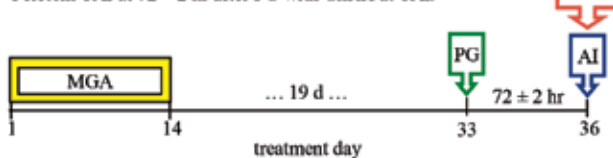
14-day CIDR®-PG

Perform TAI at 66 ± 2 hr after PG with GnRH at TAI.



MGA®-PG

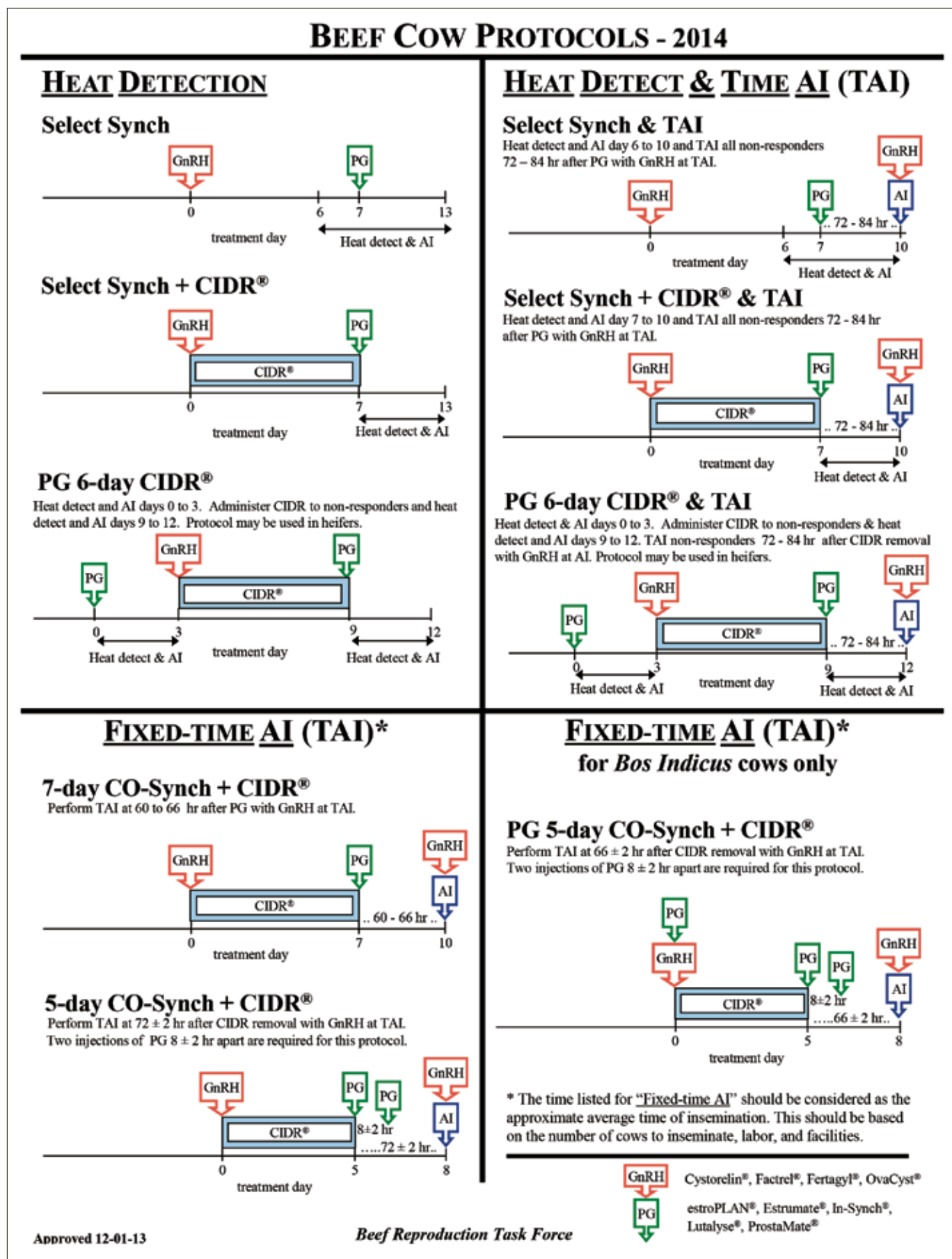
Perform TAI at 72 ± 2 hr after PG with GnRH at TAI.



* The times listed for "Fixed-time AI" should be considered as the approximate average time of insemination. This should be based on the number of heifers to inseminate, labor, and facilities.

- GnRH Cystorelin®, Factrel®, Fertagyl®, OvaCyst®
- PG estroPLAN®, Estrumate®, In-Synch®, Lutalyse®, ProstaMate®

Fig. 2: Estrous-synchronization protocols for cows recommended by the Beef Reproduction Task Force for 2014



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artificial insemination (AI). (His comparisons of the products are available in the proceedings, PowerPoint and audio posted with his presentation summary in the Newsroom at www.appliedreprostrategies.com/2013.)



▶“Heifers that conceive earlier in their first breeding season typically stay in the herd longer and produce more pounds of beef over their productive lifetimes,” said Dave Patterson, University of Missouri.

Fundamental to the success of any synchronization and AI protocol is proper heifer development prior to the first breeding season. Patterson called five key factors critical to the success of heifer-development programs:

- ▶ target weight;
- ▶ reproductive tract scores;
- ▶ pelvic measurements;
- ▶ estrous synchronization; and
- ▶ sire selection (considering birth weight and calving ease EPDs).

Prebreeding evaluations allow producers to evaluate how good of a job has been done in preparing heifers for their first breeding season, said Patterson. Prebreeding exams assess heifer weight, along with reproductive and skeletal development.

“In my opinion they’re very critical,” he said. “They’re not only ensuring success for one year, but furthering opportunities to see that producers actually continue utilizing synchronization and AI in subsequent years.”

Skeletal development, determined by pelvic measurements, plays a part in determining the level of calving difficulty a heifer will experience.

Reproductive development is assessed by evaluation of the reproductive tract and assigning a reproductive tract score (RTS) on a scale of 1 to 5, 1 being an infantile

reproductive system and 5 being a female that is cycling and, in the luteal phase, has a palpable corpus luteum (CL).

Patterson recommended gathering prebreeding RTS four to six weeks before breeding or two weeks before synchronization. Synchronization protocols shouldn’t be initiated until at least 50% of the heifers have an RTS of 4 or 5.

Over the course of the next several years, Patterson said, he believes more producers will begin pulling heifers from backgrounding lots to use as replacements. He cautioned producers about selecting females that have been previously implanted, citing the long-term effects of MGA-based protocols on females.

— by Lynsey Meharg

Control of estrus in cows

Cliff Lamb of the University of Florida addressed controlling estrus in mature cows, first explaining the differences in synchronization rate, conception rate and pregnancy rate. Synchronization rate, he explained, is the percentage of females detected in estrus compared to the number of females synchronized. Conception rate is the percent of females pregnant vs. the number inseminated, while pregnancy rate is the percent of females pregnant compared to the number synchronized.

Looking at pregnancy rates following breeding at a fixed time vs. breeding following heat detection, Lamb deduced that at a 65% conception rate, a producer would need to detect 90% of cows in heat to achieve satisfactory conception (see Fig. 3).



▶“If you’re not going to detect 90% or better of your cows in heat, you might as well go with a fixed-time AI system,” said Cliff Lamb, University of Florida.

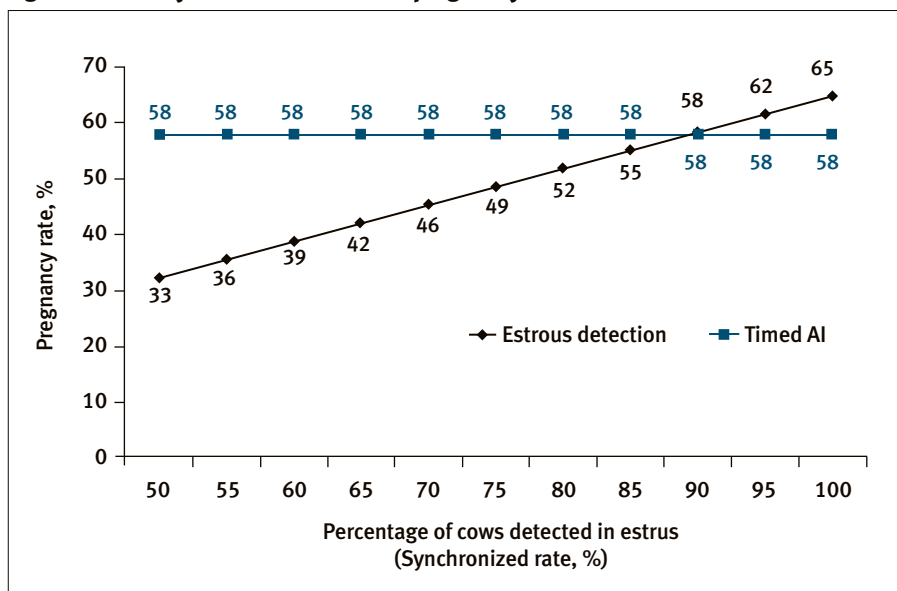
“If you’re not going to detect 90% or better of your cows in heat, you might as well go with a fixed-time AI system,” said Lamb. “You’re not going to get the same percentage of cows pregnant compared to all the cows you synchronized.”

For that reason, Lamb focused his discussion on the two synchronization protocols suggested by the Beef Reproduction Task Force for use with fixed-time AI:

- ▶ The 7-day CO-Synch + CIDR protocol involves administering a shot of gonadotropin-releasing hormone (GnRH) at the time of CIDR insertion on Day 0, administering a shot of prostaglandin (PGF) as the CIDRs are removed on Day 7, and administering

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Fig. 3: Effect of synchronization rate on pregnancy rates



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► Lamb introduced a smartphone app, the AI Cowculator, designed to help producers compare the cost of using AI vs. natural service.

another shot of GnRH 60-66 hours later as cows are bred on a fixed schedule.

► The 5-day Co-Synch + CIDR protocol involves administering GnRH at the time of CIDR insertion on Day 0, administering PGF as the CIDRs are pulled on Day 5 followed by another PGF shot 8±2 hours later and time-breeding with a GnRH shot at 72 hours.

Lamb suggested the 5-day and 7-day CO-Synch systems are examples of the trade-offs between results and convenience. Though these methods do require handling the cattle, Lamb cited the advantages and discouraged producers from pursuing other methods.

“Those are the two systems we would recommend for timed AI in beef cattle,” said Lamb. “If you hear of any others, just decide to go back to the protocol sheets and quit listening to those witch doctors.”

With the 5- and 7-day systems, results indicate the average conception rate was 58% with the 7-day and 61% for the 5-day. When using these methods, producers must decide whether the extra 3% is worth working the cattle through the chute more times.

To conclude his presentation, Lamb introduced a smartphone app (available in the Google Play Store or Apple iTunes) designed to help producers compare the cost of using AI vs. natural service. Known as the AI Cowculator, the application allows producers to estimate what it would cost to maintain a herd bull compared to what it would cost to AI each female.

— by Lynsey Meharg

Estrous Synchronization Planner

Selection and implementation of a program for synchronized AI is made easier with a tool called the Estrus Synchronization Planner (ESP), said Kansas State University animal scientist Sandy Johnson, who explained how the ESP is used.

According to Johnson, the Excel-based planning tool was developed by Iowa State University and includes a list of recommended synchronization protocols. The spreadsheet guides users through a process of selecting an appropriate protocol for the cows or heifers to be synchronized and the amount of heat detection desired.

When users enter the day and time they want to begin breeding, the planner calculates the precise day and hour that each protocol treatment should be administered and places the information on a printable calendar.

Johnson said up to three protocols can be compared in a cost analysis. Cost per AI pregnancy for the selected system is based on expected conception and estrous response rates.

“The planner can be downloaded, free, at no charge from the Iowa Beef Center website (www.iowabeefcenter.org/estrus_synch.html), where users can also find tips for downloading and saving a copy of the Estrus Synchronization Planner. Before you download the spreadsheet, it will ask for your contact information so users can be contacted by email when updates are made to the planner,” explained Johnson.

The ESP is also being developed for use with handheld devices, such as tablets and Android or iPhone devices. Look for the mobile app in iTunes and Google Play

Store or at www.beefrepro.info. According to Johnson, the mobile version will have the most critical features, but not all of those present in the full version.

— Troy Smith



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Editor's Note: Smith, Lamb, Patterson and Johnson spoke during Tuesday's ARSBC session focused on how management influences the success of AI programs. Visit the Newsroom at www.appliedreprostrategies.com/2013 to listen to their presentations and to view their PowerPoint slides, proceedings papers and supporting materials. Comprehensive coverage of the symposium is available online at www.appliedreprostrategies.com/2013. Compiled by the Angus Journal editorial team, the site is made possible through sponsorship by the Beef Reproduction Task Force.

System Cost Comparison:				23 = CO-Synch + CIDR with Fixed Time AI - 54	16 = Select Synchron + CIDR with E-AI and Cleanup AI	26 = MGA + PG with E-AI and Cleanup AI
Cost Analysis:	Units	Cost/Unit	Total Cost	Total Cost	Total Cost	Total Cost
PG Cost	100.00	\$2.50	\$250.00	\$250.00	\$250.00	\$250.00
GnRH Cost	200.00	\$2.00	\$500.00	\$500.00	\$91.00	\$91.00
MGA Supplement	0	\$0.300	\$0.00	\$0.00	\$280.00	\$280.00
CIDR Cost	100	\$10.50	\$1,050.00	\$1,050.00	\$0.00	\$0.00
Synchronization Cost Subtotal			\$1,800.00	\$1,800.00	\$621.00	\$621.00
Detect/Mgt Labor	43.8	\$10.00	\$438.21	\$595.73	\$500.00	\$500.00
Semen	100	\$25.00	\$2,500.00	\$2,500.00	\$2,500.00	\$2,500.00
Estrus Alert	100	\$1.14	\$114.00	\$114.00	\$114.00	\$114.00
			\$0.00	\$0.00	\$0.00	\$0.00
			\$0.00	\$0.00	\$0.00	\$0.00
AI Cost Subtotal			\$3,052.21	\$3,179.73	\$3,120.00	\$3,120.00
Total Cost (not including feed & yardage)			\$4,872.21	\$4,830.73	\$3,741.00	\$3,741.00
Cost / Female Synchronized			\$48.72	\$48.31	\$37.41	\$37.41
Drylot Costs:**						
Days in Drylot			0	0	26	26
Forage (units = lbs)	0	\$0.040	\$0.00	\$0.00	\$0.00	\$2,880.00
Grain (units = lbs)	0	\$0.060	\$0.00	\$0.00	\$0.00	\$864.00
Yardage (units = full-days)	0	\$0.250	\$0.00	\$0.00	\$0.00	\$900.00
Other Supplement (units = lbs)	0	\$0.150	\$0.00	\$0.00	\$0.00	\$135.00
Feed & Yardage Cost Subtotal			\$0.00	\$0.00	\$0.00	\$4,779.00

► Johnson said up to three protocols can be compared in a cost analysis. Cost per AI pregnancy for the selected system is based on expected conception and estrous response rates.