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Multi-state Beef Reproduction Task Force provides science-based recommendations for the application of reproductive technologies

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ABSTRACT: Since its formation, the Beef Reproduction Task Force (BRTF) has worked to enhance productivity and profitability of US beef herds by integrating research and extension efforts with the intent of more effectively transferring the use of reproductive technologies to the field. A key early step was to coordinate efforts in identifying effective breeding management protocols for beef cattle and to clarify their associated acronyms. A short list of recommended protocols and their acronyms for synchronization of estrus and ovulation in beef cattle was developed based on results from peer-reviewed, published research and a comprehensive review of data collected from the field. The list of recommended protocols was developed by the BRTF in cooperation with veterinarians and cattle AI industries. These protocols and their acronyms are presented uniformly in all of the major AI sire directories and are available online at <http://www.beefrepro.info>. Protocol updates are made annually to incorporate the most recent research findings related to estrous cycle control in beef cattle. The Estrus Synchronization Planner, a software program developed in cooperation with the Iowa Beef Center, now reflects these same recommendations.

Beginning in 2002, the BRTF hosted and presented 11 educational workshops to more than 1,900 attendees in key cow-calf states. These Applied Reproductive Strategies in Beef Cattle workshops targeted beef producers, AI industry personnel, veterinarians, allied industry representatives, and academicians. A national media sponsor provided online coverage of the last 3 workshops at <http://www.appliedreprostrategies.com>. A postmeeting evaluation, developed to assess application of information from 2 recent workshops, was returned by 55% of those contacted (n = 150). Attendees averaged 16 (± 13.4 SD) yr of AI experience, and 80% of respondents represented more than 100 cows. Respondents were asked to estimate the value of AI-sired calves compared with natural-service-sired calves to their operation on a per-animal-marketed basis, and 17 and 31% responded \$50 to \$100 per animal and more than \$100 per animal, respectively. As a result of what was learned at these conferences, 78% of respondents were better able to troubleshoot management-related issues, 60% made alterations to a protocol they had been using, and 35% of the respondents indicated they changed to a different estrus synchronization protocol.

Key words: artificial insemination, beef cattle, estrus synchronization, extension

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SITUATION

Implementation of AI in US beef herds has greatly lagged behind that of the dairy industry. In the NAHMS (2009) survey, 7.2% of all operations reported

use of AI, which was similar to 7.1% of operations in NAHMS (1997). Estimates of AI use in the 1993 Cow/Calf Health and Productivity Audit were 5.4% of cows and 3% of heifers (NAHMS, 1994). The reason cited most frequently by beef producers for failing to adopt AI in their herds was a lack of time and labor (NAHMS, 1998). Protocols that reduce or eliminate the need for detection of estrus are generally believed to be needed to encourage more producers to use AI.

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The degree of control of estrus and ovulation required for effective fixed-time AI was lacking in earlier estrus synchronization attempts that only regulated luteal function (Patterson et al., 1989; Odde, 1990). Development of a means to manipulate follicular development improved the precision of estrous cycle control (Twagiramungu et al., 1995) and resulting pregnancy rates to fixed-timed AI (Patterson et al., 2003; Johnson, 2005). Once this potential was recognized, a renewed interest in estrus synchronization research that controlled both luteal and follicular function was initiated. The beef industry was eager to incorporate this research and began to evaluate new protocols as they were developed. The rapid development of new protocols to synchronize estrus and ovulation and their associated acronyms created confusion among users. A new strategy was developed that included the formation of an organization and the selection of information for delivery of current research results to relevant audiences.

INPUTS

A multistate group of beef and dairy extension faculty at Land Grant institutions began to discuss joint programming efforts centered on control of the estrous cycle and expanded use of AI. The group organized as a result of common research interests related to synchronization of estrus and ovulation in cattle and their mutual extension appointments. After the first meeting in 2000, a workshop titled "Synchronization Strategies in Cattle" was held in Michigan and was targeted at veterinarians working with large commercial dairies. Differences between production systems involving beef and dairy cattle and their associated target audiences subsequently led the 2 groups to each focus on their respective industries.

The first organized symposium focused on beef cattle, titled "Applied Reproductive Strategies in Beef Cattle" (**ARSBC**), was held in Manhattan, Kansas, in 2002. Since that time, 10 additional symposia have been held in key cow-calf regions of the United States. The Beef Reproduction Task Force (**BRTF**) formed to coordinate efforts in identifying effective breeding management protocols for beef cattle and the delivery of extension programming focused on reproductive management. Members of the task force in 2010 were R. N. Funston, J. B. Hall, S. K. Johnson, G. C. Lamb, D. J. Patterson, and G. A. Perry.

Recognizing the apparent need for expanded industry partnerships in successfully transferring reproductive technologies to the field, the BRTF solicited support that subsequently led to the formation of a broad-based industry group. The BRTF invited representatives from the veterinary community and AI and pharmaceutical industries to meet as a group after the 2004 ARSBC symposium in North Platte, NE. The outcome of that meeting resulted in the formation of a national Beef Reproduction Leadership Team.

At that time a common mission was established by the group: "To optimize the productivity and improve the profitability of cow-calf operations by facilitating the adoption of cost-effective, applied reproductive technologies." The goals of the Beef Reproduction Leadership Team are to 1) promote wider adoption of reproductive technologies among cow-calf producers; 2) educate cow-calf producers in management considerations that will increase the likelihood of successful AI breeding; and 3) educate producers in marketing options to capture benefits that result from use of improved reproductive technologies. These goals provide a roadmap to educational programming for the Beef Reproduction Task Force. The Beef Reproduction Leadership Team is committed to educating beef cattle producers on sustainable reproductive management systems to maintain US leadership and competitiveness in the world beef market.

OUTPUTS

Applied Reproductive Strategies in Beef Cattle Workshops were held over the past 9 yr at the following locations: Manhattan, KS (2002); North Platte, NE (2004); Lexington, KY, College Station, TX, Reno, NV (2005); St. Joseph, MO, Rapid City, SD (2006); Billings, MT (2007); Fort Collins, CO (2008); San Antonio, TX, Nashville, TN (2010). Registered attendance at these symposia totaled more than 1,900 participants with an average composition of 22% veterinarians, 34% producers, 14% AI industry, 13% academia, 9% students, and 2% animal health industry. Audience makeup has varied widely; the Manhattan, KS, location consisted of 79% veterinarians and the San Antonio, TX, location had 82% producers, based on information provided in evaluations on the day of the program. Local university faculty members (animal science and veterinary schools) at each host site and National Cattlemen's Beef Association personnel were partners in planning and hosting the symposia. Symposia typically lasted 12 to 16 h, with 16 to 18 different speakers and 1 or 2 panel discussions. Each had segments related to estrus management and influences of management and nutrition on reproduction. Most had a segment related to semen quality and male influences on fertility. A fourth segment was generally tailored to the meeting location to address regional reproductive challenges such as endophyte-infected fescue, or *Bos indicus* breeding and or timely topics. Financial support for the symposia included a grant from Cooperative State Research Education and Extension Service (2002 only), registration fees, and industry sponsorship. National Association of Animal Breeders members and a core group of industry sponsors consistently provided financial support for the meetings.

A major output of the newly formed groups (BRTF and the Beef Reproduction Leadership Team) was the development of standardized nomenclature for the vari-

ous estrus synchronization protocols. Collectively, the groups established a short list of recommended protocols for beef heifers and cows based on results from peer-reviewed, published research and a comprehensive review of data collected from the field. These recommendations now appear uniformly in sire directories of the major AI companies and online at <http://www.beefrepro.info>. Protocol recommendations are updated annually based on the most current research findings related to estrous cycle control in beef cattle. Protocols included on this short list represent those that minimize the need for animal handling (preferably 3 times or fewer, including AI) and use of pharmaceutical agents while optimizing reproductive success. Protocols are evaluated on the basis of their efficacy when administered to mixed groups of estrous cycling and noncycling females (with 1 exception, the 1-shot PG protocol, which is only effective in estrous cycling females). The list of recommended protocols for beef heifers and cows was each divided into 3 categories, including heat detection, heat detection and timed AI, and fixed-timed AI. Each category contains 2 to 3 protocols as recommended options. These protocol guidelines are intended to minimize confusion, simplify protocol selection, aid in successful implementation, and improve success with estrus synchronization and AI. Additionally, the Beef Reproduction Task Force established a defined list of criteria in 2009 for adding or eliminating protocols, which requires a majority vote of the entire Beef Reproduction Leadership Team. A proposed new protocol will replace a current protocol if sufficient comparative research data exist to indicate that the protocol does 1 or more of the following: 1) increases fertility; 2) reduces the number of animal handlings without compromising fertility; or 3) reduces cost of the protocol without compromising fertility. A protocol may be removed if sufficient evidence is presented to the entire Beef Reproduction Leadership Team that the protocol either does not meet the criteria for consideration for addition or elimination or is to be replaced by a new protocol.

The Iowa State University Beef Center partners with the BRTF by incorporating the list of recommended protocols into the Estrus Synchronization Planner, a spreadsheet tool that provides scheduling and cost estimates for a variety of estrus synchronization protocols.

Users can update default cost settings to reflect appropriate values for their operation. Since 2006, workshop attendees have received a copy of the planner as part of their registration fee. As of January 2011, the software became available as a free download from the Iowa Beef Center web page, http://www.iowabeefcenter.org/estrus_synch.html, with the cost defrayed by program sponsors. In the first 10 d the spreadsheet became available, more than 450 copies were downloaded.

A national media sponsor, Angus Productions Inc. (St. Joseph, MO), provided online coverage of the last 3 ARSBC symposia at <http://www.appliedreprostrategies.com>. From April to October of 2010, the website averaged 1,232 visitors and 3,457 visits per month that on average last 11 min and 42 s. This site contains summaries of each meeting presentation, recorded audio from each presentation, proceedings papers, and PowerPoint slides when available. The meeting summaries have been used by print and online media outlets.

IMPACT

A postmeeting evaluation tool was developed using recommendations from Dillman (2007) with the main objective of determining if any actual changes were made in management based on information gained at meetings. A total of 150 evaluations were mailed to attendees with valid addresses for the Fort Collins, CO, and San Antonio, TX, symposia with a 55.3% response rate ($n = 43$, Fort Collins, CO; $n = 40$, San Antonio, TX). Data presented represent a proportion of those responding to individual questions. The average years of AI experience among respondents was 16.1 (± 13.4 SD) yr with 15% having no previous AI experience. One respondent had 52 yr of experience, and 34% had more than 20 yr of experience.

Respondents were asked to indicate how many cattle they represented in categories of 1 to 49, 50 to 99, 100 to 249, 250 to 499, 500 to 999, and more than 1,000 animals and resulted in 11, 9, 21, 22, 16, and 21% in each category, respectively. This is in contrast to the distribution of herd sizes from all US beef cow-calf producers in which 79% of operations have fewer than 50 head of cattle (USDA, National Agricultural Statistics Service, 2007). Adoption of AI in herds of 200 head or greater was 19.8% according to NAHMS (2009), whereas use

Table 1. Proportion of respondents increasing, decreasing, or not changing various practices or responses as a result of what was learned at Applied Reproductive Strategies in Beef Cattle symposia in Fort Collins, CO, and San Antonio, TX

Item	Responses, n	Increase, %	Decrease, %	No change, %	Don't know, %
No. of cows artificially inseminated	81	31	1	68	0
No. of heifers artificially inseminated	80	36	0	64	0
Use of single fixed-time AI	80	40	3	58	0
Pregnancy rate to AI	79	28	3	42	28
Herd reproductive performance	80	44	0	38	19
Overall confidence in AI program	80	71	1	24	4

Table 2. Proportion of responses to the question “As a result of attending this meeting, did you change any of the following?” from respondents attending Applied Reproductive Strategies in Beef Cattle symposia in Fort Collins, CO, and San Antonio, TX

Item	Responses, n	Yes, %	No, %	Unsure, %
Transportation timing of females after AI	80	40	54	6
Precalving nutrition	82	40	57	2
Prebreeding nutrition	82	56	41	2
Management of herd health	81	41	57	2
Breeding season length	81	38	56	6
Marketing of AI-sired calves	76	28	64	8
Frequency of breeding soundness exams on bulls	81	17	78	5

of AI in herd sizes of 1 to 49 or 50 to 99 was 5.6 and 8.4%, respectively.

Mean response on a scale of 1 (learned nothing) to 5 (learned a lot) was 4.0 ± 0.84 when asked, “Overall, how much did you learn at the meeting?” Seventy-four percent of the respondents answered 4 or 5. Response to the question, “In general, to what extent have you been able to apply what you learned to your operation?” indicated application of information was somewhat less, averaging 3.6 ± 1.01 on a scale of 1 (no application) to 5 (highly applicable), with 58% replying 4 or greater.

As a result of what attendees indicated was learned at the conference, 35% of the respondents indicated they changed to a different estrus synchronization protocol, 60% of respondents made alterations to a protocol they had been using, and 78% of respondents were better able to troubleshoot management-related issues. The Estrus Synchronization Planner was used by 34% of the respondents, of which a majority (89%) indicated the application of estrus synchronization protocols was made easier after using the software. Average years of AI experience was 20 yr for those that used the software and 14 yr for those that had not.

Table 1 indicates the manner in which respondents implemented change in their breeding programs as a result of what was learned at the conference. The largest response category (71%) among respondents was an increase in overall confidence in their AI programs. An increase in herd reproductive performance was indicated by 44% of the respondents, and use of fixed-timed AI was increased by 40% of respondents. Numbers of cows and heifers inseminated was increased by 31 and 36%, respectively. The greater “don’t know” response category in the pregnancy rate to AI and herd reproductive performance may be partially attributed to the fact that the evaluation was distributed only 5 mo after the San Antonio, TX, symposium, perhaps not allowing enough time for those respondents to complete these assessments.

Respondents were also asked to indicate which management techniques were changed as a result of attending the symposium (Table 2). The most common response was a change in prebreeding nutrition made by 56% of the respondents. Change in frequency of breeding soundness exams was recorded as changed by the

fewest respondents. The current use of breeding soundness exams among respondents is not known.

The respondents were asked to estimate the value of AI-sired calves over natural service-sired calves on a per-animal-marketed basis to their operation from one of the following response categories: no value, \$1 to \$5 per animal, \$5 to \$10 per animal, \$10 to \$20 per animal, \$21 to \$50 per animal, \$50 to \$100 per animal, and more than \$100 per animal. A “no value” response was made in 14% of evaluations and 3, 1, 11, 24, 17, and 31% in each of the previously mentioned categories, respectively. Of those that indicated “no value” for AI calves in their operation, 60% also answered zero to years of AI experience, and one specifically noted “no value yet.” A “no value” response may have also been given by those performing commercial AI services and not marketing AI-sired calves on their own.

IMPLICATIONS

The Beef Reproduction Task Force is an effective multistate partnership focused on the transfer of peer-reviewed scientific research related to reproductive technologies involved with breeding programs in beef cattle. Programming efforts by the BRTF are focused on veterinarians, AI industry personnel, beef producers, allied industry, and academia. Uniform presentation of breeding protocols from semen companies, extension specialists, media outlets, and allied industry now provide a clear message to users of the information. The BRTF has found this team approach to be a successful programming mechanism that has been enriched by the industry involvement. Over 70% of postmeeting evaluation respondents indicated that confidence in their AI program increased as a result of attending an Applied Reproductive Strategies in Beef Cattle symposium and 40% increased use of fixed-time AI.

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