Mississippi State University

Animal and Dairy Sciences

Department Report • 2010

MISSISSIPPI STATE UNIVERSITY
College of Agriculture and Life Sciences

MISSISSIPPI STATE UNIVERSITY
EXTENSION SERVICE

MISSISSIPPI MAFES AGRICULTURAL & FORESTRY EXPERIMENT STATION

Editors: J. A. Parish, T. B. Schmidt, and S. Hill Ward

Division of Agriculture, Forestry and Veterinary Medicine
Mississippi State University
October 2010

October 1, 2010

To Our Producers, Industry Leaders, Friends of the Department, and Others:

This year the faculty in the department of Animal and Dairy Sciences want to share some of their teaching, research, and extension program summaries with you. This report is also available on the departmental web site at www.ads.msstate.edu. We hope you will visit our website to learn more about the Department of Animal and Dairy Sciences at Mississippi State University.

Our faculty are committed to serving the citizens of this state through teaching, research and extension programs. Research and extension centers are located strategically throughout the state. Animal research facilities at the Leveck Animal Research Center, Bearden Dairy Cattle Research Center, Prairie Research Unit, Brown Loam Research Station, and the White Sands Unit give faculty opportunities to investigate the challenges facing the livestock industry.

We have many new faculty members in the department who cover a wide array of disciplines and commodity interest. You are cordially invited to visit the ADS department anytime and, of course, we hope you will take advantage of the educational programs that are presented on campus and at our outlying units.

We are pleased to provide this report and hope that it will be useful to you. Please feel free to contact individual faculty members if you have questions or desire more information.

Sincerely,

Terry E. Kiser, Ph.D.
Professor and Head

Jlp

Courses and Curricula Update from Animal and Dairy Sciences

C. E. Huntington
Department of Animal and Dairy Sciences, Mississippi State University, MS 39762

Teaching Summary

Our undergraduate student body continues to grow steadily year after year with record enrollment of 260 students for Fall 2010. Freshmen alone make up 30% of our department. Additionally, we have 8 would-be seniors that qualified for the 3+1 program and are currently first year College of Veterinary Medicine students. They will be graduating from ADS with the spring 2011 class. In terms of the distribution, 77% are female and 23% male.

The department is proud to offer 4 main concentrations within the Animal and Dairy Sciences major: Equine Science and Production, Meat Animal Science and Production, Dairy Science and Production, and Science/Veterinary Science. Seven percent of our student body is enrolled in the equine concentration, 6% in the meat animal concentration, 86% in the science/veterinary science concentration and the remaining 1% are undecided within the major. Our student body is among the best and brightest with ACT scores that are always among the highest of all the College of Agriculture and Life Sciences departments.

In an effort to continue to meet the changing face of our students, our faculty has offered some new courses to our students. Our faculty has developed two new courses: Advanced Dairy Farm Management and Advanced Beef Cattle Production. We are also in the process of making modifications to current courses such as Meats Processing and Performance Analysis of Meat Animals. We are also hopeful that we will soon be able to offer a fifth concentration called Meat Science and Technology. This concentration will prepare students to be competitive within the Meat/Muscle Foods industry. It would include new courses such as Intro to Muscle Foods and Advanced Science of Muscle Foods. The field of Meat/Muscle Foods is a very diverse field that requires students to have an understanding of chemistry, biochemistry, live animal nutrition, animal physiology, livestock production, conversation of muscle to meat, food safety, food preservation, food chemistry, and food product development. As such, we feel that it is vital that we develop a concentration that will address these issues. We are also in the works preparing courses for our freshmen and sophomore students that will be designed to help them be aware of all the various careers available to a graduate from the Animal and Dairy Sciences department.

Departmental Scholarships

A. M. Leed
Department of Animal and Dairy Sciences, Mississippi State University, Mississippi State, MS 39762

Summary

The Department of Animal and Dairy Sciences has always had the rich tradition of presenting scholarships to a large number of worthy students. Scholarships awarded for the 2010-2011 academic year were no exception due to generous alumni and former faculty members. Incoming and current students submitted applications which were reviewed and scholarships were awarded at the Animal and Dairy Sciences' Spring Banquet.

Introduction

Scholarship applicants answered a variety of questions about interests, activities, goals and academic performance. The various scholarships the department offered have a variety of specifications, so the scholarship committee worked hard to match the scholarship with the most deserving student. The majority of scholarships were awarded to current undergraduate students, but several were presented to incoming students and graduate students. This year two new scholarships were introduced, the Dr. Bob Rogers Endowed Scholarship for students interested in meat animals and the Miles Carpenter/Bill McGee Endowed Scholarship for Mississippi residents with an interest in dairy production.

Procedures

Both incoming students and current students were eligible to apply for departmental scholarships. Application forms, located on the departmental website, were completed by students and submitted either electronically or by hard copy to the scholarship chairperson. Scholarship applications were due March 15, after that date the scholarship committee, composed of departmental faculty, reviewed and evaluated the applications. Recipients were announced at the Animal and Dairy Sciences' Spring Banquet.

Results

The department awarded over $25,000 in scholarship money to both undergraduate and graduate students. Twenty-four undergraduate scholarships and one graduate scholarship were awarded. The following list is the scholarships awarded and recipients:

- *Bryan and Nona Baker Endowed Scholarship* - Jenny Bibb
- *Bedenbaugh Scholarship* – Emerald Barrett
- R*ev. and Mrs. William Page Brown Memorial Scholarship* – Courtney Brown

- *Miles Carpenter /Bill McGee Endowed Scholarship* – Courtney Law
- *Billy Gene Dig Memorial Scholarship* – Morgan Robertson
- *Janice McCool Durff and Alma McCool Liles Scholarship* – JB Farrell, Patrick First,Taylor King, Lacey Priest, Molly Rafaely, Sara Steen, Lori Ward and Caitlin Wenzel
- *Werner and Alice Essig Endowed Scholarship* – Amanda Frahm
- *Fuquay Endowed Scholarship* – Kayla Williams
- *Henry H. Leveck Memorial Scholarship* – Angel Henderson, Charles Huckaby and Samantha Lesniewski
- *Glenn McCullough Scholarship* – Colby Powell
- Rodney Moore Scholarship – Matt Woolfolk
- *Enoch Norton Endowed Scholarship* – Mary Tippy Adams and Jordan Craig
- *Dr. Bob Rogers Endowed Scholarship* – Charley Huckaby and Matt Woolfolk
- *O.W. Scott Scholarship* – Ashleigh Thomas.

2010 Scholarship Award Winners. Pictured left to right (back row): Kayla Williams, Patrick First, Jordan Craig, Charles Huckaby, Matt Woolfolk, Morgan Robertson, Ashleigh Thomas, (front row) Lori Ward, Jenny Bibb, Angel Henderson, Courtney Brown, Samantha Lesniewski, Lacey Priest.

Implications

Scholarships provide deserving students the funds necessary to pay tuition, purchase books and help defray living expenses. As the cost of education continues to rise, scholarships play a critical role in paying for higher education. Also, scholarships offer a way to compensate students for their hard work in the classroom and their involvement on campus.

Animal and Dairy Sciences Student Competitions

S. Hill Ward and B. J. Rude
Department of Animal and Dairy Sciences, Mississippi State University, Mississippi State, MS 39762

Teaching Summary

Many ADS students have the opportunity to participate in different collegiate level competitions. Two of those are the Dairy Challenge and the Academic Quadrathalon. This year, ADS had teams in both competitions which performed very well. At the national Dairy Challenge competition, the students from MSU received a Gold placing (1st=platinum, 2nd=Gold, 3rd= Silver). This competition was held in Visalia, CA on four local dairies. At the Southern Region Academic Quadrathlon, the team placed third overall. This was in conjunction with the Southern Section meeting of the American Society of Animal Science in Orlando, Florida.

Introduction

North American Intercollegiate Dairy Challenge

The North American Intercollegiate Dairy Competition (NAIDC) brings together students, professors, dairymen, veterinarians, and feed, reproductive, and health industry stakeholders from across the United States. The NAIDC first started in 2002 at Michigan State University where 14 schools from across the U.S. participated. The following year a regional competition was added in the Northeast and since then the Midwest, Western, and Southern regional competitions have been added. To demonstrate the growth and effectiveness of this competition, more than 14 schools participated in just the Southern Regional DC this past November (NAIDC, 2008). Mississippi State was among those schools for the first time.

The NAIDC is a two- day competition where students apply the theories and knowledge they have learned as undergraduates in Animal and Dairy Science programs to a real dairy business, all while working as a cohesive team. On day one of the competition, students receive data on production and farm management from a real dairy business. Working as a four person team, students tour the dairy operation and begin to compile recommendations on nutrition, reproduction, milking management, waste management, labor, facilities, and financial management. After the tour of the dairy facility, teams are given the opportunity to develop a presentation for the farm staff and a panel of judges. The first day of the competition then concludes with an informal dinner with sponsors which include industry representatives, scientists from other Universities, financial stakeholders, etc. On day two of the competition, teams present their recommendations to a panel of judges and are evaluated based on merit of their suggestions but also presentation style and accuracy. Day two then concludes with an awards banquet and dinner where again students are afforded a networking opportunity unlike any other.

Academic Quadrathalon

The Academic Quadrathlon is a team competition among the various Animal Science programs across the country. This event consists of three phases. The first phase is the "on-campus" competition. For this, each college or university desiring to send a (only one) team to the regional competition has a local competition that mimics the regional and national competition. The team that wins this on-campus competition is then invited to compete at the next phase. The second phase is the regional competition. At the event, teams form colleges and universities within each of four regions send teams to compete against each other. The team that wins this event is then invited to the third, or final, phase. The final phase is the national competition. At this competition the four teams that won the regional events compete against each other for the National Winner.

Each "event" consists of teams of four students that participate in four tests. The four tests are 1) Laboratory Practical; 2) Written Test; 3) Oral Presentation; 4) Quiz Bowl. Each of the four tests are equally weighed; however, in the event of a tie, the team that placed better in the quiz bowl is placed higher. The testing focuses on animal production; however, anything that can be involved with Animal Science is "fair game" to be included in each of these tests. This includes Poultry Science, Aquaculture, and even Zoo/Exotic Animal Science information. The on-campus competition can be designed how the individual college or university may desire. The regional and national competitions are usually conducted during a two day event, with the Laboratory Practicum and Written exams being conducted at close "Land Grant University" in order to utilize facilities, animals and equipment. The second day consists of teams giving Oral Presentations and then competing in a double elimination Quiz Bowl.

Procedures

NAIDC Preparation

For both the southern regional and national Dairy Challenge competitions, training is similar. Students meet after classes and on weekends to spend time studying dairy records (PC Dart or DairyComp), financial statements, reproductive measures, facility design, and nutritional benchmarks. These are just a few of the topics these teams will encounter when evaluating the farm and communicating suggestions to producers.

On the weekends, students will spend time with the coaches (Dr. Hill and Dr. Larson) at the Bearden Dairy Research Center and when money and time allow visit local commercial dairies. While on the farm, students learn what types of practical signs to look for when evaluating rations, housing, waste systems, and overall management of the operation.

Finally, students also spend several hours learning how to collate their thoughts into a power point presentation, the keys to effective communication of their suggestions, and practice answering questions from a panel of judges.

Academic Quadrathalon Preparation

Preparation for the Academic Quadrathlon essentially starts when students begin coursework in the Animal Sciences. This competition is designed to be student oriented event, and as such, faculty are not involved in selecting members of teams, nor are they to function as coaches. A faculty "advisor" travels with the team, but coaching or directing preparation of teams

by faculty is prohibited. Teams can request faculty to assist them by illustrating how to do certain procedures, or describe specific processes, but the students are to make the request. As such, the amount of preparation for the on-campus event varies with individual teams. However, the team that is invited to the regional competition usually studies notes and books for courses, visits production units on campus, and assists with laboratory procedures to prepare for the regional competition. The on-campus competition is a good preparation tool for the team to isolate specific strengths and deficiencies in their knowledge or abilities.

Results and Implications

NAIDC

This past year, students from ADS competed at both the Southern regional competition held in Russellville, KY and at the national competition held in Visalia, CA. At the southern regionals, team member placings were 2 platinum, 3 gold, and 1 silver. At the national competition, the ADS team received a Gold place for their evaluation of Hollywood Dairy.

2010 National Dairy Challenge Team. Pictured L to R are: Andrew Nelson, Stephanie Hill Ward (Coach), Samantha Vitale, Elaine Suever, and Angel Henderson.

There are two primary advantages to competitions like the NAIDC. First, students take the principles they have learned in and around the classroom and apply them to a real world situation. The classroom is a great place for learning, but has limitations when instructors are trying to teach applied sciences. Fortunately, at MSU we have an outstanding dairy herd and facility to supplement classroom learning. But, with the NAIDC, students get to travel to several farms in preparation for the competition and during the competition itself and thus expand their breadth of knowledge of the dairy industry. Students then bring that knowledge back to Mississippi and are able to adapt and apply what they have learned to benefit our dairy producers.

The second advantage is that these students arrive as individuals and leave as team members. With an expanding dairy industry, many producers and co-ops are beginning to form management teams. These teams often consist of a nutritionist, reproductive consultant, financial planner, farm manager, waste management specialist, and a veterinarian. With this change in management style, producing students who find teamwork commonplace is a necessity. Teamwork is a skill learned and practiced at the Dairy Challenge (Weber-Nielsen, et. al, 2003).

Academic Quadrathalon

In 2010, the regional event was held in Orlando, Florida. The Laboratory Practicum and Written Exam were hosted by the University of Florida in Gainesville. As usual, the competition among the teams was great. However, Mississippi State's team won 3rd place overall. Mississippi State has been participating in this competition for 11 years, and is always competitive, but only

twice now, has the team placed in the top three, in 2005, and this past year.

2010 Academic Quadrathalon Team. Picured L to R are: Garret Steede, Steven Davison, Brian Rude (coach), Smantha Lesniewski, and Becky Telle.

While team performance is not a good indicator of the education program at individual institutions, placing third is something that the university should be very proud of. It clearly illustrates that there are great quality students in the program, and the education experience they receive supports and enhances these students abilities. These students are definitely competitive when they apply for positions that are in line with their career goals.

Students who participate in any of the phases of this competition have unanimously stated that they had fun while participating, but that they also learned a tremendous amount. While this is a "competition" it is designed to be a learning environment. In addition to learning in an enjoyable atmosphere, students get to see other institutions facilities, meet and network with faculty and students from other universities. While there is a monetary investment by the department to continue to support this competition, the return for this investment is well above the amount required to continue participation.

References

North American Intercollegiate Dairy Challenge (NAIDC). 2008. http://www.dairychallenge.org

Weber-Nielsen, M., J. J. Domecq, L. E. Davis, D. K. Beede, M. Budine, and F. Martsolf. 2003. A partnership of universities and agri-business for an effective dairy herd management learning experience for undergraduates: The dairy challenge. J. Dairy Sci. 86:1029-1035.

Mississippi State University Block and Bridle Club

A. M. Leed
Department of Animal and Dairy Sciences, Mississippi State University, Mississippi State, MS

Teaching Summary

During the 2009-2010 academic year the Mississippi State University chapter of the Block and Bridle Club was very visible on campus through various service events, fundraisers and social activities. The club conducted business meetings every first, third and fifth Wednesday of the month. In November, at the Chapel of Memories on the MSU campus, the club formally initiated thirty-two new members into the club. These new members completed all the pledge requirements during the fall semester and were comprised of students from a variety of both agricultural and non-agricultural majors.

Introduction

The Block and Bridle Club is one of many clubs that is sponsored and advised through the Department of Animal and Dairy Sciences. Block and Bridle is a national organization consisting of students who are interested in agriculture and building friendships through livestock, social and community service events. Throughout the United States there are more than 90 chapters of Block and Bridle located at both two and four year institutions, every year chapters gather for the National Block and Bridle Convention. Similar to many Block and Bridle chapters, at Mississippi State interested new members complete a series of requirements before they become full members of the club during initiation.

2009-2010 Club Activities

During the month of June the club maintained their presence on campus by attending all the freshman and transfer student orientation fairs. Here members staffed the club display, interacted with incoming students and parents and recuirted new members. Once classes started for the fall the Block and Bridle Club presented a brief overview of the club and recuirted more potentional members to the club at the annual departmental welcome back picinic. The first official club acitivitiy was the welcome back fish fry held in conjuction with the first business meeting of the year. This event was designed to welcome back returning members and interact with potential new members. After that first meeting the club began working on halter breaking and preparing calves for the annual Little "I" showmanship show. Despite very muddy halter breaking conditions, club members accomplished halter breaking their calves and exhibted them on November 7 at the Mississippi Horse Park. Family, friends and faculty members attended the event to watch students show in either the professional or novice division. Awards were also presented to those who went the "extra mile" while working with their calf.

Service Activities

The Block and Bridle Club prides itself on being a service organization and particapted in several service activitives through the year. The club hosted two bake sales on campus where club members prepared tasty treats to sell to hungry students and staff. The fall bake sale benefited Share Our Strength, which helps fights childhood hunger in the Starkville community. The spring bake sale benefited the victims of two devesting apartment fires which affected the Starkville and MSU communities. In addition to bake sales another large service activity the club participated in was the Dixie Nationals Livestock Judging Contest. Club members traveled to Jackson to assist in the collegiate livestock judging contest by exhibiting cattle, serving as group leaders, running cards and tabulating scores. The club was also responsible for planning and hosting the Animal and Dairy Sciences' Spring Banquet, where departmental scholarships were presentated along with other student recoginzations.

Fundraising Activites

Throughout the year the club hosted several fundraisers in order to generate funds for awards, refreshments and social events. Halloween on the Farm, an annual club fundraiser, was organized and excuted during the week leading up to Halloween. The club transformed the beef unit into a haunted house for members of the Mississippi State and Starkville community. Halloween on the Farm generally runs Thursday-Saturday evening, but due to unfavorable weather Friday night was canceled. Despite this setback the club generated $850.00. The other major fundraiser for the club was the pledge sale, where pledges were auctioned to the highest bidder to complete eight hours of labor.

Social Activities

The Block and Bridle club is not all work and social events played a large part in the club's activities. This year Block and Bridle along with several other agricultural clubs hosted a "Hoe-Down". Members exhibited their dancing skills and enjoyed getting to know other College of Agriculture and Life Sciences clubs. Additionally, club members particapted in the first annual Animal and Dairy Sciences' Ag Olympics. Here members competed on teams against various other clubs in lawn games. At the conclusion of the academic year the club held its last social event, a crawfish boil.

Implications

Participation in club functions helped students build friendships and networking skills. Club members gained valuable organization skills serving on planning committees and developed work ethics and time management skills while preparing for the Little "I" show. The club also recognized outstanding members of the club at the Animal and Dairy Sciences' Spring Banquet. These members were voted on by the club for their hard work during the year. Awards were given to the following individuals: Mandy Woods – Outstanding Senior, Courtney Law – Outstanding Junior, Ashleigh Thomas – Outstanding Sophomore and Morgan Robertson – Outstanding Pledge.

The 2009-2010 academic year was highly successfully for the Block and Bridle Club. The club continued to increase membership by initiating a strong pledge class. Also, the club participated in several new service and social activities which proved to be successful. At the conclusion of the academic year the club elected a new slate of officers and started planning for the 2010-2011 academic year.

Horse Show Marketing & Management (ADS 4990)

M. C. Nicodemus
Department of Animal & Dairy Sciences, Mississippi State University, Mississippi State, MS 39762

Teaching Summary

Animal and Dairy Sciences (ADS) 4990 Horse Show Marketing & Management was offered in the 2010 spring semester at Mississippi State University as a one credit hour special topics course that was open to any undergraduate student. The course met once a week in room 4044 of the Wise Center for one hour with additional time spent outside of the classroom for the purpose of gaining firsthand experience in marketing and managing an equine event. The 11 students enrolled in the course spent the semester working on the following three local equine events: Dixie Nationals Quarter Horse Show, Bulldog Classic Quarter Horse Show, and Mississippi Future Farmers of America Horse Judging Contest. Students were involved in all aspects of each event. At the end of the semester students were responsible for presenting a summary of their activities and recommendations for improvements for marketing and managing these events in future years.

Introduction

Animal and Dairy Sciences Department offers nine undergraduate equine courses each year including: ADS 1132 Intro to Horsemanship, ADS 2102 Equine Conformation & Performance Evaluation, ADS 2122 Advanced Equine Evaluation, ADS 2212 Equine Behavior & Training, ADS 2312 Advanced Horsemanship, ADS 3223 Horse Management, ADS 3233 Equine Assisted Therapy, ADS 4112 Equine Reproduction, and ADS 4333 Equine Exercise Physiology. In the past 10 years students enrolled in select equine courses could volunteer to participate for extra credit in select local equine events such as the Dixie Nationals Quarter Horse Show, Bulldog Classic Quarter Horse Show, and Mississippi Future Farmers of America Horse Judging Contest. These events in recent years have required greater participation of students with a need for students to take a more active role in the management of these events. Experience in organizing and running equine events opens up additional job opportunities for the equine student such as horse show manager, equine facilities manager, horse show secretary, horse judging official and equine event promoter. To better prepare students for equine event job opportunities ADS 4990 Horse Show Marketing & Management was offered at the Mississippi State University Starkville campus for the first time in the spring 2010 semester as a special topics course.

Procedures

ADS 4990 Horse Show Marketing & Management was set up as a one credit hour special topics course

where the students met every Thursday for one hour to discuss the process for organizing and running a successful equine event. During each class meeting students were assigned activities for event preparation that they were to complete before the next class meeting. The following class meeting students were required to discuss their success in carrying out the activity and to give input on ways they could have improved upon the assignment. Activities included developing sponsor and event participant forms, finding event sponsors, gaining event food donations, organizing t-shirt sales, advertising the event, and recruiting volunteers. Students were required to work both independently and in committees. During the first month of classes the focus of the class activities and guest lecturers were to prepare the students for their first equine event, Dixie Nationals Quarter Horse Show. The second month of classes was dedicated to the organizing and running of the Bulldog Classic Quarter Horse Show with the following month spent in preparing for the Mississippi Future Farmers of America Horse Judging Contest. Students spent the remaining weeks of the semester reviewing and discussing the three equine events.

Dixie Nationals Quarter Horse Show

The Dixie Nationals Quarter Horse Show is held each year at the Mississippi Fairgrounds in Jackson, Mississippi and has been ranked in the past as the second largest Quarter Horse show in the United States. The show is held during Dixie Nationals, which is a four week event consisting of breed recognized horse shows, a parade, rodeos, concerts, and livestock shows starting at the end of January and finishing in February with the last week of events comprised of the Quarter Horse show and the Equine Expo. The Quarter Horse show and Equine Expo are organized and managed by the Mississippi Quarter Horse Association. Students were responsible for working with the members of the Mississippi Quarter Horse Association throughout the show starting February 18th and finishing on February 21st. Along with volunteering at the show, students were also responsible for setting up and running the Animal and Dairy Sciences equine program booth at the Equine Expo in the Trade Mart where they promoted their next equine event, the Bulldog Classic Quarter Horse Show, and recruited sponsors for that show. Their show volunteer duties included assisting show management and judging officials, setting up and taking down obstacles for various class courses and patterns, handling award presentations, and coordinating gate entry and exiting. Throughout the weekend the Mississippi Quarter Horse Association provided hotel rooms and food for the students. Each student was required to work one full day at the show and Equine Expo. Prior to the show, students were responsible for recruiting additional volunteers from the Horseman's Association, an equine student club at Mississippi State University, and coordinating their travel to and from the show and their stay during the show.

Bulldog Classic Quarter Horse Show

Bulldog Classic Quarter Horse Show is the longest running Quarter Horse show in Mississippi and is recognized by the Mississippi Quarter Horse Association. The show is sponsored by the Animal and Dairy Sciences Department and has been held

at the Mississippi Horse Park in Starkville, Mississippi throughout the facilities ten year history. For the past ten years, the Mississippi State University equine students through equine club activities and equine course extra credit opportunities have organized and managed the show with equine faculty coordinating and overseeing student participation. While in 2010 equine clubs and equine courses continued to participate in the show, the students of ADS 4990 Horse Show Marketing & Management took over the main roles of organizing and running the show. Prior to the show, students were responsible for recruiting sponsors, student volunteers, and show participants. During the show, students coordinated volunteers, assisted show officials, organized food for volunteers and show officials and for the exhibitors' dinner, worked the check in booth, set up the arena for various classes, and ran the t-shirt sales and silent auction. The show ran from March 12th to March 14th with students from the class being required to work one full day at the show.

Mississippi Future Farmers of America Horse Judging Contest

For the past ten years students have assisted with the Mississippi Future Farmers of America Horse Judging Contest for extra credit in select equine courses. Future Farmers of America chapters throughout Mississippi come to Mississippi State University each spring to participate in various contests including the horse judging contest with the goal to place well at the state level in order to qualify to represent Mississippi at the national competition. The horse judging contest held at the Mississippi Horse Park requires Future Farmers of America youth members to judge both halter and performance classes with scores given to contestants for how well they place the classes according to judging officials and senior members are also scored on how well they give oral reasons for their class placings. Each Future Farmers of America team is required to take a written exam concerning basic horse science and management with exam scores being added to their team's overall points. ADS 4990 Horse Show Marketing & Management students were required prior to the contest to coordinate riders and horse handlers to assist with the halter and performance classes and to recruit judging officials and reasons listeners for officiating the contest. Students were also responsible for developing an exam for the contestants and an informational packet for teams describing the format of the contest and rules to the contest. During the contest, students coordinated volunteers and officials, performed team check ins including passing out informational packets, announced the contest advising contestants and volunteers where they needed to be at each point in the contest, tallied team and individual scores, determined overall placing, filling in required forms for the awards ceremony, and handling set up and clean up of arena and check in booth.

Results

Dixie Nationals Quarter Horse Show

Mississippi State University student volunteers for the 2010 show were up by 30 percent each day from last year. While ADS 4990 Horse Show Marketing & Management students were only required to work one day at the show, the majority of the class worked

more than one day with four of the 11 students working the entire show. In addition to the students working the show, they were able to recruit an additional three volunteers for each day of the show from the Mississippi State University Horseman's Association. This year was the first year that students got to take more of a management role concerning certain aspects of the show. In appreciation for the hard work, Mississippi Quarter Horse Association awarded each student volunteer a Dixie Nationals jacket.

Bulldog Classic Quarter Horse Show

ADS 4990 Horse Show Marketing & Management students voted to add additional timed event classes on the show bill for Friday night to replace the cattle classes that had lost money in previous years. The timed event class entries were the highest they had been in the past 10 years. Students were solely responsible for recruiting and advertising sponsors, and through their hard work, sponsorships were up from last year with 36 sponsors in 2009 compared to 53 sponsors in 2010. While sponsorships were higher, show entries slightly dropped for the 2010 show, which was attributed to the introduction of another Quarter Horse show on the same days in Tunica, Mississippi. Although students were required to only work one day of the show, all of the students worked more than one day. In addition, student volunteers rose from last year by twenty percent for the Sunday show.

Mississippi Future Farmers of America Horse Judging Contest

This was the first year that students were involved in all aspects of the contest. New this year, students organized an informational packet for each judging team that was given to them at check in, which was well received by team coaches and parents. To reduce the length of the contest, students elected to reduce the number of classes the teams were required to judge by one halter class and two performance classes. This resulted in all teams completing the contest well before lunch and the awards ceremony, which was an improvement from last year. Students also decided contestants needed access to food and drinks, and thus, organized for the first time the Mississippi Horse Park concessions stand to be open throughout the contest. The contest was the largest in the past 10 years with 26 teams participating in the contest, and thus, required an adapted judging program from the 4-H extension programs to handle the additional teams. Students were required to learn the new program and were responsible for inputting throughout the contest scores using the new program.

Implications

ADS 4990 Horse Show Marketing & Management brought about the first year of offering a course designed to give equine students firsthand experience working on equine events. These events included the Dixie Nationals Quarter Horse Show, Bulldog Classic Quarter Horse Show, and Mississippi Future Farmers of America Horse Judging Contest. With the input of the students, changes were made in many aspects of the events that improved upon the overall success of these activities. Participation of the students throughout the course was excellent as each student successfully completed required activities with the

majority of the class exceeding required length of work for each activity. Due to the positive outcome of the students' participation and the positive response from the students concerning their activities during the course, the course is currently being proposed as a permanent course in the equine curriculum at Mississippi State University.

Contact Address:

Dr. Molly C. Nicodemus
Department of Animal & Dairy Sciences
Mississippi State University
Box 9815
Mississippi State, MS 39762
mnicodemus@ads.msstate.edu

2009-2010 MSU Equestrian Team

M. C. Nicodemus
Department of Animal & Dairy Sciences, Mississippi State University, Box 9815,
Mississippi State, MS 39762

Teaching Summary

During the 2009-2010 show season the Mississippi State University Equestrian Team prepared for each collegiate competition through organized riding practices and team building activities. Team meetings were held in conjunction with the Mississippi State University Horseman's Association with the meetings occurring during the second and fourth Tuesday of every month during the school year in the Tait Butler classroom of the Wise Center. Equestrian Team members practiced for competitions through organized riding activities scheduled prior to each competition. Twelve riders with riding levels from beginner to open in both english and western disciplines along with two alumni riders represented the University during the 2009-2010 school year at twelve Intercollegiate Horse Show Association competitions starting in October and completing the season in March. This was the tenth year Mississippi State University has been represented at collegiate horse shows with over a hundred students competing on the Equestrian Team over it's ten year history making the Equestrian Team the longest running Intercollegiate Horse Show Association Equestrian Team in Mississippi.

Introduction

Mississippi State University Equestrian Team is one of two equine riding teams representing the University at collegiate competitions. The Rodeo Team is the other equine team at Mississippi State University. Both equine riding teams are associated with the Department of Animal and Dairy Sciences, although students of any major are welcome to join. Mississippi State University is one out of over 300 colleges in the United States and Canada participating in Intercollegiate Horse Show Association competitions and was the first college in Mississippi to have a collegiate equestrian team. Mississippi College in Clinton, Mississippi is the other college recognized by the Intercollegiate Horse Show Association. Mississippi State University is currently the only college in Mississippi to compete in Intercollegiate Horse Show Association stock seat shows and to participate in a National Collegiate Athletic Association sanctioned varsity invitational horse show. Mississippi State University and Mississippi College participate in Region 1 of Zone 5 of the Intercollegiate Horse Association competing against colleges located in Tennessee and Kentucky.

Procedures

Becoming a Team Member

In the ten year history of the Equestrian Team tryouts have not been a requirement for becoming a member of

the Mississippi State University Equestrian Team. The Equestrian Team is open to all fulltime undergraduate students. Undergraduate students with a background in any level of riding from beginner to open are welcome to participate in the Equestrian Team. New to Mississippi State University this year, former Equestrian Team members that had completed their eligibility to compete or had graduated could return to the Equestrian Team to represent the University in the alumni division.

Equestrian Team members must be active members of the Mississippi State University Horseman's Association. Active membership in the Horseman's Association includes paying membership dues, attending monthly meetings, and participation in activities supported by the Horseman's Association such as volunteering at the Dixie Nationals Quarter Horse Show in February at the Mississippi Fairgrounds in Jackson, Mississippi and at the Animal and Dairy Sciences Bulldog Classic Quarter Horse Show in March at the Mississippi Horse Park in Starkville, Mississippi. Additional activities that active members participate in include the Animal and Dairy Sciences Welcome Back Picnic and Ag Olympics, Golden Triangle Regional Fair, and the Boy Scout Bulldog Camporee. During the first meeting of the Horseman's Association students meet with the club advisor and the Equestrian Team coaching staff and captains and are informed of Equestrian Team membership requirements and responsibilities and the competition schedule. The second meeting consists of members receiving the Equestrian Team handbook and filling out forms for both the Mississippi State University Equestrian Team and the Intercollegiate Horse Show Association.

Preparing for Competition

The Equestrian Team travels to host colleges within the region where the host college provides each team horses to ride in their show. This type of show environment requires riders that can adapt to any horse. Equestrian Team members are encouraged to ride a variety of horses to better prepare for competition, and therefore, riders were required for the first time this year to practice on a weekly basis prior to competition using designated practice outlets including University riding courses or select local trainers. ADS 4990 Advanced Horsemanship II was a new course offered at Mississippi State University as a special topics course that provided Equestrian Team members an outlet for practicing. Equestrian Team members could also select from other riding courses offered each year as a part of the Animal and Dairy Sciences curriculum including ADS 1132 Intro to Horsemanship, ADS 3233 Equine Assisted Therapy, and ADS 2312 Advanced Horsemanship.

Along with practicing in University riding courses to prepare for competition, riders could also select from designated local horse trainers that had volunteered their time at a reduced training rate to work with Equestrian Team members. Riders could refer to their Equestrian Team handbook to get the list of horse trainers and their contact information. Coaching staff, Dr. Molly Nicodemus and John Williams, and Equestrian Team captains, Ally Long and Stephanie Aantoos, worked directly with these local trainers to organize practices and to get input from the

trainers concerning riders' strengths and weaknesses. Equestrian Team members determined to be struggling with aspects of their riding were required to participate in additional practices prior to the show with the understanding that a lack of improvement would result in a loss of riding eligibility. These new guidelines for riders were outlined in the newly developed Equestrian Team handbook given to each member at the start of the school year.

Results

In the fall 2009 semester the hunt seat riders traveled to four Intercollegiate Horse Show Association shows starting in October and the stock seat riders traveled to three. The Equestrian Team completed the regularly scheduled show season in March with the hunt seat riders traveling to four shows during the 2010 spring semester and the stock seat riders traveling to one. The hunt seat team won throughout the show season twenty five ribbons including six first place ribbons, while the stock seat team won a total of twelve ribbons with 50 percent of those ribbons being first place ribbons. Both teams placed in the top ten of Zone 5, Region 1 with captain Stephanie Aantoos ranking fifth overall in the region in the hunt seat division.

Kristen Walters and Katelyn Brumfield represented for the first time Mississippi State University in the hunt seat alumni division at Intercollegiate Horse Show Association shows. Both riders were former members of the Equestrian Team that are currently working on graduate degrees. Their success in the alumni division qualified both riders for Regional and Zones Championships. Kristen Walters placed fifth overall in Zone 5 in alumni hunt seat rail and in alumni over fences. Katelyn Brumfield placed first overall in Zone 5 in alumni hunt seat rail, and thus, making her eligible for Intercollegiate Horse Show Association Nationals at the Kentucky Horse Park where she placed tenth overall in the nation. Katelyn Brumfield was the first Mississippi State University rider to qualify for nationals.

Team Members are: Camille Wood (Captain of the Stock seat Team), Kristen Walters (MSU Alumni Rider), Ally Long (Co-Captain of the Hunt seat Team), Stephanie Aanstoos (Co-captain of the Hunt seat Team), and Bob Cacchione (President of IHSA)

Implications

Mississippi State University Equestrian Team encountered many changes during the 2009-2010 show season including the introduction of alumni riders, requirement of regularly scheduled team practices with designated practice outlets, a new riding course dedicated to Equestrian Team practices, and a new Equestrian Team handbook outlining the requirements of team members.

These changes resulted in a successful show season with a record number of ribbons won, the best regional ranking of a hunt seat rider, and the first time a Mississippi State University rider represented the University at the national level. These changes will be continued in the 2010-2011 show season with the addition of required workouts to be scheduled through the Mississippi State University Sanderson Center.

Contact Address:

Dr. Molly C. Nicodemus

Department of Animal & Dairy Sciences

Mississippi State University

Box 9815

Mississippi State, MS 39762

mnicodemus@ads.msstate.edu

Mississippi State Horse Judging Team

M. C. Nicodemus
Department of Animal and Dairy Sciences, Mississippi State University,
Mississippi State, MS 39762

Teaching Summary

For the past ten years Mississippi State University has taken a horse judging team to compete in Oklahoma City, Oklahoma at Morgan Horse Grand Nationals Collegiate Horse Judging Competition. Every year the team has brought back multiple team and individual awards including multiple Grand and Reserve Championships and this year was no exception.

Results

The MSU horse judging team coached by Dr. Molly Nicodemus, Associate Professor of Animal & Dairy Sciences (ADS), and John Williams, ADS graduate teaching assistant, traveled this past fall to Morgan Horse Grand Nationals with three teams. This was the first time MSU was represented by three teams at any national horse judging contest. The collegiate judging competition is a day long event where students judge multiple in-hand and performance classes. After judging the classes, students prepare four sets of oral reasons to give to judging officials. Team members are scored on how well they place the classes according to judging officials and how well they present their oral reasons. The teams and team member can win awards in the following divisions: Overall, In-Hand, Performance, and Reasons.

All three MSU teams won Top Ten Honors in the Overall team division ranking third, sixth, and seventh. In both the In-Hand and Performance divisions, two of the MSU teams were awarded Top Ten Honors including one team being named Grand Champion in the In-Hand team division. Team member Lacy Priest was named Reserve Grand Champion in the In-Hand individual division. In the Oral Reasons division all three teams were awarded Top Ten Honors including one team being named Grand Champion. Team member Richard Baessler was named individual Grand Champion. All three teams had members take home Top Ten Honors in the individual Overall, In-Hand, Performance, and Oral Reasons divisions totaling eleven individual awards given to MSU team members.

Implications

This fall two MSU horse judging teams will travel to Morgan Horse Grand Nationals to continue their winning tradition. Shannon Lindsey, ADS graduate student, will be joining the coaching staff. Ms. Lindsey is a former member of the MSU horse judging team. Other former members have gone on to become horse judging officials and 4-H and FFA horse judging coaches.

2009-2010 Horse Judging Team. Top Row (left to right): Tyler Scott, Richard Baessler. Bottom Row (left to right): Lacy Priest, Mandy Arrington, Devin Stribling, Lori Ward, Courtney Law, Jamie Carroll, Anne Strohm, Amber Christian, Mary Kraft

Differences in Hair Coat Shedding and Effects on Calf Weaning Weight and Body Condition Score among Angus Dams

K. A. Gray[1], J. P. Cassady[1], C. Maltecca[1], P. Overton[1], J. A. Parish[2], and T. Smith[2]
[1]Department of Animal Science, North Carolina State University, Raleigh, NC
[2]Department of Animal and Dairy Sciences, Mississippi State University, MS

Research Abstract

Cattle with dark, thick, wooly coats are at an extreme disadvantage in hot, humid climates and are at an increased risk of heat stress and dehydration. In the Southeastern United States, where the climate is sub-tropical, cows that fail to shed in a timely manner tend to show more signs of heat stress when compared to their slick-coated contemporaries. The objectives of this study were to adapt a reasonable method to assess hair coat shedding within purebred Angus cattle, determine how much hair coat shedding variation exists among Angus cows, and estimate its effects on adjusted 205 d weight (**d205wt**) and cow's body condition score (**BCS**). Registered Angus cows (n = 532) were used over a 3-yr period in four different locations in MS and NC for this study. In 2007, 2008, and 2009, beginning the last week in March for 5 mo at approximately 30-d intervals, two trained technicians scored cows on a scale from 1 to 5. A score of 1 represented a slick, summer coat, and 5 represented a thick, winter coat. On average, cows which shed their hair coats by the end of May weaned heavier calves than cows who take longer to shed their hair coats. Scoring cattle on a scale of 1 to 5 starting in March provided phenotypic data which adequately described the variation that exists among hair coat shedding in Angus cattle located in the Southeastern region of the United States. Hair coat shedding is moderately heritable and should respond to selection. Producers seeking to reduce heat stress in their herds related to hair coat shedding should score their cows on a 1 to 5 scale in late May. Cows with hair coat shedding scores of 4 or 5, indicating little or no shedding, should be considered for culling.

Introduction

The principal method for heat dissipation in cattle is evaporation cooling. A bovine animal's success in cooling itself is directly influenced by many factors including humidity, wind speed and physiological factors like respiration rate and activity of sweat glands (Blackshaw and Blackshaw, 1994). As the ambient temperature and humidity exceed the animal's thermal neutral zone, effectiveness of evaporative cooling through sweating and respiration decreases. When humidity is high, water from sweat or even sweat vapor gets trapped in spaces between the hair follicles causing the animal to expend more energy in thermoregulation by increasing its respiration rate and increasing the amount it sweats (Finch, 1985).

Cattle with dark, thick, wooly coats are at an extreme disadvantage in hot, humid climates and are at an increased risk of heat stress and dehydration. It has been observed in the Southeastern region of the United States where the climate is sub-tropical, that cows that fail to shed in a timely manner tend to show more signs of heat stress when compared to their slick-coated

contemporaries. Signs of heat stress include decreased mobility, decreased appetite, and poorer general health. A common perception among producers within this region is that cows which shed late in the season are inferior dams with poor performing calves.

The objectives of this study were to adapt a reasonable method to assess hair coat shedding within purebred Angus cattle, determine how much hair coat shedding variation exists among Angus cows, and estimate its effects on adjusted 205 d weight (**d205wt**) and cow's body condition score (**BCS**).

Procedures

Animals

Registered Angus cows (n = 532) were used over a 3-yr period in four different locations for this study. The first location was in Reidsville, NC, where the North Carolina State University historic Angus herd is maintained at the Upper Piedmont Research Station (UPRS) on wild-type endophyte-infected tall fescue pastures. Approximately half of the animals were observed in this location. The remaining cows were distributed over three other locations in Mississippi including Mississippi State, Winona, and Okolona, MS. The cows grazed pastures consisting primarily of mixed warm-season grasses, annual ryegrass, and non-toxic endophyte-infected tall fescue. All cows were between 2 and13 yrs of age with a calving season in NC in late autumn and calving seasons in MS was in the early autumn or late winter/early spring.

Data

In 2007, 2008, and 2009, beginning the last week in March for 5 mo at approximately 30-d intervals, two trained technicians scored cows on a scale from 1 to 5 (Table 1). A score of 1 represented a slick, summer coat, and 5 represented a thick, winter coat. A score of 3 was halfway shed, while a score of 4 was a cow that started shedding but was not quite half way to a summer coat. A score of 2 was more than halfway shed but not shed slick yet.

Table 1. Description of hair coat shedding scores

Hair Shedding Score	Definition
5	Full winter coat
4	Coat exhibits initial shedding
3	Coat is halfway shed
2	Coat is mostly shed
1	Slick, short summer coat

Cows were then grouped into 5 categories based on the mo the cow began to shed her winter coat. A cow was considered to have begun shedding its winter coat when she received a score of 3 or less. Cows that never received a score of 3 or less (n = 13) during the 5 mo of observation were small in number and were grouped with cows that shed in July. These categories will be referred to as mo of first shedding (**MFS**) (Figure 1).

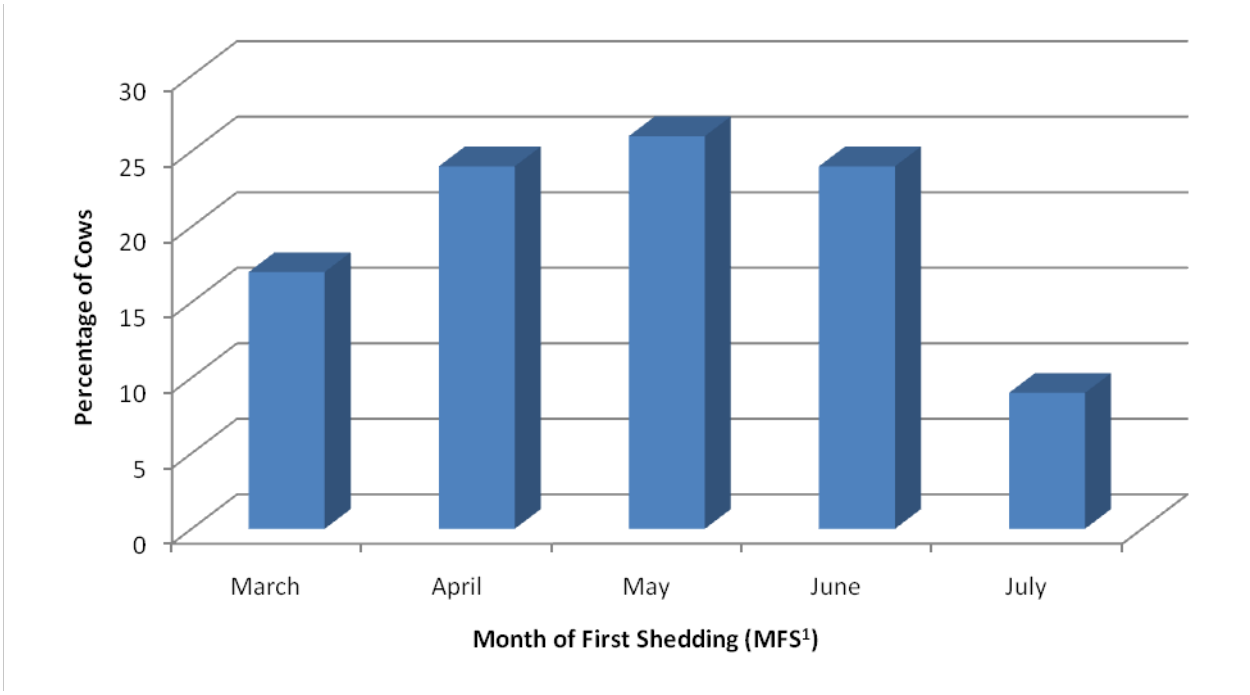


Figure 1. Month cows begin to shed (MFS)

[1] First month in which a cow received a score of 3 or less using the following scoring system: 5 = full winter coat; 4 = coat exhibits initial shedding; 3 = coat is halfway shed; 2 = coat is mostly shed; 1 = slick, short summer coat.

All cows within the analysis weaned a calf at approximately 6 mo of age. Weaning weights were recorded and submitted to the American Angus Association. An adjusted weaning weight (**d205wt**) was then calculated by the association adjusting for age of dam, and age of calf to 205 d. In this study, d205wt was considered to be a trait of the cow for both phenotypic and genotypic analysis.

Phenotypic Analysis

The first model tested the association between MFS and d205wt or BCS using the mixed procedure of SAS. Models for d205wt and BCS included fixed effects of yr (3 levels), location (4 levels), sex of the calf (2 levels) and MFS (5 levels) with a random effect of sire of calf (n=86). Sire of calf was included in the model to adjust for any genetic advantage from certain sires. Age of calf and age of cow (2 levels; heifer or cow) were added as a covariate and fixed effect, respectively, for BCS. They were not added to the d205wt model, because the trait already accounted for these factors.

Data were further analyzed by dividing cows into two groups. Cows were considered adapted to the subtopical climate when they had an MFS of March, April, or May, while the remaining animals were considered unadapted and undesirable. These two categories are referred to as the adapted score (AS). The second model was similar to the first model except MFS was replaced with AS. All other effects included in the model were as before.

Genetic Analysis

Variance components were estimated for d205wt and AS. Fixed effects included in the model were yr (3 levels), sex of calf (2 levels) and location (4 levels). Random effects of cow and a permanent environmental effect were also included. Variance components were estimated using THRGIBBS2F90 program (Misztal et al., 2002). A single chain consisting of 100,000 iterations was employed, with a burn-in period of 25,000 iterations. Convergence was assessed visually from the trace plot. Inferences on variables were obtained as mean of the respective posterior distributions.

Results

Two technicians collected all shedding scores within each location. Each technician's scores were analyzed separately. It was found that technicians were in agreement in their scoring of the cows (data not shown), and only one technician score was used within each location.

All effects in the first model were significant ($P < 0.01$) for d205 wt. For BCS, MFS was not significant, therefore BCS was not considered in the rest of the analysis. Least square means of d205wt were calculated for MFS (Table 2). Cows that shed earlier in the year did not differ in their BCS but had calves that were heavier at weaning.

Table 2. LS means of adjusted weaning weights associated with the month the dam begins shedding (MFS)

MFS	d205wt, lb	Standard Error
March	597	6.4
April	589	8.8
May	587	7.1
June	578	7.3
July	551	8.8

Differences in least square means were calculated as well (Table 3). Adjusted weaning weight of calves out of cows that had MFS in March, April, and May did not differ from one another ($P > 0.05$). For AS scores, calves' d205wt out of cows that had MFS in March, April, and May did differ from calves' d205wt out of cows that had MFS in June and July ($P < 0.05$).

Table 3. Least square means differences of adjusted weaning weights of dams that began shedding in different months

Contrast	Difference	Standard Error	Pr > |t|
March – April	7.9	6.85	0.25
March – May	10.2	7.85	0.19
March – June	19.2	8.52	0.02
March – July	45.9	10.11	0.01
April – May	2.3	7.37	0.75
April – June	11.31	7.91	0.15
April – July	38.0	9.50	0.01
May – June	9.0	6.95	0.20
May – July	38.0	9.50	0.01
June - July	26.7	7.93	0.01

The second model takes advantage of this natural grouping found in the data using AS as the effect of interest. All remaining effects were similar to the first model, and all were significant ($P < 0.01$). Least square means were calculated, and their differences appear in Tables 4 and 5, respectively.

Table 4. Least square means of adjusted weaning weights associated with cows that shed by the end of May or after May (AS)

AS	d205wt, lb	Standard Error
Shed by May	589	5.6
Shed after May	565	6.8

Table 5. Differences in least square means of adjusted 205 d weaning weights of dams that began shedding by May vs after May

Contrast	Difference	Standard Error	Pr > |t|
Shed by May – Shed after May	24.1	6.16	.01

Calves from cows that began to shed by the end of May had d205wt at 24 lbs heavier than their contemporaries that were out of cows that began to shed after May.

Variance components were estimated for two traits and heritabilities and genetic correlations were calculated (Table 6). Heritabilities of d205wt ($h^2 = 0.27$) and AS ($h^2 = 0.35$) were low to moderately

heritable, and the genetic correlation was moderately strong, negative, and favorable ($r_g^2 = -0.50$). On average, cows which shed their hair coats by the end of May wean heavier calves than cows who take longer to shed their hair coats.

Table 6. Heritabilities on diagonal and genetic correlation below diagonal

	d205wt	AS
d205wt	0.27	
AS	-0.50	0.35

Scoring cattle on a scale of 1 to 5 starting in March provided phenotypic data which adequately described the variation that exists among hair coat shedding in Angus cattle located in the Southeastern region of the United States. Some variation did occur among technicians when scores were 3 or less and between 4 and 5. To decrease the amount of variation that occurred among technicians, scores were grouped into two categories as explained above. Because this scoring system was used over multiple locations and technicians, grouping the shedding scores into these categories led to consistent measurement.

The first model showed that an extended time to shedding in cows resulted in lighter calves at weaning. Although this trend did hold over all 5 mo, there was no significant difference between the first three months or the last two months. For this reason animals were grouped using AS, which in reality is a more realistic approach for implementation. Labor costs and time would prohibit monthly shedding scores to take place in most production settings; however, it has been shown that one score taken at a strategic time is sufficient for capturing the variation that occurs in hair coat shedding. In this sample it was shown that by the end of May animals should be scored to predict calf weaning performance. This time may vary depending on the location, humidity, and overall environment of the herd in question.

Weaning weight is an economically important trait. Angus producers have increased the weaning weights of their calves over the past 40 yr. This study shows that there is a high genetic correlation between weaning weight and hair coat shedding. It would seem reasonable that by default animals will continue to improve in hair coat shedding through correlated selection. Although this does seem plausible, most drive for selection within the Angus breed occurs in cooler, less humid environments. There may be a genotype by environment interaction that is not evident in the more temperate regions where most of the selection occurs. This study provides evidence that certain sires will produce better calves in hot, humid, and otherwise less than ideal environments, but definite conclusions cannot be made until more data are collected in cooler environments with some of the same sire families represented.

It is possible that early hair coat shedding does not necessarily cause heavier d205wt. However, there is evidence that even if early hair coat shedding is not the cause, it is a good indicator of heavier weaning weights. Hair coat shedding has a greater heritability than weaning weight; therefore, by including AS in an index, producers could potentially increase their

response to selection of d205wt in sub-tropical climates.

A possible explanation for the relationship between hair coat shedding and weaning weight of calves could be differences in prolactin concentrations. Prolactin has many functions within the cow. One of its functions is associated with lactation (Knight, 2000). Prolactin also influences hair regression regulation (Nixon et al., 2002). Therefore, it could be concluded that hair coat shedding rate could be an indicator of the amount of prolactin available. When cows are not shedding, it indicates that prolactin levels are low. Low prolactin levels may also affect the amount of milk available for the calf, which would directly affect d205wt.

Hair coat shedding has also been shown to be affected by diet. Toxic wild-type endophyte-infected tall fescue affects prolactin concentrations (Bernard et al., 1993) and hair coat shedding (McClanahan et al., 2008). Based on results of this study, it was concluded that even while all animals are on wild-type endophyte-infected tall fescue there still was variation within the herd. This provides evidence that some sire families are more adapted to this type of environment and they are more productive even when fed a wild-type endophyte-infected tall fescue diet.

Temperature may also play an important role in when cows begin to shed their winter coat. Further analysis will need to be performed to determine how much temperature affects rate of hair coat shedding within these herds.

Continued research will help to completely understand how shedding and productive traits like calf weaning weight are associated. This research does provide evidence that cows that shed late in the season wean lighter calves. Hair coat shedding is a heritable trait and could be altered by selection. Producers within the Southeastern or Southern United States that have observed late hair coat shedding within their herds can select for hair coat shedding earlier in the season. This should result in higher weaning weights, making the cow herd more productive.

Implications

Hair coat shedding is moderately heritable and should respond to selection. Producers seeking to reduce heat stress in their herds related to hair coat shedding should score their cows on a 1 to 5 scale in late May. Cows with hair coat shedding scores of 4 or 5, indicating little of no shedding, should be considered for culling.

Literature Cited

Bernard, J. K., A. B. Chestnut, B. H. Erickson, and F. M. Kelly. 1993. Effects of prepartum consumption of endophyte-infested tall fescue on serum prolactin and subsequent milk-production of holstein cows. J Dairy Sci 76: 1928-1933.

Blackshaw, J., and A. Blackshaw. 1994. Heat stress in cattle and the effect of shade on production and behaviour: A review. Aust J Exp Agric 34: 285-295.

Finch, V. A. 1985. Comparison of non-evaporative heat-transfer in different cattle breeds. Aust J Agric Res 36: 497-508.

Knight, C. H. 2000. Overview of prolactin's role in farm animal lactation. Livest Prod Sci 70: 87-93.

McClanahan, L. K., G. E. Aiken, and C. T. Dougherty. 2008. Case study: Influence of rough hair coats and steroid implants on the performance and physiology of steers grazing endophyte-infected tall fescue in the summer. The Professional Animal Scientist 24: 269-276.

Misztal, I., S.Tsuruta, T. Strabel, B. Auvray, T. Druet, and D. H. Lee. 2002. Blupf90 and related programs (BGF90). In: Proc. 7th World Genet Appl Livest Prod, Montpellier, France

Nixon, A., C. Ford, J. Wildermoth, A. Craven, M. Ashby, and A. Pearson. 2002. Regulation of prolactin receptor expression in ovine skin in relation to circulating prolactin and wool follicle growth status. J Endocrinol 172: 605-614.

Growth and Ultrasound Body Composition Traits of Steers fed an Omega-3-fatty acid-fortified supplement from Flaxseed while on Improved Pastures and following Feedlot Finishing

R. C. Vann[1], S. T. Willard[2], E. L. Schenck[2], J. M. Martin[2], K. Moulton[2], W. Holmes[2], A. Brown[2], B. Thomas[2], T. E. Lawrence[3] and M. S. Brown[3]

[1]MAFES-Brown Loam Experiment Station, Raymond, MS
[2]Mississippi State University, Mississippi State, MS
[3]West Texas A&M University, Canyon, TX

Research Summary

The objectives of this study were to determine the potential of omega-3 fatty acid fortified supplements as an energy supplement to facilitate decreased mobilization of intramuscular fat associated with cattle grazing forages and to improve the fatty acid content in meat throughout the feedlot feeding period. Angus crossbred steers (n=42) grazing ryegrass-bermudagrass pastures were assigned to either a control (CON; natural 15 molasses tub; Animal Feed Supplement, Poteau, OK.) or an omega-3 fatty acid fortified tub (FLAX; flaxseed molasses tub; Animal feed supplement, Poteau, OK.). Steers were allowed to graze pastures with free choice access to tubs for 168 days and were then shipped to a feedlot with continued access to the tubs during the 121 days feedlot feeding period. Ultrasound body composition traits and muscle biopsies of the semitendinous muscle were collected on day 0 (D0), 91(D91) and 168 (D168) of the grazing period and longissimus steaks were collected at harvest. Steaks collected at harvest were analyzed for fatty acid profiles and warner-bratzler shear force measurements. The PROC Mixed procedure of SAS was used for analysis. There were no differences in BW or ADG for the two treatment groups, except for ADG at the end of the feedlot feeding period tended to be greater for the FLAX group compared to CON group ($P \leq 0.07$). The CON group had greater ultrasound ribeye area ($P \leq 0.05$) than the FLAX group from D91 throughout harvest. There were no differences ($P \geq 0.10$) in ultrasound intramuscular fat or carcass ribeye area, marbling scores, quality grades or yield grades between the two treatment groups. CON steers tended to have greater percent oil in steaks ($P \leq 0.08$) and a tendency for a greater C17:0 ($P \leq 0.09$) steak fatty acid content. In conclusion, FLAX supplementation while on pasture did not enhance growth or ultrasound body composition traits, and access to FLAX during feedlot finishing in this tub form had little influence on steak composition post-harvest.

Introduction

Society is becoming increasingly health-conscious and trends are toward the consumption of leaner beef products. Forage finishing of beef has produced mixed results on carcass characteristics and palatability attributes (Mandell et al., 1998). In addition, forage finished beef is often harvested at ages older than those of grain fed cattle and require two additional months of feeding to reach targeted harvesting end points achieved by grain fed cattle (Mandell et al., 1997; 1998). Granted several studies have demonstrated that forage fed beef has higher levels of omega-3 fatty acids and conjugated linoleic acid (CLA) than their grain fed counterparts (Duckett et al., 1993). Higher

levels of these compounds in human diets have positive impacts on health (Dhiman et al., 1999), and this attribute is currently being used as an extremely attractive marketing strategy given increased diet-related awareness of the consuming public. A portion of the population however, does not want to sacrifice the customary flavor and tenderness qualities associated with traditional grain-fed beef (May et al., 1992). One way of compromising is to produce beef products raised primarily on grass with a shorter feedlot feeding period utilizing an energy supplement to enhance the fatty acid content of the beef. Therefore, the objective of this research project was to determine the potential of omega-3 fatty acid fortified supplements as an energy supplement to decrease mobilization of intramuscular fat deposition associated with cattle grazing forages and to increase the fatty acid content in meat throughout the feedlot finishing period. The rationale for following the cattle through the feedlot feeding phase was to determine the possibility of the flaxseed product to have positive carry-over effects on the fatty acid profiles of subsequently grain fed beef products even though concentrate feeding tends to decrease omega-3 fatty acid profiles of meat products.

Procedures

Angus crossbred steers (n=42) were maintained on ryegrass-bermudagrass pastures and assigned to either a control (CON; natural 15 molasses tub; Animal Feed Supplement, Poteau, OK) or an omega-3 fatty acid fortified tub (FLAX; Flaxseed molasses tub; Animal Feed Supplement, Poteau, OK). Steers were allowed to graze pastures with free choice access to the tubs for 168 d; then they were shipped to a feedlot at West A&M University in Canyon, TX., with continued access to the tubs for the 121 d feedlot finishing period. Ultrasound body composition measurements and semitendinous muscle biopsies were collected on D0, 91, and 168 of the grazing period and ultrasound at the end of the feedlot feeding period. At harvest, longissimus steaks were collected and analyzed for fatty acid profiles and warner-bratzler shear force measurements. Blood samples were collected on D0, 28 (D28), 56 (D56), 91, 112 (D112), 168 and 305 (D305) and plasma harvested for analysis of concentrations of cholesterol and Blood Urea Nitrogen (BUN). Statistical analysis was performed using the PROC Mixed procedure of SAS for the main effect of treatment group. Correlation coefficients with Fisher's r to z transformation were utilized to identify significant ($P \leq 0.05$) correlative trends among treatment groups.

Results

There were no differences in BW and ADG for the two treatment groups; except for ADG at the end of the feedlot finishing period which was greater in the FLAX group compared to the CON group ($P \leq 0.07$). The CON group had greater ultrasound ribeye area ($P \leq 0.05$) than the FLAX group from D91 through to harvest at the end of the feedlot finishing phase. There were no differences in ultrasound intramuscular fat or carcass ribeye area, marbling scores, quality grades or yield grades between the two treatment groups. The quality grades of the steers were as follows: FLAX steers graded 10% Premium Choice compared to CON steers at 5% Premium Choice; the CON steers graded 70% Choice compared to FLAX steers at 60% Choice; and the FLAX steers graded 30% Select compared to CON steers at 25% Select.

FLAX steers had a greater 18:0 (Stearic) and 18:2 (Linoleic) fatty acid content in muscle biopsies while grazing forages ($P \leq 0.06$). CON steers tended to have greater percentage of oil in steaks ($P \leq 0.08$; Fig. 1), a tendency for a greater C17:0 (Magaric which is a saturated fatty acid; $P \leq 0.09$) and a greater 18:2 (Linoleic which is a omega-6 fatty acid) steak fatty acid content. The warner-bratzler shear force measurements on longissimus steaks post-harvest were not different between the two treatment groups (Fig. 2).

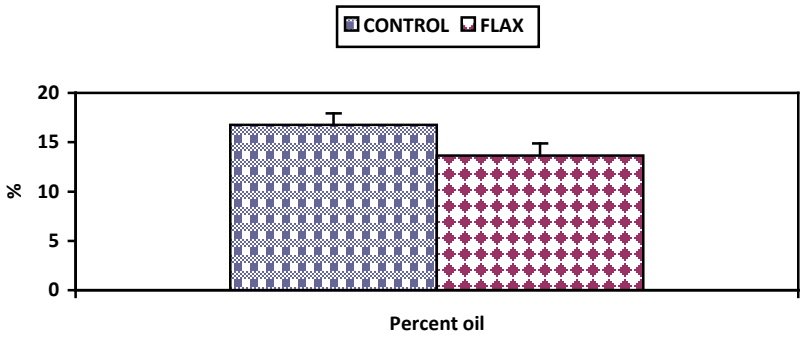


Figure 1. The percent oil in longissimus steaks post-harvest

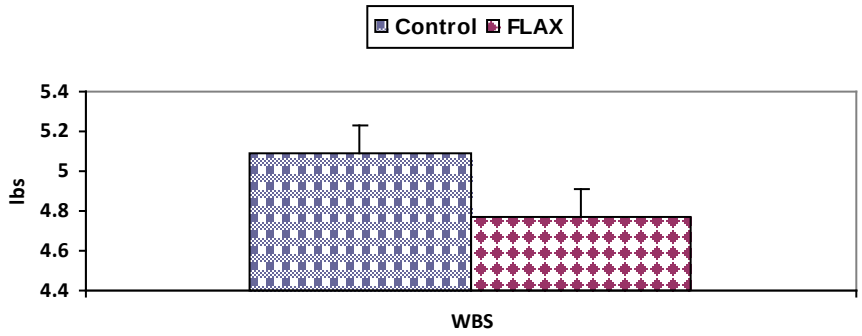


Figure 2. The Warner-Bratzler Shear Force Measurements for Longissimus Steaks post-harvest.

Total cholesterol concentrations were similar between the two treatment groups, except for D56 of the grazing period, FLAX steers had greater ($P \leq 0.06$) total cholesterol level compared to CON steers (163.9 ± 6.05 vs 143.9 ± 5.86 mg/dl, respectively). High density lipoprotein (HDL) cholesterol concentrations were similar between the two treatment groups, except for D28 and D112 of the grazing period, the FLAX steers had greater HDL concentrations compared to the CON steers (D28, 71.8 ± 2.1 vs 64.6 ± 2.1 mg/dl respectively; D112, 77.1 ± 2.1 vs 69.4 ± 2.1 mg/dl, respectively). Concentrations of BUN were lower at D28 and D91 of the grazing period for the FLAX steers ($P \leq 0.01$) compared to the CON steers (D28, 14.1 ± 1.01 vs 18.2 ± 0.92 mg/dl, respectively; D91, 17.1 ± 1.01 vs 24.9 ± 0.92 mg/dl, respectively). However, at the end of the grazing period (D168) and the end of the feedlot finishing phase (D305) the FLAX steers had greater BUN concentrations compared to the CON steers (D168, 21.7 ± 1.01 vs 15.4 ± 0.92 mg/dl, respectively;

D305, 18.9 ± 1.01 vs 14.1 ± 0.92 mg/dl, respectively).

Implications

FLAX supplementation while on pasture did not enhance growth or ultrasound body composition traits, and access to FLAX during the feedlot finishing phase in this form had little influence on steak composition post-harvest. Perhaps a different method of fatty acid supplementation would have proved a more beneficial option during the feedlot finishing period as the cattle did not consume enough of the product in this tub form to achieve any added benefit of fatty acid supplementation in steaks post-harvest.

Acknowledgements

The authors appreciate the cooperation of all Mississippi Agricultural and Forestry Experiment Station employees that assisted with the collection of this data. In addition, for funding through the Mississippi State University, Alternative Crops and Value-Added Products Initiative.

Literature Cited

Dhiman, T.R., G.R. Anand, L.D. Satter, and M.W. Pariza. 1999. Conjugated linoleic acid content of milk from cows fed different diets. J. Dairy Sci. 82:2146-2156.

Duckett, S.K., D.G. Wagner, L.D. Yates, H.G. Dolezal and S.G. May. 1993. Effects of type of feed on beef nutrient composition. J. Anim. Sci. 71:2079-2088.

Mandell, I.B., E.A. Gullett, J.G. Buchanan-Smith, and C.P. Campbell. 1997. Effects of diet and slaughter endpoint on carcass composition and beef quality in Charolais cross steers. Can. J. Anim. Sci. 77:403-414.

Mandell, I.B., J.G. Buchanan-Smith, and C.P. Campbell. 1998. Effects of forage vs. grain feeding on carcass characteristics, fatty acid composition, and beef quality in Limousin-cross steers when time on feed is controlled. J. Anim. Sci. 76:2619-2630.

May, S.G., H.G. Dolezal, D.R. Gill, F.K. Ray, and D.S. Buchanan. 1992. Effects of days fed, carcass grade traits, and subcutaneous fat removal on postmortem muscle characteristics and beef palatability. J. Anim. Sci. 70:444-453.

Temperament influences stress hormone and IgG concentrations in Angus cross calves

R. C. Vann[1], N. C. Burdick[2], J. G. Lyons[2], T. H. Welsh, Jr.[2], and R. D. Randel[3]
[1]MAFES-Brown Loam, Mississippi State University, Raymond, MS
Texas AgriLife Research, Texas A&M System, [2]College Station, and [3]Overton, TX

Research Summary

The objective of this study was to determine the influence of temperament on concentrations of cortisol, epinephrine, norepinephrine, and IgG in Angus-cross calves. Calves from 2005 and 2006 were selected based on temperament score measured 28 d prior to weaning and at weaning. Temperament score is an average of exit velocity and pen score. Based on temperament score the 10 most Calm, 10 Intermediate and 10 most Temperamental from each sex (steers and heifers in 2005, bulls and heifers in 2006) were selected from each calf crop (n = 120). Blood was collected 28 d prior to weaning, at weaning, and 28 and 56 d post-weaning to determine serum cortisol and IgG, and plasma epinephrine and norepinephrine concentrations. Concentrations of epinephrine and norepinephrine were greater in 2005 than 2006. Cortisol concentrations were lower in Calm and Intermediate compared to Temperamental calves. Heifers had greater cortisol concentrations with steers being intermediate and bulls having lower concentrations. Calm calves had lower epinephrine concentrations than Intermediate and Temperamental calves. Concentrations of epinephrine declined over the 4 collection times. Temperamental had greater concentrations of norepinephrine compared to Intermediate and Calm calves. Concentrations of norepinephrine changed over the 4 collection times and were not influenced by sex. Concentrations of IgG were influenced by the following interactions: temperament x sex and sex x day. Specifically, Intermediate steers had greater concentrations of IgG than Intermediate heifers and bulls, and bulls had greater IgG concentrations at weaning than heifers and bulls. In summary, concentrations of stress hormones varied due to temperament. In addition, concentrations of cortisol and epinephrine varied by sex, whereas IgG concentrations varied by the combination of temperament and sex classifications.

Introduction

Temperament is described as the reactivity of cattle to humans or novel environments (Fordyce et al., 1988). Cattle temperament can influence cattle management due to the potential for temperamental cattle to injure themselves or workers and cause damage to facilities. Additionally, temperament has been demonstrated to negatively influence growth, carcass characteristics, and immune function (Voisinet et al., 1997; Fell et al., 1999; King et al., 2006; Oliphint, 2006). Therefore, producers often select against temperamental cattle.

More temperamental or excitable cattle have been demonstrated to have

greater basal concentrations of the stress hormones cortisol and epinephrine (Curley et al., 2006; Burdick et al., 2010). Stress hormones are known to be immunosuppressive on many aspects of immune function (Martin, 2009). Therefore, it has been hypothesized that the greater basal concentrations of stress hormones in more temperamental cattle negatively influence their immune function, specifically circulating concentrations of immunoglobulin. Therefore, the objective of this study was to determine the influence of temperament on concentrations of cortisol, epinephrine (EPI), norepinephrine (NE), and immunoglobulin G (IgG).

Procedures

Calves from the 2005 and 2006 calf crops at the Mississippi Agricultural and Forestry Experiment Station in Raymond, MS were utilized for this study. Calves were selected based on temperament score, an average of exit velocity and pen score, measured 28 d prior to and at weaning. Exit velocity (Burrow et al., 1988; Curley et al., 2006;2008), the rate of speed of a calf traversing a distance of 1.83 m after its exit from a working chute, was determined using two infrared sensors (FarmTek Inc., North Wylie, TX) and was used to calculate velocity [velocity = distance (m) / time (s)]. Pen score (Hammond et al., 1996) is a subjective measure of temperament in which calves are separated into small groups of three to five animals and their reactivity to a human observer ranked on a scale of 1 (calm, docile, approachable) to 5 (aggressive, volatile, crazy). Based on temperament score the 10 most Calm, 10 Intermediate, and 10 most Temperamental from each sex (steers and heifers in 2005 and bulls and heifers in 2006) were selected from each calf crop (n = 120).

Whole blood was collected 28 d prior to weaning, at weaning, and 28 and 56 d after weaning. Serum was used to determine concentrations of cortisol (RIA; DPC, Los Angeles, CA) and IgG (ELISA; Bethyl laboratories, Montgomery TX), and plasma was used to determine concentrations of EPI and NE (EIA; Alpco Diagnostics, Salem, NH). Data were analyzed using the MIXED procedure of SAS (SAS Inst. Inc., Cary, NC). Sources of variation included temperament, sex, day, and year.

Results

Serum IgG concentrations were not affected by year ($P = 0.29$), day ($P = 0.09$), temperament ($P = 0.67$), or sex ($P = 0.39$). However, there was a sex x temperament interaction ($P < 0.01$). Specifically, Intermediate steers had greater IgG concentrations compared to Intermediate bulls and heifers. Additionally, there was a sex x day interaction ($P = 0.02$) with bulls having greater IgG concentrations at weaning compared to steers and heifers.

There was no effect of sex on plasma NE concentrations ($P = 0.43$). Steers had lower concentrations of EPI compared to bulls and heifers ($P < 0.01$). Concentrations of NE and EPI were greater in 2005 than in 2006 ($P < 0.01$) and were greater in Temperamental calves than Calm calves ($P < 0.01$; Fig.1)). Concentrations of both NE and EPI decreased over time ($P < 0.01$).

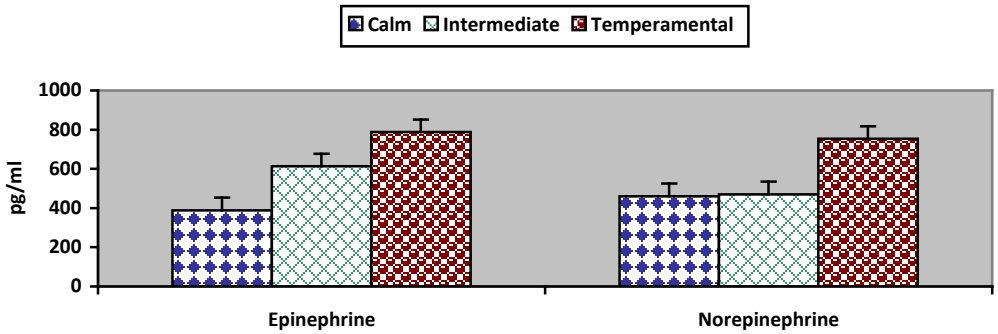


Figure 1. Concentrations of Epinephrine (EPI) and Norepinephrine (NE) in calm, intermediate and temperamental calves (Temperament P < 0.001).

Serum cortisol concentrations were not affected by year ($P = 0.87$). Concentrations of cortisol were greater in Temperamental compared to Calm and Intermediate calves ($P < 0.01$; Fig. 2). Additionally, bulls had lower cortisol concentrations compared to heifers and steers ($P < 0.01$; Fig. 3). Cortisol concentrations were affected by day, with greater cortisol concentrations at weaning and 56 d post-weaning ($P < 0.01$).

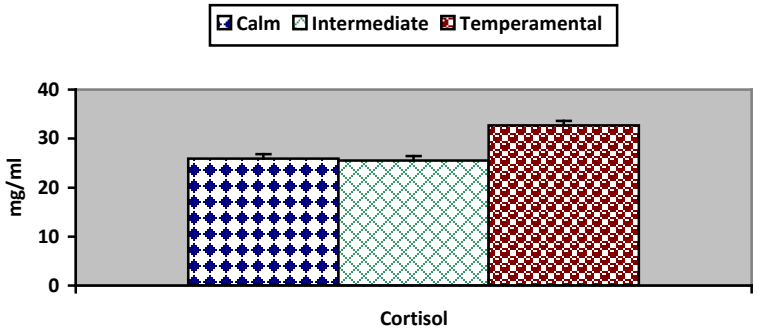


Figure 2. Cortisol concentrations for calm, intermediate and temperamental calves (Temperament *P* < 0.001).

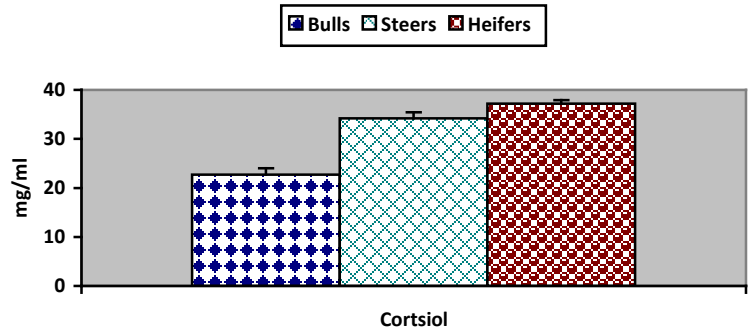


Figure 3. Cortisol concentrations for bulls, steers and heifers (Sex *P* < 0.001)

Implications

There appears to be a relationship between temperament and concentrations of stress hormones. Temperament also influenced IgG concentrations in the calves. In addition, sex of the calf influenced concentrations of cortisol and EPI, and IgG concentrations. Sex differences in IgG and stress hormone concentrations may require development of different therapies and procedures for male and female calves.

Literature Cited

Burrow, H. M., G. W. Seifert, and N. J. Corbet. 1988. A new technique for measuring temperament in cattle. Proc. Aust. Soc. Anim. Prod. 17:154-157.

Burdick, N. C., J. A. Carroll, L. E. Hulbert, J. W. Dailey, S. T. Willard, R. C. Vann, T. H. Welsh, Jr., and R. D. Randel. 2010. Relationships between temperament and transportation with rectal temperature and serum concentrations of cortisol and epinephrine in bulls. Live Sci. 129:166-172.

Curley, Jr., K. O., J. C. Paschal, T. H. Welsh, Jr., and R. D. Randel. 2006. Exit velocity as a measurement of cattle temperament is repeatable and associated with serum concentration of cortisol in Brahman bills. J. Anim. Sci. 84:3100-3103.

Curley, Jr., K. O., D. A. Neuendorff, A. W. Lewis, J. J. Cleere, T. H. Welsh, Jr., and R. D. Randel. 2008. Functional characteristics of the bovine hypothalamic-pituitary-adrenal axis vary with temperament. Horm. Behav. 53:20-27.

Fell, L. R., I. G. Colditz, K. H. Walker, and D. L. Watson. 1999. Associations between temperament, performance and immune function in cattle entering a commercial feedlot. Aust. J. Exp. Ag. 39:795-802.

Fordyce, G., R. M. Dodt, and J. R. Wythes. 1988. Cattle temperaments in extensive beef herds in northern Queensland. 1. Factors affecting temperament. Aust. J. Exp. Agric. 28:683-687.

Hammond, A. C., T. A. Olsen, C. C. Chase, Jr., E. J. Bowers, R.D. Randel, C. N. Murphy, D. W. Vogt, and A. Tweolde. 1996. Heat tolerance in two tropically adapted *Bos taurus* breeds, Senepol and Romosinuano, Compared with Brahman, Angus, and Hereford Cattle in Florida. J. Anim. Sci. 74:295-303.

King, D. A., C. E. Schuehle, R. D. Randel, T. H. Welsh, Jr., R. A. Oliphint, B. E. Baird, K. O. Curley, Jr., R. C. Vann, D. S. Hale, and J. W. Savell. 2006. Influence of animal temperament and stress responsiveness on the carcass quality and beef tenderness of feedlot cattle. Meat Sci. 74:546-556.

Martin, L. B. 2009. Stress and immunity in wild vertebrates: Timing is everything. Gen. Comp. Endocrinol. 163:70-76.

Oliphint, R. A. 2006. Evaluation of the inter-relationships of temperament, stress responsiveness and immune function in beef calves. M.S. thesis, Texas A&M University, College Station.

Voisinet, B. D., T. Grandin, J. D. Tatum, S. F. O'Connor, and J. J. Struthers. 1997. Feedlot cattle with calm temperaments have higher average daily gains than cattle with excitable temperaments. J. Anim. Sci. 75:892-896.

From Bench to Barnyard: Improving Animal Fertility Using Functional Genomics

E. Memili, S. Dogan, K. E. Grant
Laboratory of Animal Functional Genomics, Department of Animal and Dairy Sciences, Mississippi State University, Mississippi State, MS 39762

Research Summary

Fertility is the most essential factor controlling animal reproduction. Reproductive efficiency of the herd is crucial for farmers to have sustainable business to provide quality and cost effective milk and beef for consumers.

Obtaining viable offspring depends on the ability of quality sperm and egg to generate a developmentally competent embryo that initiates pregnancy and sets the stage for fetal development (Figure 1).

Introduction

Despite millions of dollars of economic impact, there are no reliable biomolecular markers to predict quality of semen and embryos. Further, basic biology and molecular signatures of quality sperm and embryo are not well understood.

The long term goal of our laboratory is to increase fertility and decrease infertility in farm animals, primarily in cattle. Specific research objectives in the laboratory include identification of biomolecular markers and mechanisms for determining quality of sperm egg, and embryo.

Materials and Methods

To accomplish our objectives, we conduct research using powerful tools including functional genomics (genomics, transcriptomics, and proteomics) and systems biology with collaborators from academics and industry (publications).

Results and Implications

Our research findings demonstrated specific proteins, RNA and DNA markers associated with sperm and embryo quality. The results are significant because they provide: 1) Better understanding of fundamental biology of sperm, egg, fertilization and embryo development, and 2) molecular markers to predict semen and embryo quality (Table 1).

The research programs in the laboratory also provide quality training opportunities for undergraduate, graduate and post-graduate students in animal functional genomics. This is vital because the students empowered with knowledge and skills in cutting edge research will be leaders as teachers and scientists in animal agriculture to have a positive impact on science, society, and our economy.

Figure 1. It takes two to generate an embryo that sets the stage for later development

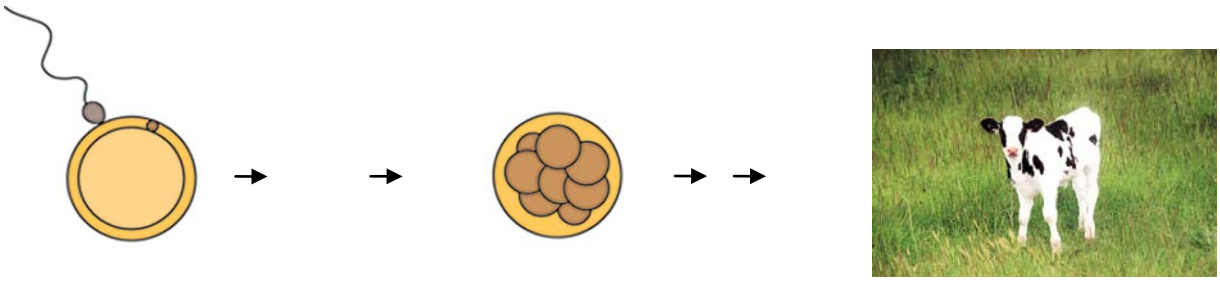


Table 1. Molecular players of fertility in cattle

Gametes & embryos	Markers	Possible functions of the marker	Reference publications
Egg	Proteins involved in oxidative phosphorylation	Maturation of the egg	Peddinti et al., 2010
Sperm	Integrin Beta 5	Fusion of sperm and egg	Feugang et al., 2009
Embryo	HMGN3A, DNA Methyltransferases	Epigenetic regulators of gene expression and development through chromatin remodeling and DNA methylation	Uzun et al., 2009; Rodriguez-Osorio et al., 2010

Publications from the last two years

1. Wang, X., Kaya, A., Memili, E. Proteomic markers in sperm for Angus bull fertility. *Under review.*

2. Feugang, J.,M., Rodriguez-Osorio, N., Kaya, A., Wang, H., Page, G.P., Ostermeier, G.C., Topper, E.K., Memili, E. 2010. Transcriptome analyses of bull spermatozoa: implications for fertility. *In press.* Reproductive Biomedicine online.

3. Peddinti, D., Memili, E., Burgess, S.C. 2010. Proteomic-based systems biology modeling of bovine germinal vesicle stage oocyte and cumulus cell interaction. PLoS One 5(6):e11240.

4. Rodriguez-Osorio, N., Wang, H., Rupinski, J., Bridges, S.M. and Memili, E. 2010. Comparative functional genomics of mammalian DNA methylation. Reproductive Biomedicine online 20(2):243-255.

5. Bovine Genome Sequencing and Annotation Consortium including

Memili E and others. 2009. The genome sequence of Taurine Cattle: A window to ruminant biology and evolution. Science 324(5926):522-528.

6. Rodriguez-Osorio, N., Wang, Z., Kasinathan, P., Page, G.P., Robl, J.M. and Memili, E. 2009. Transcriptional reprogramming of gene expression in bovine somatic cell chromatin transfer embryos. BMC Genomics 10:190.

7. Uzun, A, Rodriguez-Osorio, N., Wang, H., Kaya, A., Parrish, J.J., Ilyin, V. and Memili, E. 2009. Comparative Functional Genomics of Chromatin Remodeling Proteins HMGN3a and SMARCAL1 During Early Mammalian Embryogenesis. BMC Genomics 10:183.

8. Feugang, J.M., Kaya, A., Page, G.P., Chen, L., Mehta, T., Hirani, K., Nazareth, L., Gibbs, R.A. and Memili, E. 2009. Two stage genome wide association study identifies Integrin beta five as having a potential role in bull fertility. BMC Genomics 10: 176.

9. Wang, H., Feugang, J.M., Rodriguez-Osorio, N., Jung, S., Garrison, K., Wolgemuth, C., Greer, L., Memili, E. 2009. Effects of culture media and inhibitors on biology of porcine embryonic development *in vitro.* Livestock Science 121: 102-107.

10. Feugang, J.M., Camargo-Rodriguez, O.D. and Memili, E. 2009. Culture Systems for Bovine Embryos. Livestock Science 121:141-149.

Modifying the Double-Ovsynch protocol to include human chorionic gonadotropin to synchronize estrus in dairy cows and heifers

J. A. Binversie and J. E. Larson
Department of Animal and Dairy Sciences, Mississippi State University, Mississippi State, MS

Research summary

The objectives of this study were to determine whether conception rates were increased, ovulation rates were changed, or follicle and CL characteristics were altered after modifying the Double-Ovsynch protocol to include human chorionic gonadotropin (hCG) compared to the current Double-Ovsynch protocol. Protocols were conducted in nulliparous dairy heifers (13 to16 mo; n=51) and primiparous and multiparous dairy cows (60 to 431 d postpartum; n=92). One of two treatments were randomly assigned to animals blocked by parity. They received either an injection of 200µg GnRH or 2000 IU hCG at the onset of the Pre-Ovsynch. Seven days later all females received 25 mg $PGF_{2\alpha}$ followed 3 d later with an injection of GnRH. After 7 d, cows and heifers started the Breeding-Ovsynch which consisted of an injection of GnRH followed by $PGF_{2\alpha}$ 7 d later and then a second injection of GnRH either 48 (heifers) or 56 (cows) h after the $PGF_{2\alpha}$. Approximately 16 h after the 2nd injection of GnRH of the Breeding-Ovsynch, all cows and heifers received a timed artificial insemination (TAI). Conception rates were similar (23.4 and 23.0%; P > 0.1) for cows treated with GnRH or hCG as well as heifers (30.8 and 36.2%; P > 0.1). Ovulation rates did not differ between cows treated with GnRH or hCG (59.0 and 72.9%; P >0.1) with also no difference observed in heifers (42.9 and 57.9%; P >0.1). In conclusion, these preliminary data indicate that no advantage was achieved by replacing the first injection of GnRH in the Double-Ovsynch protocol with hCG.

Introduction

Previous to the mid-1990s, dairy cattle producers had to perform estrus detection several times a day to determine the appropriate time to inseminate their cows. In 1994, it was estimated that the failure and inaccuracy of heat detection resulted in an annual loss of $300 million to the dairy industry in the United States (Senger 1994). This was due to the fact that most dairy herds have an estrus detection efficiency of less than 50% (Senger 1994). But over the past 10 to 15 years, estrus synchronization protocols have been developed to combat this ever growing problem. These protocols allow dairy producers to use hormonal injections to manipulate a cow's reproductive cycle so that insemination can take place on a specific day of their choice. These protocols are referred to as timed artificial insemination (TAI) protocols. The use of these protocols greatly reduces the need for estrus detection and increases the overall reproductive efficiency of the herd (Pursley et al., 1997a). The greater the conception and pregnancy rate achieved from a protocol, the more profitable it will be to the dairy producer. The original estrus synchronization protocol referred to as Ovsynch, was introduced to the dairy industry in the mid to late 1990s (Pursley et al., 1995; Pursley et al., 1997b), and since then researchers have developed several modifications to the original Ovsynch (Geary and Whittier, 1998; Pursley et al.,

1998; Moreira et al., 2001; El-Zarkouny et al., 2004; Brusveen et al., 2008).

It has been reported that conception rates are greatest when the Ovsynch protocol is initiated on d 5 to 12 of the estrous cycle (Vasconcelos et al., 1999; Cartmill et al., 2001). This results in greater rates of ovulation to the first injection of GnRH of Ovsynch and thus increased conception rates (Vasconcelos et al., 1999; Cartmill et al., 2001). Research indicates that a critical component of successful synchronization of ovulation in dairy cattle involves the inclusion of a presynchronization stage (Moreira et al., 2001; Navanukraw et al., 2004; Bello et al., 2006; Galvão et al., 2007). This presynchronization stage increases the likelihood of ovulation to the first injection of GnRH of Ovsynch, thus leading to increased conception rates. Bello et al. (2006), Galvão et al. (2007), and Souza et al. (2008) reported that with increased synchrony from the presynchronization stage, efficacy of the Ovsynch protocol was then greatly enhanced resulting in increased conception rates.

Souza et al. (2008) introduced the novel idea of putting two Ovsynch protocols together to form what is known as Double-Ovsynch. The first Ovsynch is referred to as Pre-Ovsynch and is used for presynchronizing the female. After the Pre-Ovsynch, another Ovsynch, the Breeding-Ovsynch, is initiated seven days later and the cow will be inseminated after this Ovsynch. In this study, human chorionic gonadotropin (hCG) was utilized in an attempt to improve the presynchronization stage. It is a hormone that has similar activity to luteinizing hormone (LH), inducing ovulation by binding to LH receptors on the ovary and producing LH-like effects (Stevenson et al., 2007). Therefore, ovulation of a dominant follicle using hCG is no longer dependent upon the LH surge produced from an injection of GnRH. Research has shown that hCG has an increased capacity to induce ovulation when compared to GnRH (Dahlen et al., 2007; Stevenson et al., 2007; Dahlen et al., 2008).

The objectives of this experiment were to determine whether conception rates were increased, ovulation rates were changed, or follicle and CL characteristics were altered after modifying the Double-Ovsynch protocol to include hCG compared to the current Double-Ovsynch protocol. The hypothesis is that replacing the first injection of GnRH in the Double-Ovsynch protocol with hCG would increase the percentage of females that ovulate, thus improving the overall presynchronization rate leading to improved conception rates.

Procedures

All procedures in this study were approved by the Institutional Animal Care and Use Committee of Mississippi State University. Protocols were conducted in nulliparous (virgin) dairy heifers (13 to16 mo; n=51) and primiparous (1 lactation) and multiparous (2+ lactations) dairy cows (60 to 431 d postpartum; n=92) during the fall 2009 breeding season at the Bearden Dairy Research Facility. Cows were grouped into 3 replicates with the first two groups enrolled in October while the third group enrolled in December. Heifers were grouped into two replicates with both groups enrolled in November. One of two treatments were then randomly assigned to animals blocked by parity. They received either an injection of 200µg GnRH (Cystorelin; **GnRH**) or 2000 IU hCG (Chorulon; **hCG**) at the onset of the Pre-Ovsynch (Figure 1). Seven days later all females received 25 mg $PGF_{2\alpha}$ (Lutalyse; **$PGF_{2\alpha}$**) followed 3 d later with an injection of GnRH. After 7 d, cows and heifers started the Breeding-Ovsynch which

consisted of an injection of GnRH followed by $PGF_{2\alpha}$ 7 d later and then a 2nd injection of GnRH either 48 (heifers) or 56 (cows) h after the $PGF_{2\alpha}$. Approximately 16 h after the 2nd injection of GnRH of the Breeding-Ovsynch, all cows and heifers received a TAI. Body condition scores (BCS) of all females were also recorded at the time of the first injection of GnRH/hCG for analysis. Scores were based on a 5 point scale (Edmonson et al., 1989): 1 = severe underconditioning to 5 = severe overconditioning. All inseminations were conducted by three AI technicians using sex sorted semen from 13 different sires. Pregnancy diagnosis was performed approximately 35 d post-TAI by palpation per rectum and again at approximately 90 d.

Transrectal ultrasonography was conducted twice for examination of ovarian structures on all cows and heifers. Maximum diameters were recorded of all CLs along with all follicles greater than 4 mm. During first ultrasound examination, the number and size of CLs and follicles present on the ovaries as a result of the first injection of GnRH or hCG was recorded. Follicular measurements from the second ultrasound examination were used to determine the size of the dominant follicle as a result of the injection of GnRH or hCG. Four blood samples were also taken from all cows and heifers throughout the protocol via the coccygeal vein of the tail. Samples were centrifuged and the plasma was collected and frozen at -20°C for later assessment of concentrations of progesterone using solid-phase competitive binding radioimmunoassay progesterone kits (Coat-A-Count, Siemens Medical Solutions Diagnostics, Los Angeles, CA). Blood samples 1 and 2 were used to determine if ovulation had occurred through comparisons of concentrations of progesterone. Blood sample 3 was taken to determine luteal regression, and blood sample 4 was used to determine the cycling status of the animal at the onset of Breeding-Ovsynch. Proper luteal stage at the onset of Breeding-Ovsynch was also assessed and was defined as low P4 (< 1.0 ng/mL) at d 10 and high P4 (> 1.0 ng/mL) at d 17 of protocol. This ensures that the female will be in the range of d 5 to 12 of her estrous cycle and thus more likely to ovulate to the first injection of GnRH of Breeding-Ovsynch.

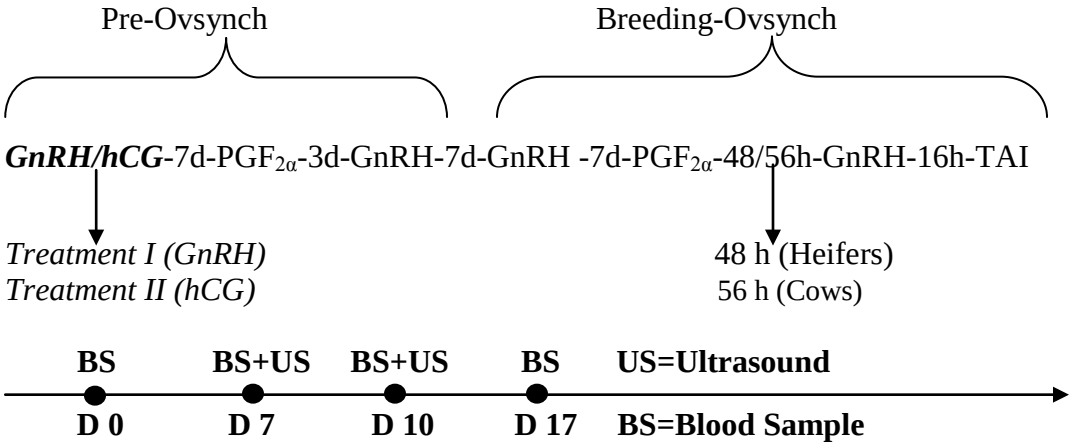


Figure 1. Schematic of treatment protocols and sampling schedule.

Statistical Analysis. The GENMOD procedure of SAS (SAS Inst. Inc., Cary, NC) was used to analyze all binomial data (conception rate, ovulation rate, and luteal stage). The GLM procedure of SAS was used for analysis of largest follicle size at d 7 and 10 post treatment as well as the number of CLs on the ovaries 7 d post treatment. Least square means were separated when a protected F test ($P \leq 0.05$) was detected. Standard errors of means are presented. Cows and heifers were separated for analysis of data. Variables considered for the statistical model for cows were treatment, breed, days in milk (categorized as <100 DIM or ≥100 DIM), milk production (categorized as <100 or ≥100 lbs/day), parity (primiparous vs. multiparous), group, BCS (categorized as <2.75, 2.75 to 3.0, or >3.0), and AI technician. Variables were removed from the statistical model when a P-Value greater than 0.15 was observed. Variables considered for heifers included treatment, breed, age (<15 or ≥15 months of age at AI), group, and BCS (categorized as ≤2.75 or ≥3.0) and AI technician. All two-way interactions between variables were considered for the analysis of data.

Results

Preliminary data are presented for this experiment. Additional data will be collected during the 2010 breeding season to generate more conclusive results. For both dairy cows and heifers, conception rates did not differ ($P > 0.1$) between females treated with hCG and those treated with GnRH (Table 1). However, an overall effect of AI technician ($P < 0.05$) was found to affect conception rates for the cows (Figure 2).

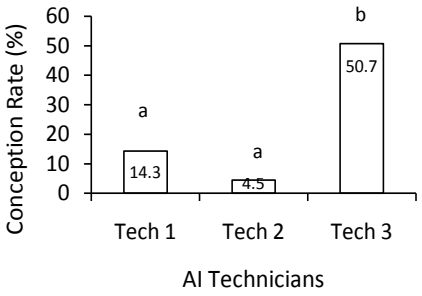


Figure 2. Effect of AI technician (Tech 1; n=30, Tech 2; n=27, and Tech 3; n=35) on conception rates in cows. Different letters differ by $P < 0.05$.

An interaction of treatment by technician was found to affect conception rates in cows as well ($P < 0.05$; data not shown). Conception rates in the heifers were greater ($P < 0.05$) in those animals 15 months or older (48.0%) compared to those heifers less than 15 months (19.2%; Figure 3).

There were no differences observed in ovulation rates between cows treated with hCG or GnRH (74.4 and 60.0%, respectively; Table 1). There was, however, a tendency for an effect of group on ovulation rate ($P = 0.1$; Figure 4). Since the third group of cows were enrolled in the experiment at a cooler time of year compared to the other two groups (December versus October), it is possible the carryover of summer heat stress was still affecting their ovarian responsiveness. Ovulation rates in heifers did not differ ($P > 0.1$) between hCG and GnRH treatments (57.9 and 42.9%, respectively; Table 1). No main effects or interactions were observed to be significantly different for heifers.

There were no differences in the percentage of cows that were at the proper luteal stage at the onset of Breeding-Ovsynch between the hCG and GnRH treated cows ($P > 0.1$; Table 1). Proper

luteal stage in cows had a tendency to be decreased (P = 0.07) for those animals less than 100 DIM (68.5%) compared to those cows greater than or equal to 100 DIM (88.7%; Figure 5). Proper luteal stage for heifers at the onset of Breeding-Ovsynch also did not differ between treatment groups (P > 0.1; Table 1). However, as with conception rates in heifers, age significantly affected whether or not she was at the correct luteal stage at the beginning of Breeding-Ovsynch (P < 0.05; Figure 3).

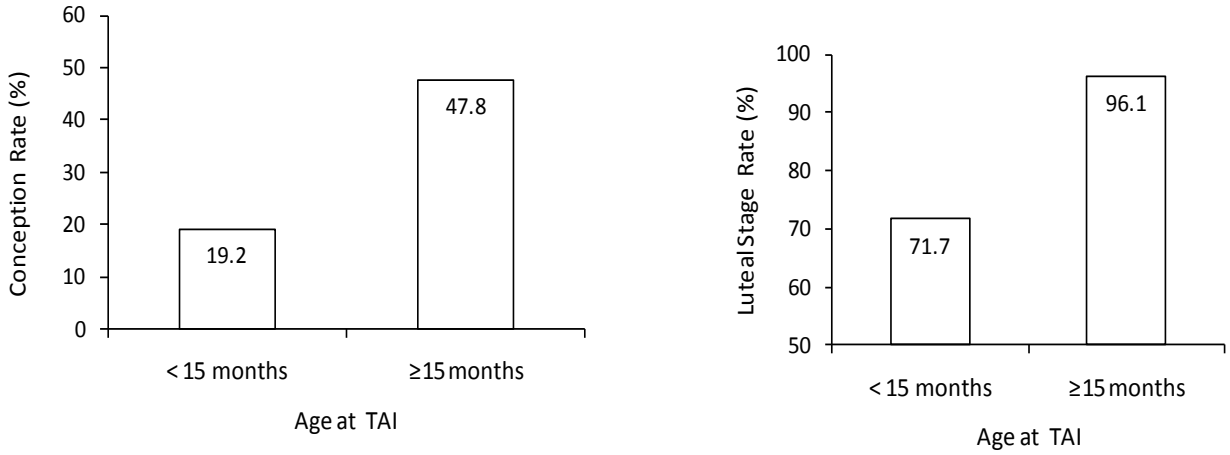


Figure 3. Effect of age (<15 months; n=26 and ≥15 months; n=25) of heifer on conception and proper luteal stage rates. Different letters differ by P < 0.05

For both cows and heifers, proper luteal stage at the onset of Breeding-Ovsynch did not differ between treatment groups. This could explain why no differences were observed in conception rates. Research indicates that the ideal time to start the Ovsynch protocol is d 5 to 12 of the estrous cycle with ovulation to the first injection of GnRH being the most critical (Vasconcelos et al., 1999; Cartmill et al., 2001; Bello et al., 2006; Galvão et al., 2007). Since no differences were observed for proper luteal stage between females treated with GnRH or hCG, it is likely ovulation rates to the first injection of GnRH of Breeding-Ovsynch were similar between treatment groups. However, ovulation rates to the first injection of GnRH of Breeding-Ovsynch were not determined for this experiment.

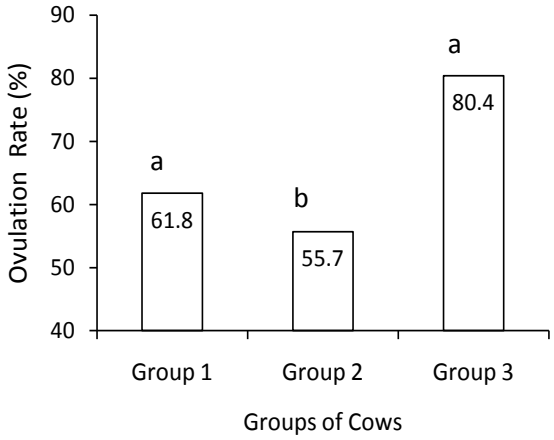


Figure 4. Effect of group (Group 1; n=23, Group 2; n=25 and Group 3; n=31) on ovulation rate in cows. Different letters differ by $P < 0.05$

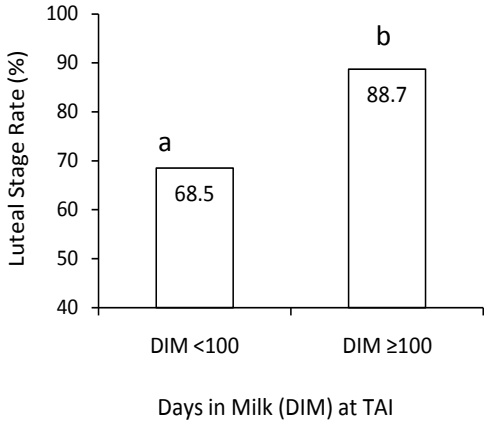


Figure 5. Effect of days in milk (DIM<100; n=56 and DIM≥100; n=36) on proper luteal stage rate at onset of Breeding-Ovsynch in cows. Different letters differ by $P < 0.05$

Table 1. Conception, ovulation and proper luteal stage rates

	Cow			Heifer		
Parameter	GnRH	hCG	P-Value	GnRH	hCG	P-Value
No. of animals	46	46		26	25	
Conception rate (%)	23.4	23.0	P > 0.1	30.8	36.2	P > 0.1
Ovulation rate (%)	59.0	72.9	P > 0.1	42.9	57.9	P > 0.1
Proper luteal stage rate (%)	82.2	75.0	P > 0.1	80.4	87.4	P > 0.1

Ovarian Characteristics. The number of CLs on the ovaries 7 d post treatment was greater (P < 0.05) in cows treated with hCG compared to GnRH (1.82 and 1.20, respectively; Table 2). Group did have an effect on the number of CLs (P < 0.1; Table 3). Again, as with ovulation rate in cows, this could be attributed to the third group of cows being enrolled in the trial at a cooler time of year as compared to the first two groups. For heifers, the number of CLs found on the ovaries 7 d post treatment was greater (P < 0.05) in the hCG group compared to the GnRH group (1.43 and 0.94, respectively; Table 2). No other main effects or interactions were found to be significant in the heifers. Although no differences were found in ovulation rates, hCG treated animals did have significantly greater number of CLs on d 7 post treatment indicating that hCG caused multiple ovulations when administered as compared to GnRH. This data is in agreement with Stevenson et al. (2008) which observed significantly increased luteal structures in dairy cows and heifers treated with hCG as compared to GnRH 7 d post treatment.

The size of the largest follicle present on either ovary 7 d post treatment was similar (P > 0.1) between the hCG and GnRH treated cows (11.5 ± 0.6 and 12.6 ± 0.6 mm; Table 2). Stevenson et al. (2007) also compared largest follicle size between cows treated with GnRH or hCG 7 d post treatment and no differences were observed. However, for this study, size of the largest follicle on d 7 was found to be affected (P < 0.05) by parity when comparing primiparous and multiparous cows (10.5 ± 0.7 and 13.6 ± 0.4 mm; Table 4). This difference could be attributed to the fact that multiparous cows generally have greater milk production and feed intake than primiparous cows. This could then cause increased follicular size in multiparous cows due to increased metabolism of progesterone through the increase in feed intake (Sangsritavong et al., 2002). Interestingly, size of the largest follicle 7 d post treatment was larger (P < 0.05) for hCG compared to GnRH treated heifers (13.0 ± 0.7 and 10.8 ± 0.8 mm; Table 2). In contrast, Dahlen et al. (2008) measured largest follicle size 2 d post hCG and GnRH treatment in Holstein heifers and reported significantly smaller follicle sizes for the hCG group. However by d 4, hCG treated heifers only tended to have smaller follicle sizes when compared to the GnRH treated heifers. It is unclear why the heifers treated with hCG had a larger follicle size 7 d post treatment; additional data generated may provide more conclusive evidence.

The size of the dominant follicle was measured d 10 post treatment and there was no difference (P > 0.1) between hCG and GnRH treated cows (14.3 ± 0.7 and 15.1 ± 0.7 mm; Table 2). Parity again was found to affect (P <0.05) follicle size when comparing primiparous and multiparous cows (13.3 ± 1.0 and 16.1 ± 0.5 mm; Table 4) The size of the dominant follicle 10 d post treatment was not analyzed for heifers

due to the fact a large proportion of heifers had already ovulated at that time.

Table 2. Ovarian characteristics on d 7 and 10 post treatment

	Cow			Heifer		
Parameter	GnRH	hCG	*P*-value	GnRH	hCG	*P*-value
No. of animals	46	46		21	24	
D 7 Largest follicle size (mm)	12.6 ± 0.6	11.5 ± 0.6	$P > 0.1$	10.8 ± 0.8	13.0 ± 0.7	$P < 0.05$
D 7 No. of CLs	1.20 ±0.16	1.82 ±0.13	$P < 0.05$	0.94 ±0.16	1.43 ±0.16	$P < 0.05$
D 10 dominant follicle size (mm) (mm(mm)(mm)	15.1 ± 0.7	14.3 ± 0.7	$P < 0.05$	N/A	N/A	N/A

Table 3. Number of CLs on d 7 post treatment in cows

Parameter	Group 1	Group 2	Group 3	*P*-value
No. of cows	29	27	36	
Day 7 CLs	1.39 ± 0.16	1.36 ± 0.17	1.79 ± 0.15*	$P < 0.1$

***** Differs from groups 1 and 2 by P = 0.05

Table 4. Follicle sizes on d 7 and 10 post treatment in cows

Parameter	Primiparous	Multiparous	*P*-value
No. of cows	26	66	
Day 7 largest follicle size (mm)	10.5 ± 0.7	13.6 ± 0.4	$P < 0.05$
Day 10 dominant follicle size (mm)	13.3 ± 1.0	16.1 ± 0.5	$P < 0.05$

Implications

These data indicate that the inclusion of hCG in the Double-Ovsynch protocol does not improve conception rates, however, additional data is needed to make this conclusion. No differences have been observed in conception, ovulation, and proper luteal stage rates. If desirable results are observed with the addition of more animals, the findings of this study could benefit the dairy industry by providing a potentially more efficacious breeding program to producers which in turn will increase the reproductive efficiency and profitability of their herds.

References

Bello, N.M., J.P. Steibel, and J.R. Pursley. 2006. Optimizing ovulation to first GnRH improved outcomes to each hormonal injection of Ovsynch in lactating dairy cows. J. Dairy Sci. 89: 3413-3424.

Brusveen, D. J., A. P. Cunha, C. D. Silva, P. M. Cunha, R. A. Sterry, E. P. B. Silva, J. N. Guenther, and M. C. Wiltbank. 2008. Altering the time of the second gonadotropin-releasing hormone injection and artificial insemination (AI) during Ovsynch affects pregnancies per AI in lactating dairy cows. J. Dairy Sci. 91: 1044-1052.

Cartmill, J. A., S. Z. El-Zarkouny, B. A. Hensley, G. C. Lamb, and J. S. Stevenson. 2001. Stage of cycle, incidence, and timing of ovulation, and pregnancy rates in dairy cattle after three timed breeding protocols. J. Dairy Sci. 84:1051–1059.

Dahlen, C. R., J. E. Larson, G. Marquezini, and G. C. Lamb. 2007. Effects of human chorionic gonadotropin (hCG) and gonadotropin releasing hormone (GnRH) on follicle and corpus luteum dynamics and concentrations of progesterone in pre-pubertal Angus heifers. J. Anim. Sci. 85(E-Suppl. 1):648. (Abstr.).

Dahlen, C. R., and G. C. Lamb. 2008. Effect of human chorionic gonadotropin (hCG) on ovarian structure dynamics and concentrations of progesterone in cycling Holstein heifers. J. Dairy Sci. 91(E-Suppl. 1):249. (Abstr.).

Edmonson A. J., I. J. Lean, L. D. Weaver, T. Farver, and G. Webster. 1989. A body condition scoring chart for Holstein dairy cows. J. Dairy Sci. 72:68–78.

El-Zarkouny, S. Z., J. A. Cartmill, B. A. Hensley, and J. S. Stevenson. 2004. Pregnancy in dairy cows after synchronized ovulation regimens with or without presynchronization and progesterone. J. Dairy Sci. 87:1024–1037.

Galvão, K.N., M.F. Sá Filho, and J.E.P. Santos. 2007. Reducing the interval from presynchronization to initiation of timed artificial insemination improves fertility in dairy cows. J. Dairy Sci. 90: 4212–4218.

Geary, T. W., and J. C. Whittier. 1998. Effect of a timed insemination following synchronization of ovulation using the Ovsynch or Co-Synch protocol in beef cows. Prof. Anim. Sci. 14:217–220.

Moreira, F., O. Orlandi, C.A. Risco, R. Mattos, F. Lopes, W.W. Thatcher. 2001. Effects of presynchronization and bovine somatotropin on pregnancy rates to a timed artificial insemination protocol in lactating dairy cows. J. Dairy Sci. 84:1646–59.

Navanukraw, C., D. A. Redmer, L. Reynolds, J. D. Kirsch, A. T. Grazul-Bilska, and P. M. Fricke. 2004. A modified presynchronization protocol improves fertility to timed artificial insemination in lactating dairy cows. J. Dairy Sci. 87:1551–1557.

Pursley, J.R., M.O. Mee, M.C. Wiltbank. 1995. Synchronization of ovulation in dairy cows using $PGF_{2\alpha}$ and GnRH. Theriogenology 44:915–23.

Pursley, J. R., M. R. Kosorok, and M. C. Wiltbank. 1997a. Reproductive management of lactating dairy cows using synchronization of ovulation. J. Dairy Sci. 80:301–306.

Pursley, J. R., M. C. Wiltbank, J. S. Stevenson, J. S. Ottobre, H. A. Garverick, and L. L. Anderson. 1997b. Pregnancy rates per artificial insemination for cows and heifers inseminated at a synchronized ovulation or synchronized estrus. J. Dairy Sci. 80:295–300.

Pursley, J. R., R. W. Silcox, and M. C. Wiltbank. 1998. Effect of time of artificial insemination on pregnancy rates, calving rates, pregnancy loss, and gender ratio after synchronization of ovulation in lactating dairy cows. J. Dairy Sci. 81:2139–2144.

Sangsritavong, S., D.K. Combs, R. Sartori, M.C. Wiltbank. 2002. High feed intake increases blood flow and metabolism of progesterone and estradiol-17ß in dairy cattle. J. Dairy Sci. 85:2831–42.

Senger, P. L. 1994. The estrus detection problem: new concepts, technologies, and possibilities. J. Dairy Sci. 77:2745-2753.

Souza, A.H., H. Ayres, R.M. Ferreira, and M.C. Wiltbank. 2008. A new presynchronization system (Double-Ovsynch) increases fertility at first postpartum timed AI in lactating dairy cows. Theriogenology 70: 208-215.

Stevenson, J.S., M.A. Portaluppi, D.E. Tenhouse, A. Lloyd, D.R. Eborn, S. Kacuba, and J.M. DeJarnette. 2007. Interventions after artificial insemination: conception rates, pregnancy survival, and ovarian responses to gonadotropin-releasing hormone, human chorionic gonadotropin, and progesterone. J. Dairy Sci. 90:331-340.

Stevenson, J. S., S. M. Tiffany, and E. Inskeep. 2008. Maintenance of pregnancy in dairy cattle after treatment with human chorionic gonadotropin or gonadotropin-releasing hormone. J. Dairy Sci. 91:3092–3101.

Vasconcelos, J. L. M., R. W. Silcox, G. J. M. Rosa, J. R. Pursley, and M. C. Wiltbank. 1999. Synchronization rate, size of the ovulatory follicle, and pregnancy rate after synchronization of ovulation beginning on different days of the estrous cycle in lactating dairy cows. Theriogenology 52:1067–1078.

Performance of Holstein heifers supplemented with Coccidiostat, Mannanoligosaccharide, or β-glucan

J.M. Graves and S. Hill Ward
Department of Animal and Dairy Sciences, Mississippi State University, Mississippi State, MS 39762

Research Summary

40 Holstein heifer calves were used to evaluate the effects of replacing antibiotics in milk replacer with yeast products. Calves were fed either: coccisidostat, mannanoligosaccharide (MOS), β-glucan, coccidiostat + MOS, coccidiostat + β-glucan, or MOS + β-glucan. Heifers were assigned to treatment at birth and remained on trial until 56 days of age. Throughout the trial, body measures, dry matter intake, and blood metabolites were measured to assess growth and immune status of heifers. Also, fecal samples were obtained to determine the effects of these yeast products on bacterial shedding. Because treatment diets were similar (equal in protein and energy), there were no differences in intake, growth, or immune responses. Calves fed MOS did have a higher shedding of fecal E. coli, but showed no differences in presence of coccidia. The results of this study indicate that these yeast products may be suitable replacements for antibiotics in milk replacers. However, given the expense of isolating β-glucan, it seems that the correct dosage of yeast or MOS (dosage TBD) would be sufficient to provide immune support.

Introduction

Public Health Concern

Today's consumers are becoming more and more aware of where their food products originate. Concerns of microbial resistance due to the use of sub-therapeutic antibiotics in food production animals has raised many eye brows in recent years with in the medical community as well as with animal producers. It is believed that human pathogens are becoming resistant to certain antibiotics due to the sub-clinical use of antibiotics in animals that are reared for consumption and the potential for translation of these antibiotics into the food product. As public health concerns increase, producers will be limited or eventually banned from using antimicrobial agents for therapeutic and growth promotion uses. Europe, Denmark, and Sweden have all taken measures to ban the use of antibiotics as growth promoters in food animals. According to Wierup (2001) and Inborr (1996), there was an increase in post-weaning scour rates following the restricted use of antimicrobial growth promoters. Phillips et al. (2004) states that most of the antibiotic resistance problem in humans comes from human use, however, there has been a concerted attack against agricultural use of antibiotics. Because of this "attack", animal scientist and producers have been working in collaboration to find an alternative to the use of sub-therapeutic use of antibiotics.

The administration of an antimicrobial, usually as a feed additive, over a period of time, to growing animals that results in improved physiological performance, is the definition of growth promotion given by, Phillips et al. (2004). In the 1940s, chickens were fed by-products of tetracycline and were found to grow faster than those not fed the by-products. This is when growth promoting effects of

antibiotics were first discovered (Stokestad et al., 1949). Since then, poultry, swine, and cattle producers have utilized some antibiotics, or derivatives, as growth promoters. Phillips et al. (2004) state that antimicrobials are an integral part of efficient and humane livestock production, as growing the best animal in the shortest length of time with the least amount of disease interference is a main objective in livestock production. Swine producers use therapeutic antibiotics during the weaning phase to treat gastrointestinal disorders and then later in life to treat pneumonia, whereas cattle producers use antibiotics mostly to treat respiratory infections in calves and mastitis in cows (Phillips et al., 2004).

As the demand to find alternatives to antibiotics increases, scientist are working hard to find products that will allow producers to still achieve their goal to raise quality animal products in the fastest time, the most efficiently. Researchers have investigated yeast cultures and yeast cell wall products as the basis for alternatives for antibiotics. Two of products being investigated include Mannanoligosaccharides and β-glucans.

Feed Additives

Mannanoligosaccharide

Bacteria have specific binding cites for particular carbohydrates. Therefore, intestinal bacteria attach themselves to a preferred carbohydrate and then make it across the gut wall. *E. coli*. is an example of a bacteria that chooses to bind to mannan. Mannanoligosaccharide (MOS) is a carbohydrate fraction of the yeast cell wall that is not digestible, therefore as the bacteria attaches to MOS, it leaves the gut still attached. These carbohydrates are not hydrolyzed by digestive enzymes like other sugars and soluble carbohydrates, but instead are broken down by different lactobacilli and some bifidobacteria (Blezinger, 2006). The yeast cell wall is composed of glucan, mannan, and chitin. The matrix of the cell wall is comprised of glucan, while the mannan sugars protrude from the surface of the cell wall (Blezinger, 2006). The mannan portion of the cell wall which is about 30% influences cell adhesion and the glucan fraction which also makes up about 30% of the cell wall is recognized by immune system (Blezinger, 2006). In human research, oligosaccharides also have served as probiotics, enhancing the non-pathogenic microbes in the intestine. In animal research, they aid in eliminating pathogenic bacteria and reducing incidence of disease (Spring, 1998). In a neonatal calf study performed by Heinrichs et al. (2003), calf starter with MOS did increase feed intake, post-weaning. There was no growth difference between animals fed MOS than those fed antibiotics in feed. Heinrichs et al.(2003) also found no differences in average daily gain from feeding MOS in milk replacer, but did find that calves with scours recovered more rapidly. Hill et al. (2008) suggest that MOS be used as an alternative growth promoter in production animals.

β-glucans

β-glucans are polysaccharides linked by glycosidic bonds. They are found most commonly in the cellulose of plants, the bran of cereal grains, the cell wall of baker's yeast, fungi, mushrooms, and bacteria. Of these possible places of β-glucans to be found, the most widely used is yeast, more specifically, *Saccharomyces cerevisiae*. β-glucans that come from yeast cell walls are known for their ability to modulate and activate the immune system. For this reason, they are called "biological response modifiers". The cell wall of *S. cervisiae* is a matrix composed of chitin, mannoproteins, and β-glucans (Lesage and Bussey, 2006). Eicher et al. (2006) performed a study using β-glucan in concert with ascorbic acid

(vitamin C), as vitamin C is also an immunomodulator as well as an antioxidant, to evaluate the response of 32 cross-bred neonatal cross-bred pigs when challenged with lipopolysaccharide (LPS). The results from this study showed ADG was greater ($P < 0.05$) in pigs supplemented with both β-glucan and vitamin C compared to the control or only vitamin C. Cortisol response was less ($P < 0.01$) for the vitamin C-supplemented pigs compared to control. It is recommended that β-glucans be fed in concert with ascorbic acid (Vitamin C) to obtain the most effective results. The preferred dosage of β-glucan supplementation is between .2 to .8 mg per kilogram of body weight, while the preferred amount of Vitamin C is between 250 to 500 mg per kilogram of feed per day. NUTRI-FERM ENERGY PLUS™ is a presently-preferred form of β-glucan, which is derived from yeast. It is produced by Natural Chem Industries, Ltd., Houston, TX.

Objectives:

1. To evaluate calf performance from 0-8 weeks of age when supplemented with coccidiostat, MOS, β-glucan, coccidiostat + MOS, coccidiostat + β-glucan, or MOS + β-glucan.
2. To determine the effectiveness these supplements have on growth promotion, feed intake/efficiency, and overall health status in calves.
3. To evaluate the efficacy of these antibiotic alternatives on E. *coli* shedding.

Materials and Methods

General Treatment

Forty Holstein heifer calves (n=40) were used in the current trial at the Bearden Dairy Research Center at Mississippi State University. At birth, calves were randomly assigned to one of five different treatment groups. Calves were individually housed in plastic hutches made by Calf Tel® which were bedded with wheat straw. In order to maintain a dry, insulated environment for calves, additional wheat straw was added as needed. Nose-to-nose contact between calves was eliminated by hutch arrangement. The trial was conducted over an eight week period, where calves were weaned at six weeks of age and remained in hutches until eight weeks of age. Calves were fed 1 ga (1.5 lb powder) of a non-medicated milk replacer (22% CP, 20% Fat: Land O'Lakes) from an open pail once daily at 0630 until day 35, at which daily milk allowance was then reduced to ½ ga (0.8 lb powder). At day 42, calves were weaned. After milk feeding, buckets were rinsed and filled with water, allowing calves ab libitum access to water until next feeding. A non-medicated starter grain (18% CP) was offered in increments of 2.0 lb/d starting at 1 day of age. When a calf had no feed refusals, grain allowance was increased by 2 lb/d. All 40 calves used for this study were born between September 2009 and February 2010.

Individual Treatment Specifications

As calves were born, they were alternately assigned to one of five treatments. Treatments were as follows: **CX** (1 g/d Deccox, **MOS** (0.02 lb/d Mannanoligosaccharide), **β-g** (0.001 lb/d β-glucan), **CX + MOS** (0.002 lb/d Deccox + 0.02 lb/d Mannanoligosaccharide) and **MOS + β-g** (0.02 lb/d Mannanoligosaccharide + 0.001 lb/d β-glucan). Treatment additives were mixed with 100mL warm water and then added to milk replacer at feeding.

Growth Performance

Calves were separated from dams within 12 h after birth. At that time, calves received 0.75 ga of colostrum via esophageal feeding tube. A single blood sample was collected via jugular venipuncture between 2 and 7 d after birth to ensure adequate time for IgG absorption. IgG concentrations were determined using a single radial immunodiffusion kit (VMRD Inc., Pullman, WA). Body weight (BW), hip height (HH), hip width (HW), wither height (WH) and body length (BL) was measured at birth, once weekly and the final day on trial. Body temperatures were also recorded weekly. Grain refusals (orts) were collected and measured daily and then pooled by treatment for weekly feed analysis. Analyses of feed samples were completed in the Scales Nutrition Laboratory in the Animal and Dairy Sciences Department at Mississippi State University for: dry matter (DM), nitrogen (N), Fat, NDF and ADF (according to AOAC methods).

Health status and blood sampling

Respiratory and fecal scores were evaluated and recorded daily at feeding according to Hill et al. (2009). Briefly, fecal scores were determined on a 5 point scale where 1 represented normal (soft, solid, no fluid), 2 soft (semi-solid), 3 Runny (soft, mostly fluid), 4 Watery (fluid) and 5 bloody. Respiratory scores were as follows: 1-normal, 2- runny nose, 3-heavy breathing, 4-moist cough and 5-dry cough. Two blood samples were collected once weekly (Wednesdays), 4 hours after feeding; one 5 mL vaccutainer containing EDTA for complete blood count (CBC) analysis with differential and one 10mL vaccutainer containing no anticoagulant. Samples were immediately transported (7 miles) to the laboratory. The whole blood samples were analyzed for CBC in the Animal Pathophysiology Laboratory of the College of Veterinary Medicine at Mississippi State University. The blood samples containing no anticoagulant were processed in the Animal Physiology Lab at Mississippi State University; centrifuged at 3000 x g at 4°C for 30 minutes and then serum was stored in 1.5 mL polypropylene tubes at -20°C until further analysis of cortisol concentrations. Cortisol samples were analyzed via radioimmunoassay (Coat-A-Count, Siemens Healthcare Diagnostics Inc., Los Angeles, CA).

Fecal Sampling

Fecal samples were collected weekly until calves reached 21 days of age and then twice weekly to analyze for the presence of Coccidia. Analysis was conducted in the Animal Pathophysiology Laboratory of the College of Veterinary Medicine at Mississippi State University. The additional fecal samples were collected given the 21 d lifecycle of Coccidia. E.*coli* shedding was recorded and analyzed by taking a fecal sample from each calf at weeks 2, 4 and 8. A sterile 10µL loop of fecal material was placed into 990µL of LB broth. A 10-fold serial dilution was conducted to yield a 10^{-4} dilution and was then plated on MacConkey agar. Plates were incubated for 24 hrs at 37°C. After incubation time was complete, colony forming units (CFU's) were counted.

Feed Analysis

All samples were first dried for 48 hrs in a 64°C drying oven to obtain "Air Dry" data. Samples were then ground in a Willy Mill through a 2 mm screen. Ground samples were placed back into its original sample container (Whirl-pak) until further analysis. Feed was analyzed for dry matter, ash, ndf/adf, fat and nitrogen according to AOAC protocols (AOAC, 1984).

Statistical Design and Analysis

A completely randomized design was used as the experimental design of this

project. Class variables included Calf_ID, treatment, and week. All data were analyzed using the MIXED procedure of SAS (version 9.2). Orthogonal contrast statements were used to determine differences between treatments if present, the contrast statements were: 2 vs. 3, 2 vs. 5, 3 vs. 5 and 1 vs. all. Data sets containing multiple measures per calf were analyzed by ANOVA for repeated measures. Treatment differences with $P \leq 0.05$ were considered significant, while $0.05 < P \leq 0.10$ were considered a tendency.

Results

Calf IgG concentrations were adequate for passive transfer of immunity in all calves in the present study. Calf nutrient intake and growth measures among treatment groups were similar ($P \geq 0.05$; Table 1; Figure 1.). Likewise, there were no differences between treatment group in blood parameters ($P \geq 0.05$; Table 2).

Figure 1. Growth performance of Holstein heifers fed CX, MOS, β-GLUCAN, or some combination.

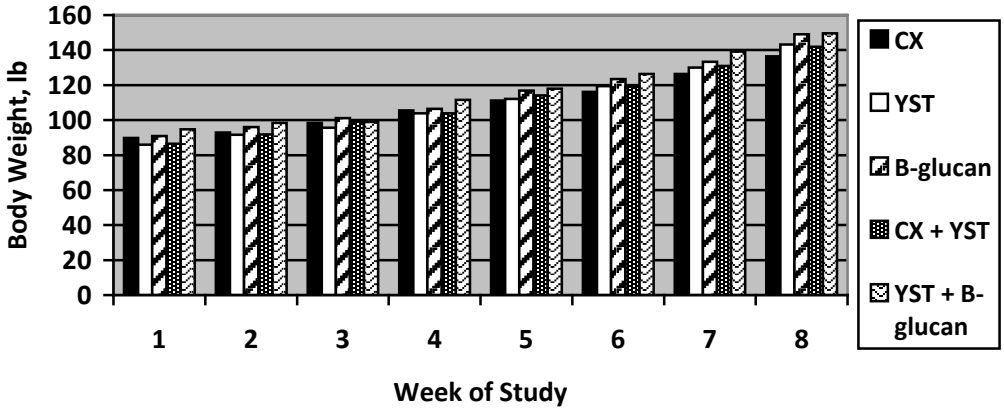


Figure 2. E. c*oli* concentrations in feces of heifers fed CX, MOS, β-GLUCAN, or some combination.

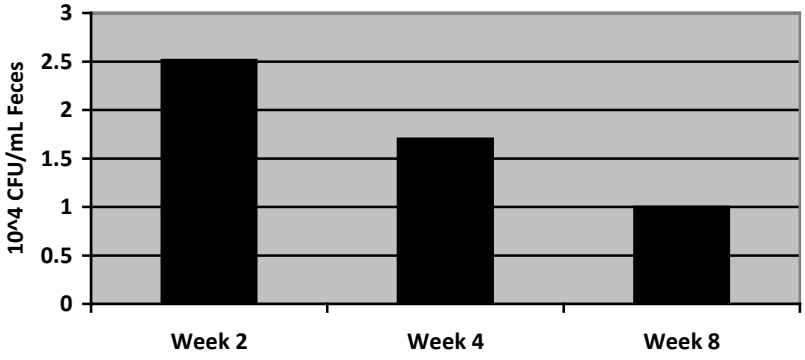


Table 1. Nutrient Intake and Growth Measures in Holstein heifers fed CX, MOS, β-GLUCAN, or some combination.

	Treatment						P <	
	CX	**YST**	**B-glucan**	**CX + YST**	**YST + B-glucan**	**SEM**	**Trt**	**Period**
DMI: Starter grain, lb/d								
Period 1[1]	0.220	0.374	0.419	0.308	0.374	0.176	0.25	0.01
Period 2[2]	1.278	1.762	1.762	1.410	2.026	0.198		0.01
Period 3[3]	3.546	4.141	3.789	3.568	4.185	0.176		0.01
DMI: Milk, lb/d								
Period 1	1.564	1.564	1.564	1.564	1.564	-		-
Period 2	0.771	0.771	0.771	0.771	0.771	-		-
Period 3	0	0	0	0	0	-		-
DMI: Total[4], lb/d								
Period 1	1.784	1.938	2.004	1.872	1.938	0.176	0.25	0.001
Period 2	2.048	2.555	2.533	2.181	2.819	0.198		0.001
Period 3	3.546	4.141	3.811	3.590	4.185	0.176		0.001
CP Intake: Total, lb/d								
Period 1	0.352	0.374	0.396	0.374	0.374	0.044	0.29	0.001
Period 2	0.396	0.507	0.507	0.441	0.551	0.044		0.001
Period 3	0.683	0.793	0.705	0.683	0.837	0.044		0.001
NDF Intake: Starter, lb/d								
Period 1	0.044	0.088	0.066	0.066	0.066	0.044	0.26	0.001
Period 2	0.264	0.374	0.308	0.264	0.374	0.044		0.001
Period 3	0.749	0.881	0.705	0.683	0.705	0.044		0.001
ADF Intake: Starter, lb/d								
Period 1	0.022	0.044	0.044	0.022	0.022	0.022	0.28	0.001
Period 2	0.110	0.154	0.132	0.110	0.176	0.022		0.001
Period 3	0.286	0.352	0.308	0.264	0.286	0.022		0.001
Initial BW, lb	86.3	86.1	87.0	83.9	90.5	2.70	0.10	-
Final BW, lb	136.3	142.9	149.1	141.8	148.2	5.88	0.10	-
ADG, lb/d	0.90	1.01	1.10	1.03	1.05	0.08	0.10	-
Feed Efficiency[5]	0.85	0.88	0.96	0.92	0.88	0.04	0.41	-

[1] Period 1 = d 1 to 34, [2] Period 2 = d 35 to 41, [3]Period 3= d 42 to 55, [4] Total DMI= Starter DMI + Milk DMI, [5] Feed Efficiency = Gain/Feed

Table 2. Blood Parameters in Holstein heifers fed either CX, MOS, β-GLUCAN, or some combination.

	CX	MOS	β-GLUCAN	CX + MOS	MOS + β-GLUCAN	SEM	P-value
	Blood Parameters, Mean ± SE						
White Blood Cells, K/ul	8.39	7.92	7.73	8.29	8.80	0.65	≥0.05
Red Blood Cells, M/ul	8.40	8.44	8.27	8.48	20.2	5.42	≥0.05
Hemoglobin, g/dl	10.7	11.0	10.8	11.3	11.7	0.42	≥0.05
Hematocrit, %	29.1	30.2	28.2	31.0	31.4	1.17	≥0.05
Platelets, K/ul	1264	1118	1290.2	926	1229	125	≥0.05
Plasma Protein, g/dl	5.97	6.71	5.95	6.09	6.09	0.37	≥0.05
Neutrophil, #/ul	3455	3589	3332	3336	3643	401	≥0.05
Lymphocyte, #/ul	4829	3973	4073	4425	4806	351	≥0.05
Monocyte, #/ul	346	305	337	270.6	261.5	77	≥0.05
Eosinophil, #/ul	52.3	43.0	17.3	37.5	25.9	13.7	≥0.05
Basophil, #/ul	43.7	30.0	16.8	44.3	36.9	9.82	≥0.05

Weekly body measurements were recorded and analyzed and no differences were found among treatments for BW, WH, HH, HW or BL ($P < 0.71$, 0.75, 0.19, 0.74 and 0.58, respectively). No treatment differences were observed in fecal and respiratory scores or rectal temperatures ($P \geq 0.05$) in calves. The presence of Coccidia was also not different ($P < 0.77$) between treatment groups, however, calves between the age of 28 and 49 d of age, had significantly higher ($P \leq 0.05$) observations of fecal coccidia when compared to calves between the ages of 7 to 24 d or 52 to 56 d of age. Cortisol concentrations ranged from 0.22 to 126.19 ng/mL, however, there were no differences between treatments ($P = 0.92$). Heifers fed MOS or MOS + β-glucan had higher ($P = 0.02$ and $P < 0.01$, respectively) fecal concentrations of E. *coli* compared to heifers fed CX, CX + MOS, or β-glucan alone. Fecal E. *coli* concentrations were lower ($P < 0.05$) in week 8 when compared to weeks 2 and 4 (Figure 2).

Discussion and Conclusions

The objectives of this study were to evaluate the efficacy of using antibiotic alternatives such as MOS and β-glucan on calf growth and health performance and feed intake/efficiency. The purpose of this study was also to evaluate the effects these products have on E. *coli* shedding. Based on the results we found, feeding these products as the given dosages, had no beneficial impact on growth and health performance, which includes feed intake and efficiency, fecal and respiratory health and blood parameters. All calves were healthy throughout the duration of the trial. Our feed intake findings are in contrary with Heinrichs et al. (2003) where MOS-fed calves had improved feed intake, however, our growth and blood parameter results are similar to those found in the same experiment. The E. *coli* shedding results found in the current study may be an indication of the gram (-) binding and non-digestible properties of MOS, which increased E. *coli* shedding, serving as a

suitable alternative for sub-therapeutic antibiotic use while maintaining a healthy calf. Further studies need to be conducted to determine optimum dose and feeding method (example: milk/milk replacer or starter grain) of these products.

Implications

Results from this study show that while these calves did not demonstrate and increase in feed intake nor gain due to the addition of yeast products to their diets, there was also no decrease in intake, gain, or other negative impacts. This indicates that these particular yeast supplements may be acceptable replacements in milk replacers for antibiotics and additives with antibiotic-like properties. Other researchers have shown a positive impact on intake with the addition of these products and the conflicting results in this study show that more work is needed to determine the proper dosage to achieve those positive results as well as exploring the effectiveness of these types of additives in immune-compromised calves.

Acknowledgments

The authors wish to thank Novus International, Inc. (Novus Animal Health) for partial funding of this project. We would also like to express gratitude to the employees at the Bearden Dairy Research Center for their guidance and assistance with this trial.

References

Association of Official Analytical Chemists. 1984. Official Methods of Analysis, 14th ed. AOAC, Arlington VA.

Blezinger, S. 2006. Yeast Products Can Have Positive Effects On Cattle Performance. http://www.cattletoday.com/archive/2006/June/CT489.shtml

Eicher, S.D., C.A. McKee, J.A. Carroll and E.A. Pajor. 2006. Supplemental vitamin C and yeast cell wall β-glucan as growth enhancers in newborn pigs and as immunomodulators after an endotoxin challenge after weaning. J. Anim Sci. 84:2352-2360.

Heinrichs, A.J.,C.M. Jones, and B.S. Heinrichs.2003. Effects of Mannan Oligosaccharide or Antibiotics in Neonatal Diets on Health and Growth of Dairy Calves. J.Dairy Sci.86:4064-4069.

Hill,S.R., B.A. Hopkins, S.Davidson, S.M. Bolt, D.E. Diaz, C.Brownie, T.Brown, G.B. Huntington, and L.W. Whitlow. 2009. The addition of cottonseed hulls to the starter and supplementation of live yeast or mannanoligosaccharide in the milk for young calves. J Dairy Sci. 92:790-798.

Hill, T.M., H.G. Bateman II, J.M. Aldrich, and R.L. Schlotterback.2008. Oligosaccharides for Dairy Calves. Professional Animal Scientist. October, 2008.

Inborr, J. (1996). No antibiotics, no salmonella-Pig production according to the Swedish model. In *Proceedings of the Society of Feed Technologiests, Coventry, UK.*

Lesage, G. and H. Bussey. 2006. Cell Wall Assembly in *Saccharomyces cerevisiae*. Microbial Mol Biol Rev. 70(2): 317-343.

Phillips, I., M. Casewell, T. Cox, B. De Groot, C. Friis, R. Jones, C. Nightingale, R. Preston and J. Waddell. 2004. Does the use of antibiotics in food animals pose a risk to human health? A critical review of pulished data. Journal of Antimicrobial Chemotherapy. 53:28-52.

Spring, P. 1998. Mannanoligosaccharide. Its logical role as a feed additive for piglets. In: Biotechnology in the Feed Industry, Proceedings of the 14th Annual Symposium. Nottingham University Press, Nottingham, United Kingdom.

Stokestad, E.L.R., T.H. Jukes, J. Pierce et al..1949. The multiple nature of the animal protein factor. *Journal of Biological Chemistry* 180, 647-54.

Wierup,M.. 2001. The Swedish experience of the 1986 year ban of antimicrobial growth promoters, with special reference to animal health, disease prevention, productivity, and use of antimicrobials. *Microbial Drug resistance* 7, 183-90.

Dixie National Junior Round-Up

F. D. Jousan
Department of Animal and Dairy Sciences, Mississippi State University, Mississippi State, MS

Extension Summary

In early February, 4-H youth brought their livestock projects to Jackson for the Dixie National Junior Round-Up Livestock Shows. This show is the showcase for Mississippi 4-H Livestock Programs and site of the largest junior market livestock show in Mississippi. Those animals that received a blue ribbon at their District Livestock Show qualified for the Dixie National Junior Round-Up. Despite difficult economic times, 2,256 animals were exhibited, the most since 2000. These data further support the strength of Mississippians and the dedication and interest that still existed in showing livestock when economic times were challenging for many.

Introduction

The Dixie National Junior Round-Up is the largest junior livestock show held in Mississippi. Youth and their families begin preparing for this show many months in advance. Much thought and decision goes into selecting the animal for show, and then the process starts to provide the animal with proper nutrition, care, and training of the animal in preparation for show. Through this process, youth learn about aspects of nutrition, reproduction, genetics, selection, and exhibition with their livestock. This enables youth to be competitive in education contests held in conjunction with the Dixie National Junior Round-Up, where scholarships can be won to help with their educations when they reach college. Therefore, the objective of the Dixie National Junior Round-Up livestock shows is to offer youth with the opportunity to showcase the progress they have made with their livestock project in the show ring while providing them with opportunities to obtain monies through education contests to aid them as they pursue postsecondary instruction.

Procedures

Qualification for Dixie National Junior Round-Up

In order to show livestock at the Dixie National Junior Round-Up, youth compete with their animals at 1 of 5 district shows, depending on their county of residence. At these shows, all animals that received a blue ribbon qualified for the Junior Round-Up. In the market shows at the district competition, youth were allowed to show up to 6 market hogs, 6 market goats, 6 market lambs, and 3 market steers. From these animals that qualified, youth were allowed to weigh-in and show 2 market animals in those species at the Dixie National Junior Round-Up. For breeding animals, youth were allowed to enter and show up to 6 beef cattle, 6 dairy cattle, 6 dairy goats, and 6 commercial meat goat does at the Dixie National Junior Round-Up. For the education contests, youth enter competition by submitting applications that were scored prior to on-site competition. In addition, their performance in the remaining aspects of the contests held during the livestock shows contribute to overall rankings.

Results

One thousand, seven-hundred thirty-three 4-H and FFA youth exhibited 2,256 animals at the 2010 Dixie National Junior Round-Up, an increase of 11.5% in number of animals shown from 2009. This was the most animals shown at this event since 2000, when 2,128 animals were exhibited. The following is a breakdown of the number of entries in 2010 along with the change in number of animals shown from 2010 to 2009 shows in parenthesis: 756 beef cattle (+13); 166 dairy cattle (-26); 668 market hogs (+111); 232 market lambs (+26); 210 market goats (+49); 132 commercial meat goat does (+37); and 92 dairy goats (-27). The increase in market animals exhibited was due to exhibitors being able to show 3 market animals, as long as 1 of the 3 market animals was Mississippi Bred. This change was made for Mississippi producers to be better able to market their animals for shows.

The education contests had a similar amount of participation at the 2010 Dixie National Junior Round-Up. At the Premier Exhibitor contests, there were 41 participants in the beef division, 9 in the dairy division, 7 in the lamb division, 21 in the swine division and 24 in the goat division, totaling 102 youth who participated in these contests. This reflects a 12% increase from 2008, when 91 youth competed in these contests. In the Academic Scholarship Program, awarded by the Sale of Junior Champions, 40 applications were received from which the 25 scholarships were awarded. In addition, the Dixie National Booster Club awarded 6 $1,000 scholarships to the highest placing graduating senior for each species in showmanship.

Implications

The Dixie National Junior Round-Up was a successful event on a number of levels. Many of the species had increased numbers shown, and with the changes to the number of market animals an exhibitor could show if 1 was Mississippi Bred, the overall number of animals exhibited at the Junior Round-Up increased from 2009. The valuable information that youth learn about their livestock project enables them to be competitive in the education contests and scholarship program, and the growing number of participants is encouraging. These data show that Mississippi youth are resilient, hard-working individuals who are enjoy the challenges associated with showing livestock and competing for scholarship monies.

Dixie National Sale of Junior Champions

F. D. Jousan
Department of Animal and Dairy Sciences, Mississippi State University, Mississippi State, MS

Extension Summary

The Dixie National Junior Round-Up Livestock Show is the site of the largest junior market livestock show in Mississippi. Each year, the champions and reserve champions in the junior market shows are selected to participate in the Sale of Junior Champions. Of the 1,489 market animals exhibited at 1 of 5 District Livestock Shows, 42 market animals qualified for the 41st Sale of Champions auction in 2010. These animals sold for $275,201.30, with 80% of the money going to the exhibitor and 20% into a scholarship fund and to pay expenses of the sale. In addition, 33 youth were recognized for their academic accomplishments and successes with breeding animals, and $41,500 was awarded to these individuals. Even though this was a difficult year from a financial standpoint for many buyers and contributors, the hard work of the promotion committee paid off with the monies raised for Mississippi youth.

Introduction

The Dixie National Junior Round-Up is the largest junior livestock show held in Mississippi. This show culminates each year with the Sale of Junior Champions, where the champion and reserve champion exhibitors in the market shows earn the privilege to sell their animal in a live auction. Youth and their families begin preparing for this show many months in advance in hopes of qualifying an animal for the sale. Much thought and decision goes into selecting the animal for show, and then the process starts to provide the animal with proper nutrition, care, and training of the animal in preparation for show.

Membership on the Sale of Champions Promotion Committee includes adults, businesspeople, and the Extension 4-H Livestock Specialist who are interested in promoting the junior livestock program in Mississippi. These members work diligently to bring potential buyers and contributors to the sale each year to invest in the future of Mississippi youth. The committee seeks to 1) promote the 4-H and FFA livestock program in Mississippi; 2) promote economic, educational and personal development opportunities for youth; and 3) to motivate and increase interest in the junior livestock program. Not only are youth recognized for qualifying their animal for the sale, but other youth exhibitors are rewarded for their achievements in education contests and with their breeding animals.

Procedures

The Sale of Junior Champions Promotion Committee met several times in the latter part of 2009 to discuss potential buyer and contributor lists. Each committee member was challenged with contacting these businesses and individuals to encourage them to participate in the upcoming sale. The number of animals qualifying for the sale varies each year, with approximately 40 animals being sold annually. Youth receive 80% of the sale of the animal, while 15% of the money goes into the scholarship fund and 5% covers the expense of the sale. Money in the scholarship fund was used to recognize

youth winning education contests (Premier Exhibitor contests), being a graduating senior without qualifying an animal for the sale (Academic Scholarships), and for exhibiting animals that won supreme awards (Supreme Animal Scholarships).

Results

One thousand, four-hundred eighty-nine market animals were exhibited at one of five District Livestock Shows in an attempt to qualify for the Dixie National Junior Round-Up. Of these market animals, 1,236 animals were exhibited at the Junior Round-Up from which 42 market animals qualified for the Sale of Junior Champions. The sale included 8 market steers, 13 market hogs, 13 market lambs and 8 market goats. These 42 animals sold for $275,201.30, making it the 16th consecutive year the sale grossed over $100,000. To date, the 41 combined sales have grossed a very impressive $4.25 million dollars.

While the exhibitor is allowed to keep 80% of the money from the proceeds of the animal, 15% of that money is used in the scholarship program. Twenty-five Academic Scholarships (each worth $1,200) were awarded to graduating seniors who did not have an animal that qualified for the sale (totaled $30,000). Forty applications were received for the Academic Scholarships in 2009. In addition, the Premier Exhibitor contest recognized the winner of each of the 5 species shown (beef, 41 entries; dairy, 9 entries; sheep, 7 entries; swine, 21 entries; and goat, 24 entries) with $1,500 scholarships, totaling $7,500. Finally, the exhibitor of the Supreme Beef Bull, Supreme Beef Female and Supreme Dairy Animal received a $1,000 Supreme Animal Scholarship, totaling $3,000. Altogether, $40,500 in scholarships was awarded to 33 youth by the Sale of Champions Promotion Committee. The scholarship program was initiated in 1993, and to date, 366 scholarships have been awarded for a total of $395,700.

Implications

The 2010 Sale of Junior Champions gross sale total increased by 18% from 2009, and all committee members were pleased with its outcome and for recognizing the a large number of animals to qualify for the sale. Despite difficult economic times, buyers and contributors gave generously and the number of youth served in this program was substantial. These data demonstrate the generosity of Mississippians when it comes to helping put youth in a position to be successful later in life. That is the goal of the Sale of Champions, to work toward the personal development of youth who participate in livestock programs.

2010 Mississippi 4-H Congress

F. D. Jousan
Department of Animal and Dairy Sciences, Mississippi State University, Mississippi State, MS

Extension Summary

Mississippi 4-H Congress is an annual event where senior 4-H youth are given opportunities to compete in educational contests involving livestock. Over the course of a 3-day period, youth compete in visual presentation contests, judging contests, quiz bowl competitions and poster contests. Winning teams in the Meats Judging Contest and Dairy Quiz Bowl advance to represent Mississippi in national competition. Though youth enjoy their time during 4-H Congress, they are very competitive and display knowledge and abilities in a variety of contests.

Introduction

Mississippi 4-H Congress is an annual state event designed to supplement county 4-H programs. This event provides positive leadership and educational opportunities for senior 4-H members from across the state in an effort to develop these young people to their full potential, allowing them to become productive citizens and catalysts for positive change and ready to meet the needs of a diverse and changing society. In late May, on the campus of Mississippi State University, senior 4-H members (age 14 to18 years) are given opportunities to compete in a variety of livestock-related contests. Senior 4-H members give Visual Presentations related to Beef, Sheep, Swine, Goats, Dairy Animals, and Dairy Foods. There are Meats and Dairy Products Judging Contests in addition to Meats and Dairy Quiz Bowls. State Congress provides 4-H members with friendly competition and opportunities to meet 4-H'ers from across the state, attend educational workshops, and have a lot of fun during their visit to the campus. Therefore, the objective of the Mississippi 4-H Congress is to improve youth's knowledge and skills through experiential learning, life skills training, and leadership development opportunities. In addition, winners in state competitions are selected.

Procedures

At 4-H Congress, a variety of competitions are offered to senior youth. The Visual Presentation contest is divided into several areas, including Beef, Sheep/Swine/Meat Goat, Dairy Foods, and Dairy Animals Visual Presentations. Youth present on a topic of their choice, using posters or Microsoft PowerPoint to supplement their presentation. In Meats Judging, individuals and teams judge 4 classes of meat product, identify 25 retail cuts of beef, pork and lamb and present 2 sets of oral reasons on 2 placing classes. The winning senior Meats Judging team advances to national competition in Denver, CO. Dairy Products Judging includes scoring samples of milk, cottage cheese, cheddar cheese, and ice cream, rating each sample for overall impression and scoring any taste defects. Two quiz bowls are offered, a Dairy Quiz Bowl and Livestock Quiz Bowl. Dairy Quiz Bowl involves a multi-phase event with a scored quiz and rounds of questions asked to each team. The winning senior Dairy Quiz Bowl team advances to national competition in Louisville, KY. The Livestock Quiz Bowl was a pilot contest that is designed as a Jeopardy-style contest with questions

written from source books about cattle, sheep, swine, meat goats, and dairy goats. The final competition available to youth is a Dairy Poster Contest where youth, ages 8 to 18 years, design a poster based on the national dairy month motto for that year.

Results

There was quality participation in the educational contests held during 4-H Congress this past year. In the visual presentations, there were a total of 15 participants (4 in Sheep/Swine/Meat Goat; 5 in Beef; 4 in Dairy Foods; and 2 in Dairy Animals). In Meats Judging, there were 7 teams and 26 youth that competed in the contest. Dairy Products Judging had 7 teams and 36 total youth judging the dairy product samples. In the quiz bowl competitions, Dairy Bowl had 3 teams and 13 youth while Livestock Bowl had 3 teams and 11 youth. A total of 38 youth submitted posters in the Dairy Poster Contest using the theme "Dairy Makes Cents". In this contest, there were 13 participants in the 8 to 10 year old division, 11 participants in the 11 to 13 year old division and 14 participants in the 14 to 18 year old division. Altogether, 139 youth competed in livestock-related educational contests during 4-H Congress.

Implications

Many people think of livestock shows when the 4-H Livestock Program is mentioned. It is important to emphasize the valuable characteristics youth can learn by giving presentations, judging meats and dairy products and justifying their decisions with oral reasons, and using their knowledge of livestock in quiz bowl competitions. These are productive contests that allow youth to exercise their true capabilities and understandings of what they have learned with their own animals. Participation is always encouraged to allow youth to develop the self-confidence to speak to a group of people about a livestock topic of their interest. It should be noted that for the past 3 years, the Mississippi 4-H State Presidents' main project interests have been the livestock program. These livestock-related educational contests held during 4-H Congress are critical to the 4-H Livestock Program as they allow youth to gain needed experiences in communication and decision-making that will enable them to be successful in life.

2009 Mississippi 4-H Horse Championships

F. D. Jousan
Department of Animal and Dairy Sciences, Mississippi State University, Mississippi State, MS

Extension Summary

The highlight of the year for youth interested in the 4-H Horse Program is the Mississippi 4-H Horse Championships. Many of these youth had to qualify for this show by placing well at one of 4 district horse shows held across the state. In 2009, 692 youth competed at district shows on 1,167 horses, with a total of 3,181 total entries in these shows. Overall, 61 counties had youth represented at the district shows. At the state horse show, 506 youth (representing 59 counties) competed on 761 horses, with a total of 1,541 entries being shown, making this the largest State 4-H Horse Show in 10 years. The district and state shows offered numerous opportunities for junior and senior youth to compete in education contests. Altogether, 310 youth competed in these education contests. In our creative contests, Horse Art, Horse Photography and County T-shirt Design, there were 297 youth entered and 17 counties that submitted entries. The Mississippi 4-H Horse Program was well represented by youth at national contests, attesting to the quality of the youth involved in this program.

Introduction

The State 4-H Horse Championships is the largest 4-H horse show held in Mississippi. Youth and their families begin preparing for this show many months in advance. Much time and effort goes into training and working with the horse and rider to make them best suited for competition. During this process, youth gain valuable insight regarding proper nutrition for their horse and preparation for the district and state horse shows. In addition to an understanding of nutrition, youth learn about aspects of reproduction, genetics, selection, and exhibition with their horses, thereby enabling them to be competitive in education contests held in conjunction with the State 4-H Horse Championships, where senior winning individuals and teams are selected to represent Mississippi in national contests. Therefore, the objective of the State 4-H Horse Championships is to offer youth the opportunity to showcase the progress they have made with their horses in competition while providing opportunities to use their knowledge and training about horses in educational contests.

Procedures

There are 2 types of classes offered through the Mississippi 4-H Horse Program: District Only classes where youth must qualify their horses to advance to state competition and State Only classes where youth compete on their horses at the state show without having to qualify for that class. State Only classes require some equipment that all district shows are not able to obtain, such as jumps and fences for over fences classes. At the district horse shows (Northeast: Verona, MS; Northwest: Batesville, MS; Southeast: Meridian, MS; Southwest: Canton, MS), all junior (age 8 to 13) educational contests are held, with the top 3 teams and/or individuals (depending on the contest) advancing to compete at the state show against other winning juniors. Senior 4-H youth compete at the state competition held during the state horse show. During the state horse show, all

education contests are held prior to the horse classes. Education contests offered at these shows include Horse Public Speaking, Horse Individual Demonstration, Horse Team Demonstration, Horse Bowl, Horse Judging, and Hippology (senior-only event). In addition, creative contests are offered for youth to compete in as individuals and as a county, including Horse Art, Horse Photography, County T-shirt Design Contest, and County Educational Display Contest. Winners are announced at the Opening Ceremony. Of the classes offered during the state horse show, 50 horses were chosen to advance to the Southern Regional 4-H Horse Championships. Winners of the senior educational contests received some travel support to compete at the Western National 4-H Roundup in the Horse Classic in Denver, Colorado.

Results

At the District 4-H Horse Shows held in 2009, 692 youth rode 1,167 horses with a total of 3,181 entries. Overall, 67 counties had youth represented at the 4 district shows. At the state horse show, 506 youth (representing 59 counties) competed on 761 horses, with a total of 1,541 entries being shown. At the state show, senior 4-H participation in education contests increased in Horse Bowl, Horse Judging and Hippology. Altogether, 310 youth competed in these educational contests at the district and state horse shows. In our creative contests, 160 youth had exhibits in Horse Art, 137 youth had exhibits in Horse Photography and 17 counties entered the County T-shirt Design Contest. The winning senior youth in the educational contests that competed in national competition in January 2010 were quite successful, and Mississippi placed 2nd overall out of 30 states in the Horse Classic, the highest placing ever achieved as a state. Mississippi had the Champion Horse Judging Team and Reserve Champion Hippology Team and had the High Point Individuals in both contests.

Implications

It is important for youth to learn communication skills in 4-H. The Mississippi 4-H Horse Program provides many opportunities for youth to gain valuable experiences in educational contests that will help them as they progress towards college. Competition in these events is friendly but fierce, similar to what is seen in our classes. Mississippi youth performed well at regional and national contests, demonstrating the depth of the quality of youth at these district and state shows. Data from the 2010 horse shows will be documented next year.

4-H/FFA Beef Heifer Replacement Contest

F. D. Jousan
Department of Animal and Dairy Sciences, Mississippi State University, Mississippi State, Mississippi

Extension Summary

44-H and FFA livestock projects have been successful at teaching youth and their families about responsibility and care for their livestock. The Replacement Beef Heifer Development Contest is a year-long event where the contestant is personally responsible for the daily management of their heifers. During the year, youth maintain records about their project to justify management decisions. At the end of the contest, they turn in a record book (30% of the contest), have their heifers evaluated (20% of the contest), and make a presentation about their project during an interview (50% of the contest). In the second year of competition, 10 entries were received in November the contest will be completed in August. It is anticipated that youth in this contest will be able to educate adult beef cattle producers about management practices and become good stewards of their cattle.

Introduction

Livestock shows have always been popular among Mississippi youth. Showing livestock provides youth with a variety of avenues to learn about their animals, including aspects of nutrition, reproduction, genetics, selection, and exhibition. As youth grow in the program, they are better able to utilize and understand this information to make enhanced decisions regarding their livestock projects. A common misconception about livestock shows is that the most successful youth are those who have unlimited resources from which high-quality livestock and equipment can be obtained for shows. This has been known to discourage some youth and families from participating in livestock shows. Some youth, regardless of whether they show cattle, are integral parts of family cattle operations and have obtained experiences that will enable them to make sound heifer management decisions. Therefore, the objective of the Replacement Beef Heifer Development Contest is to recognize those youth that have a true passion for raising beef cattle. In doing so, youth will learn about proper heifer development practices and procedures and can be a positive influence on adult producers involved in raising cattle.

Procedures

Contest Design

The 4-H and FFA Heifer Development Contest is a 12-month project that started on November 1, 2009, and concluded August 14, 2010. Contestants must be 4-H or FFA members who compete as individuals unless 2 or more brothers or sisters (each at least 14 years of age but not over 18 years of age as of January 1 of the year in which the contest begins) of a family constitute a joint entry. If the entrant is in college, he/she must personally manage and care for their heifers on a daily basis by commuting to and from home and school. It is not permissible to have someone else care for contest heifers while away at school.

The heifer development project must consist of 3 heifers (purebred or

commercial) that are either autumn born from the previous year or spring born of the year in which the contest begins. While not mandatory, the heifers can be exhibited in junior shows. Heifers can be purchased from a purebred or commercial producer or be selected from operations of an immediate family member (parent, stepparent, brother, sister, half-brother, half-sister, grandparent, or legal guardian). This contest is designed to evaluate the youth producer's ability to manage the heifers rather than the genetic makeup of the heifers. Therefore, participants using purebred and commercial heifers will be judged together without preference given for breed or breed type. Contestants will be judged on all managerial aspects of their heifer development project. Participants were encouraged to take advantage of Extension agents, advisors, and experienced producers in selecting quality heifers and discussing production costs.

Evaluation System

Y Youth submitted entry forms with a description of the 3 heifers they entered in the contest by November 1, 2009, to the Extension 4-H Livestock Specialist. Initial criteria to be included on the entry form included each animal's age, weight, breed, and starting value (purchase price). In addition, each entrant submitted their goals for the project. If registered heifers were used, the entry included a photocopy of that animal's(s') registration paper.

Heifers chosen for the contest must have been born in the autumn of 2009 or the spring of 2010. Any heifer with a sign of 3-year-old teeth were eliminated at the contest site, regardless of a registered or printed birth date for that heifer.

In order to verify that the 3 animals entered in the contest were the same 3 brought to the contest site, electronic identification (EID) tags were inserted in each heifer's ear at the time of entry. An alternative to using an EID tag included checking an ear tattoo for registered beef heifers to match the tattoo on that heifer's registration paper. Upon arrival to the contest site, all entered heifers were checked to confirm that the heifer was entered in the contest.

The 4-H and FFA Heifer Development Contest consists of 3 components: a visual appraisal of the heifers, a record keeping system, and an interview process.

- **Visual Evaluation:** A committee of judges evaluated each group of 3 heifers managed by the contestant. Criteria that were evaluated included weight, frame score, growth, body condition score, health, structural/skeletal soundness, and reproductive ultrasound evaluation. In addition, each entrant was judged on their salesmanship skills and overall knowledge of phenotypic characteristics of their heifers. *This component of the contest was worth 20%.*

- **Records:** Youth were required to submit records kept throughout the project by August 2, 2010. At the start of the project, contestants were asked to list short- and long-term goals for their heifer project. During each month of the project, contestants should have recorded management practices performed on his/her heifers. Examples include recording the amount of feed, hay or other nutritional supplements purchased or fed, veterinarian expenses and other health-related costs, breeding decisions, rotational grazing of pastures, a complete budget/expense sheets and any other

management issue in which the youth made a decision for the continued development of his/her heifers. At the conclusion of the project, youth should have addressed whether they achieved their goals set at the start of the project. These records were judged on their completeness and exactness during the contest year. *This component of the contest was worth 30%.*

- **Interview:** A committee of judges interviewed the exhibitor on their individual production practices. Exhibitors gave a 10 to 15 minute presentation (Microsoft PowerPoint slides or other visual aids) to summarize his/her heifer development project. This presentation included anything relevant to the contestant's project (goals for project and if they were accomplished, pictures to illustrate the project, etc). Each exhibitor then answered questions from the committee in regard to their project, such as the process used to select the heifers, record keeping system used, nutrition program, bull used for breeding purposes, health records and any production practices utilized by the exhibitor during this contest. *This component of the contest was worth 50%*.

Judges for this contest were chosen from Extension area livestock agents, cattle producers, Extension specialists, and cattle association members. All ties were to be broken using the interview score followed by the record book.

Results

In the second year of this contest, 10 entries were received. The contest has not been concluded this year to date. Throughout the year, several educational opportunities were made available to youth to assist them with their heifer project. In addition, an interactive video session about the contest was held with 10 counties participating, totaling over 40 adults and youth who wanted to learn about the design of the contest.

This contest is a big endeavor for youth, and it was important to reward them justly. While the education and knowledge learned about heifer development will benefit youth long-term, it was important to provide valuable prizes for winning. To date, prizes to be awarded for the Replacement Beef Heifer Development Contest include a bumper-pull livestock trailer, Dell laptop, truck/trailer hitches, cash prizes, and complementary artificial insemination school registrations for all participants. The announcement of winners and awarding of prizes will take place during the Mississippi State Fair. The winning youth will present their contest results and what they learned about heifer development during the 2011 Mississippi Cattlemen's Association annual convention.

Implications

The Replacement Beef Heifer Development Contest provides an authentic experience for youth that choose to participate. Not only do youth learn valuable information that they can use for a lifetime, but the cattle industry benefits as young cattlemen and cattlewomen will be educated producers in the future. These youth can be a positive influence on their own family's cattle production system and share their insights with other cattle producers around the state, causing adults to think more about their own management decisions.

Making Tracks Leadership Camp

J. A. Parish[1], L. L. Peters[2], and S. Blossom[2]
[1]Department of Animal and Dairy Sciences, Mississippi State University, MS
[2]Mississippi Cattlemen's Association, Jackson, MS

Extension Summary

The Making Tracks Leadership Camp ("Making Tracks") is a joint effort among the Mississippi State University (MSU) Animal and Dairy Sciences Department, the Mississippi Cattlemen's Foundation, and the Mississippi Junior Cattlemen's Association (MJCA). Making Tracks is one of the annual highlights of MJCA activities. This 3-day event held during the summer on the MSU campus includes workshops dealing with all aspects of the cattle industry. Both hands-on activities with cattle and beef and interactive classroom sessions are used to educate youth during the camp. In its 18 years of existence, over 800 youth representing five states have attended the camp.

Introduction

Selection Now in its eighteenth year, the Making Tracks Leadership Camp ("Making Tracks") is a joint effort among the Mississippi State University (MSU) Animal and Dairy Sciences Department, the Mississippi Cattlemen's Foundation, and the Mississippi Junior Cattlemen's Association (MJCA). It is sponsored annually by The Wax Company, LLC of Amory, MS. Making Tracks is the only camp of its kind coordinated by a state cattlemen's association.

Making Tracks is one of the annual highlights of MJCA activities. The MJCA was organized at the 1991 Mississippi State Fair with the election of the inaugural board of directors. The MJCA is sponsored by the Mississippi Cattlemen's Association (MCA), with a member of the MCA staff serving as advisor for the organization. The youth organization was developed with the future of the cattle industry in Mississippi in mind. Leadership development is the key objective of the MJCA.

Procedures

Youth must be entering at least the 9th grade to participate in Making Tracks. The 3-day event is held annually during the summer on the MSU campus. It includes workshops dealing with all aspects of the cattle industry. Both hands-on activities with cattle and beef and interactive classroom sessions are used to educate youth during the camp. Topics covered are varied each year, and have included subject areas such as cattle reproduction, parliamentary procedure, live animal judging, beef end product, and Beef Quality Assurance.

Making Tracks has utilized many MSU facilities over the years for various activities. Attendees stay in campus dorms during the camp. Host sites around campus include the Animal and Dairy Sciences Department classrooms and laboratories, Leveck Animal Research Center ("South Farm") Beef Unit, Bearden Dairy Research Unit, Ballew Hall meats laboratory, and College of Veterinary Medicine facilities. The Mississippi Agricultural and Forestry Experiment Station Prairie Research Unit and area beef cattle operations have also played host to Making Tracks events.

Results

Since its inception, over 800 youth have attended Making Tracks. Approximately, 50 youth attend each year. In addition to Mississippi youth, campers have attended from Alabama, Louisiana, Georgia, and Kentucky.

Making Tracks is often the first introduction to the MSU Animal and Dairy Sciences Department for many youth attending the camp. Attendees are actively recruited by department faculty and clubs during the camp. Many former Making Tracks attendees have gone on to enroll at MSU as Animal and Dairy Sciences majors or in related majors that take Animal and Dairy Sciences courses.

Implications

Making Tracks is a unique leadership camp that focuses on the beef cattle industry. It is a key educational and social opportunity for youth in the region interested in the beef production and marketing. The annual camp is a good example of a collaborative effort of the Animal and Dairy Sciences Department and Mississippi industry partners. The continued demand for this long-running program indicates its value to youth development.

Beef Cattle Boot Camps

J. A. Parish[1], J. D. Rivera[2], R. C. Vann[3], and H. T. Boland[4]
[1]Department of Animal and Dairy Sciences, Mississippi State University, MS
[2]South Mississippi Branch Station, Poplarville, MS
[3]Brown Loam Branch Station, Raymond, MS
[4]Prairie Research Unit, Prairie, MS

Extension Summary

The Mississippi State University Extension Service (MSU-ES) Beef Cattle Boot Camps were initiated in 2010 to provide an interactive, hands-on educational opportunity for beef cattle producers on Mississippi Agricultural and Forestry Experiment Station (MAFES) stations. Boot Camp topics in 2010 included forage scenarios, hay storage demonstrations, feed valuation, tractor safety, beef cattle research overviews, cattle facility troubleshooting, cattle shrink, calf processing, freeze branding, and body condition management. Participants rated the presentations highly and provided suggestions for future Boot Camps. A set of Boot Camps is now scheduled to be held on an annual basis each April.

Introduction

The Mississippi State University Extension Service (MSU-ES) Beef Cattle Boot Camps were initiated in 2010 to provide an interactive, hands-on educational opportunity for beef cattle producers on Mississippi Agricultural and Forestry Experiment Station (MAFES) stations. They were held at the MAFES Prairie Research Unit in Prairie, MS and MAFES Brown Loam Branch Experiment Station near Raymond, MS. Another set of Boot Camps is scheduled for April 2011 at the MAFES Prairie Research Unit and MAFES White Sand Unit near Poplarville, MS.

Procedures

Many MSU-ES beef cattle educational programs focus on complex problems or topics, with the target audience being established beef cattle producers with experience in cattle production. Rather than focus on that target audience, the Boot Camps offered a new approach. They focused on novice producers, who may not have the experience or knowledge of longer established producers. The goal of the Boot Camps was to provide basic information to producers in a hands-on, applicable manner. While the novice group was the ideal target, the Boot Camps also offered the opportunity to established producers to refresh themselves on basic cattle production skills and information.

The Boot Camps were advertised through the Cattle Business in Mississippi magazine, on the Internet, and via local Extension offices. The same program was offered at two locations on different dates to allow participants to choose their preference for program location and date. Boot Camp topics in 2010 included forage scenarios, hay storage demonstrations, feed valuation, tractor safety, beef cattle research overviews, cattle facility troubleshooting, cattle shrink, calf processing, freeze branding, and body condition management. Live animal demonstrations were included in the program.

Each Boot Camp program began at 9:00 a.m., included lunch, and concluded at 3:30 p.m. Registration fees covered the cost of lunch, refreshments, Boot Camp notebooks, and other Boot Camp materials. Both MSU-ES and MAFES personnel were involved in the Boot Camp planning and program implementation.

Results

All participants completing evaluations of the 2010 Boot Camps indicated that the information presented would be useful on their operations. They also were unanimous in saying that the length of the program was appropriate. On a 1 to 5 scale, with 1 being "poor" and 5 being "excellent", the average rating for all Boot Camp presentations was 4.2. These ratings for individual topics ranged from 3.8 to 4.4.

The topics selected for the 2011 Boot Camps were planned in large part from the suggestions on the participant evaluation forms and verbal feedback from the 2010 Boot Camp attendees. The 2011 Boot Camps will follow the same general format as the 2010 Boot Camps but will feature all new topics. This will allow persons to attend a Boot Camp on an annual basis and receive new information at each event.

Implications

Hands-on learning experiences are considered valuable to beef cattle producers, especially novice producers who may require more hands-on experiences to understand basic practices. The Beef Cattle Boot Camps provide opportunities for these experiences while also highlighting MAFES beef cattle research activities. In addition, they facilitate MSU-ES and MAFES personnel interactions with beef cattle producers.

Recent EPD Trends for Mississippi Beef Cattle Improvement Association Bull Sales

J. A. Parish[1] and T. Smith[1]
[1]Department of Animal and Dairy Sciences, Mississippi State University, MS

Extension Summary

The Mississippi Beef Cattle Improvement Association (MBCIA) Bull Sale Program has a 42-year history of promoting beef cattle improvement within Mississippi. The present study explores recent MBCIA sale history from 2004 to 2010 to determine expected progeny difference (EPD) trends of bulls consigned to this marketing program. Results show that EPD reporting in MBCIA bull sales for scrotal circumference and end product traits improved over this time period. A large proportion of catalogued bulls ranked within the top half and/or top quarter of their respective breeds for growth, maternal, and end product traits. There is evidence of strong selection emphasis placed on growth traits and milk production, in particular, among sale consignments. These findings indicate that the MBCIA bull sales are a consistent source of bulls with high EPD profiles for a wide range of economically relevant traits.

Introduction

The Mississippi Beef Cattle Improvement Association (MBCIA) was established in 1968 for the purpose of unifying beef cattle breeders and promoting beef cattle improvement within Mississippi. The MBCIA is a member of the Beef Improvement Federation, which was formed as a means to standardize beef cattle performance programs and methodology and to create greater awareness, acceptance, and usage of beef cattle performance concepts. The MBCIA membership includes purebred and commercial beef cattle producers, commodity association representatives, and Mississippi State University Extension Service and Mississippi Agricultural and Forestry Experiment Station personnel.

In keeping with its purpose, in 1969 MBCIA initiated a bull sale program with the objective of encouraging production and identification of genetically superior bulls by purebred breeders and promoting the purchase and use of these bulls by commercial producers. The MBCIA bull sale program consists of purebred bull consignment sales open to consignments from Mississippi cattle producers. Out-of-state cattle producers are also invited to nominate bulls for this sale provided the bulls were performance tested on either the Hinds Community College Bull Test, a 112-day grain-based bull performance test established in 1982 in Raymond, MS, or the South Mississippi Gain-on-Forage Bull Test, a 140-day forage-based bull performance test established in 1986 near Tylertown, MS. The MBCIA Fall Bull Sale conducted its 40th annual sale in 2008 and is hosted annually on the second Thursday in November. Additionally, a MBCIA Spring Bull Sale began in 2008 and is held annually in conjunction with the Hinds Community College Bull Test sale on the first Thursday in March.

Bulls offered through MBCIA sales are required to have passed a breeding soundness examination within 30 days prior to the sale date, met minimum growth and

scrotal circumference requirements, and are backed with extensive performance information. Bulls are also screened for structural soundness and other defects such as temperament problems prior to being accepted for sale participation. Over the 42-year history, MBCIA bull sale requirements have been updated on several occasions to reflect industry changes and new performance goals. These changes have impacted both specific bull consignments and sale participations levels.

Furthermore, the bull sale order rewards bulls for achieving specific weight per day of age levels; scrotal circumference levels; and expected progeny difference (EPD) percentile rankings for birth weight or direct calving ease, weaning weight, yearling weight, ribeye area, and intramuscular fat EPD. In addition, bulls move closer to the start of the sale order with high visual appraisal scores and by having documented ultrasound body composition scan results. This has likely impacted the specific bull consignments to the MBCIA sales by shifting emphasis to performance data and EPD.

Though the MBCIA Bull Sale Program has a 42-year history, it is worthwhile to explore the recent history of this program to determine recent trends relevant to potential MBCIA bull sellers and buyers. The present summary of MBCIA bull sales is intended to track and analyze EPD trends in recent sale consignments.

Procedures

The MBCIA sale manager, Extension Beef Cattle Specialist, provided sale catalog data from November 2004 to March 2010 for this review. This data included 5 MBCIA fall bull sales from 2004 to 2008 and 3 MBCIA spring bull sales from 2008 to 2010. Simple descriptive statistics were determined from the sale data to illustrate recent sale trends for the following EPD: weaning weight (WW), yearling weight (YW), milk (MILK), scrotal circumference (SC), intramuscular fat or marbling (IMF), and ribeye area (REA).

During the period studied, several noteworthy changes to the sale occurred that should be factored into any interpretation of the results. Sale eligibility requirements were altered over time with the goal of strengthening the overall quality of MBCIA sale offerings. Adjusted 365-day yearling weight requirements were put in place for the Fall 2005 MBCIA Bull Sale at 850 lb, increased to 900 lb with the Fall 2007 MBCIA Bull Sale, and finally set at 1000 lb with the Spring 2008 MBCIA Bull Sale. Eligible bull age ranges were widened to include bulls from 13 to 39 months of age starting with the Fall 2005 MBCIA Bull Sale and then later narrowed down to 13 to 26 months of age starting with the Spring 2008 MBCIA Bull Sale. Sale eligibility requirements were changed effective with the Fall 2006 MBCIA Bull Sale such that at least one of the following 1) ultrasound EPD, 2) carcass EPD, or 3) ultrasound body composition scan results were required for bulls to meet sale eligibility.

Results

From 2004 to 2010, only two out of the 298 bulls catalogued for MBCIA bull sales lacked WW, YW, or MILK EPD (Table 1). The percentages of bulls with SC EPD reported tended to be higher during the 2008 to 2010 period than during the 2004 to 2007 period. Similarly, the percentages of bulls with end product (IMF/Marbling, REA) EPD reported tended to increase after 2005. This coincided with the change to MBCIA bull sale eligibility requirements effective

starting with the Fall 2006 MBCIA Bull Sale such that at least one of the following 1) ultrasound EPD, 2) carcass EPD, or 3) ultrasound body composition scan results were required for bulls to be allowed in the sale program.

Table 1. Number (percent) of bulls Mississippi Beef Cattle Improvement Association (MBCIA) bull sales with various expected progeny differences (EPD) reported by their respective breed associations, 2004 to 2010[1, 2]

MBCIA Sale	Bulls catalogued, n	Bulls with WW EPD, n (%)	Bulls with YW EPD, n (%)	Bulls with MILK EPD, n (%)	Bulls with SC EPD, n (%)	Bulls with IMF EPD, n (%)	Bulls with REA EPD, n (%)
Fall 2004	47	47 (100)	47 (100)	47 (100)	22 (47)	26 (55)	26 (55)
Fall 2005	46	46 (100)	46 (100)	46 (100)	15 (33)	24 (52)	24 (52)
Fall 2006	50	50 (100)	50 (100)	50 (100)	19 (38)	41 (82)	41 (82)
Fall 2007	45	45 (100)	45 (100)	45 (100)	16 (36)	34 (76)	34 (76)
Fall 2008	20	20 (100)	20 (100)	20 (100)	10 (50)	20 (100)	20 (100)
Spring 2008	14	14 (100)	14 (100)	14 (100)	11 (79)	14 (100)	14 (100)
Spring 2009	39	38 (97)	38 (97)	38 (97)	18 (46)	38 (97)	38 (97)
Spring 2010	37	36 (97)	36 (97)	36 (97)	24 (65)	33 (89)	33 (89)

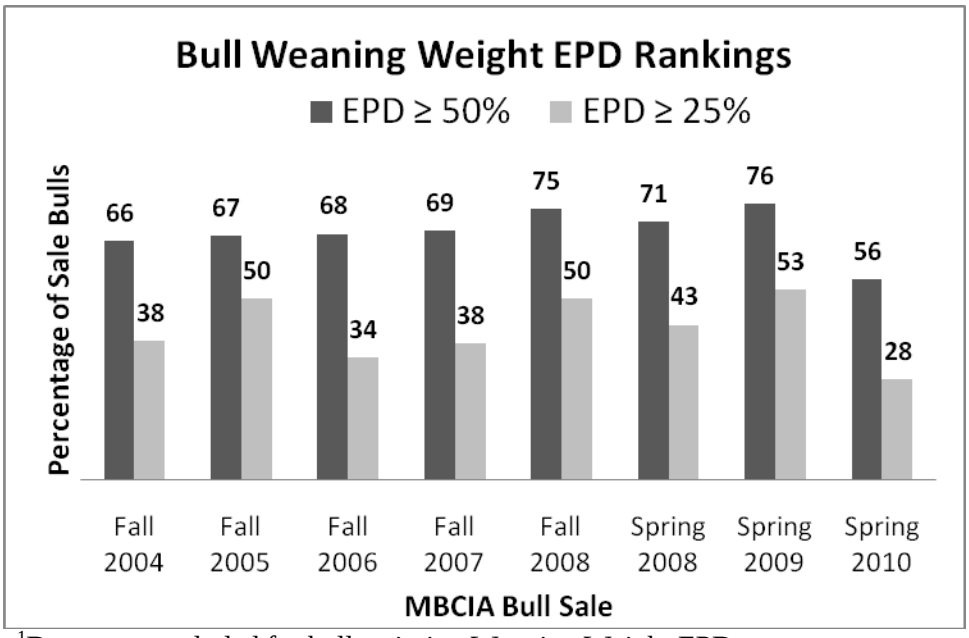
[1]WW EPD = Weaning Weight EPD; YW EPD = Yearling Weight EPD; MILK EPD = Milk EPD; SC EPD = Scrotal Circumference EPD; IMF EPD = Intramuscular Fat or Marbling EPD; REA EPD = Ribeye Area EPD.
[2]Missing EPD were due to the respective breed association not reporting an EPD for a specific trait because either 1) the trait was not included in the breed's national cattle evaluation or 2) there was a lack of sufficient information on a particular bull to generate an EPD calculation for a trait included in a breed's national cattle evaluation.

The MBCIA bull sales consistently attract bull consignments in the top half and quarter of the respective breeds for growth traits. Over half of the bulls in all eight sales analyzed from 2004 to 2010 ranked within the top half of their breeds for WW EPD (Figure 1). In excess of one-quarter to over one-half of bulls were in the top quarter of their breeds for WW EPD. The same results held for YW EPD (Figure 2). This indicates a strong selection emphasis on growth traits for bulls consigned to these sales.

A widely used maternal trait genetic selection tool throughout the U.S. is MILK EPD. In seven of the eight MBCIA sales evaluated, 70% or more of the bulls catalogued had MILK EPD in the top half of their breeds (Figure 3). On average, over one-third of all bulls catalogued for these sales ranked in the top quarter of their breeds for MILK EPD.

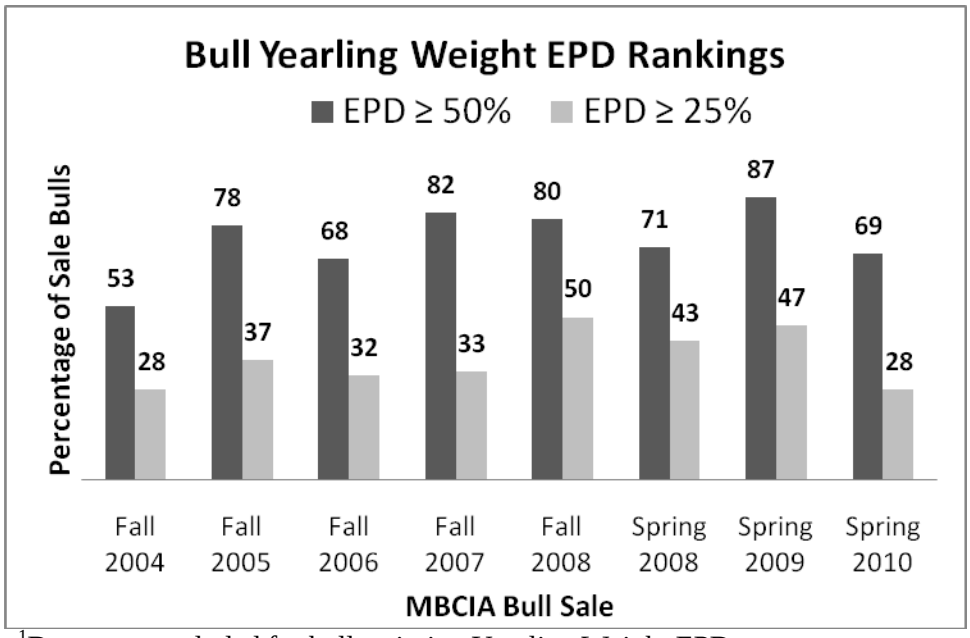
Scrotal circumference EPD is important from the standpoint of selecting sires for reduced daughter age at puberty as well as bull semen producing capacity. The SC EPD levels indicated that MBCIA sale bulls were on par with national averages for SC EPD percentile rankings (Figure 4). However, less selection emphasis was placed on achieving high SC EPD in the MBCIA bull consignments during this period compared to WW, YW, and MILK EPD.

The percentages of bulls with IMF EPD (Figure 5) or REA EPD (Figure 6) in the top half and/or top quarter of their breeds tended to vary more from sale to sale than the other traits analyzed. Yet, despite genetic antagonisms between intramuscular fat and ribeye area, the sales that offered higher proportions of bulls in the top half and/or quarter of their breeds for IMF EPD also tended to be the same sales in which higher proportions of bulls were in the top half and/or quarter of their breeds for REA EPD. For the spring sales, there appears to have been slightly more emphasis placed on selection for high IMF EPD compared with selection for high REA EPD. On average, MBCIA sale bulls were on par with national averages for both IMF and REA EPD percentile rankings. In addition, in 5 of the 8 individual MBCIA sales assessed, the majority of the bulls offered exceeded breed averages for IMF EPD. The same held true for REA EPD.



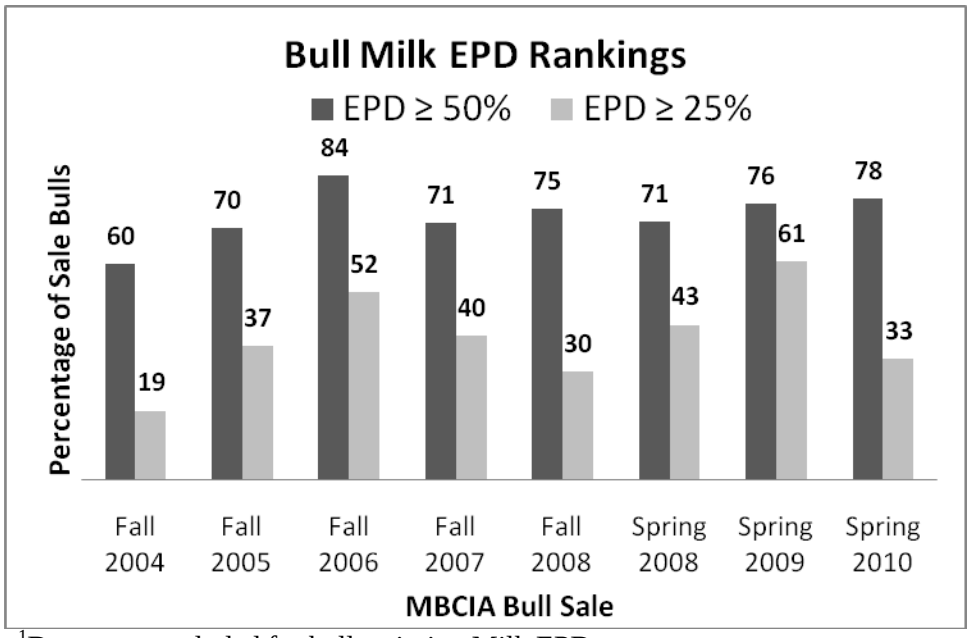
[1]Data were excluded for bulls missing Weaning Weight EPD.

Figure 1. Percentages of bulls catalogued for Mississippi Beef Cattle Improvement Association (MBCIA) bull sales with Weaning Weight Expected Progeny Difference (EPD) in top half or quarter of breed, 2004 to 2010[1]



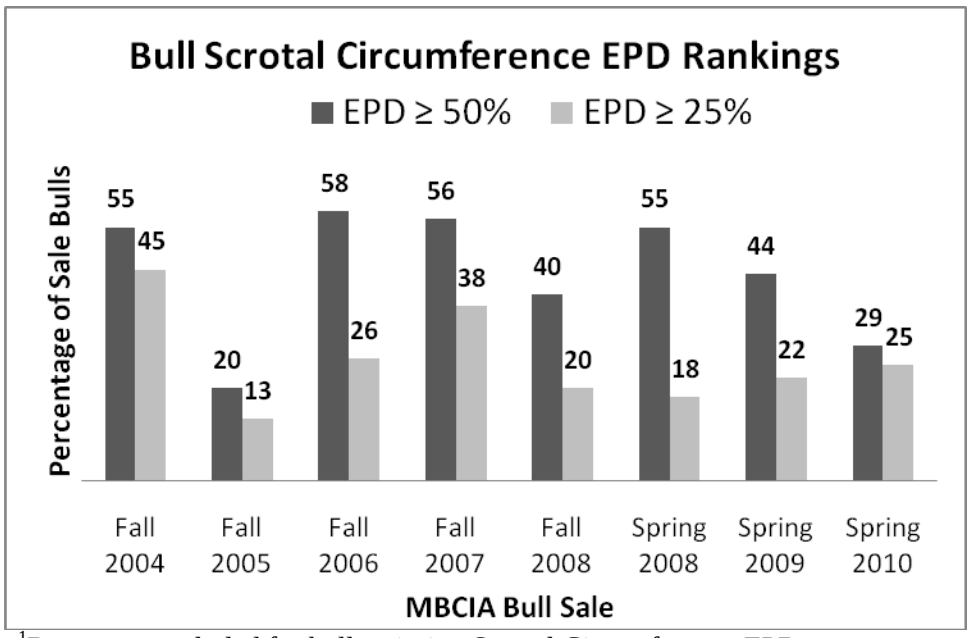
[1]Data were excluded for bulls missing Yearling Weight EPD.

Figure 2. Percentages of bulls catalogued for Mississippi Beef Cattle Improvement Association (MBCIA) bull sales with Yearling Weight Expected Progeny Difference (EPD) in top half or quarter of breed, 2004 to 2010[1]



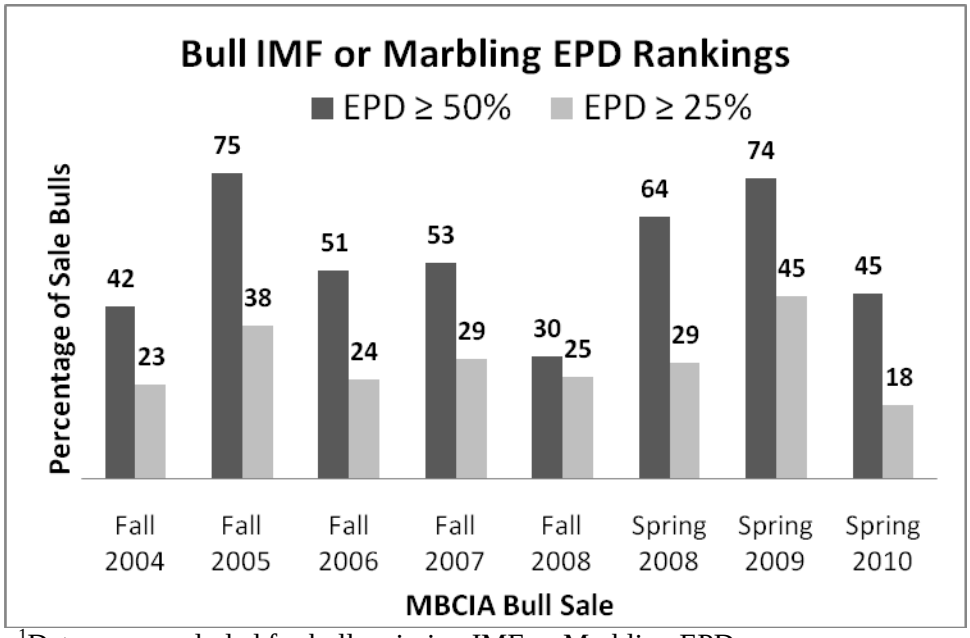
[1]Data were excluded for bulls missing Milk EPD.

Figure 3. Percentages of bulls catalogued for Mississippi Beef Cattle Improvement Association (MBCIA) bull sales with Milk Expected Progeny Difference (EPD) in top half or quarter of breed, 2004 to 2010[1]



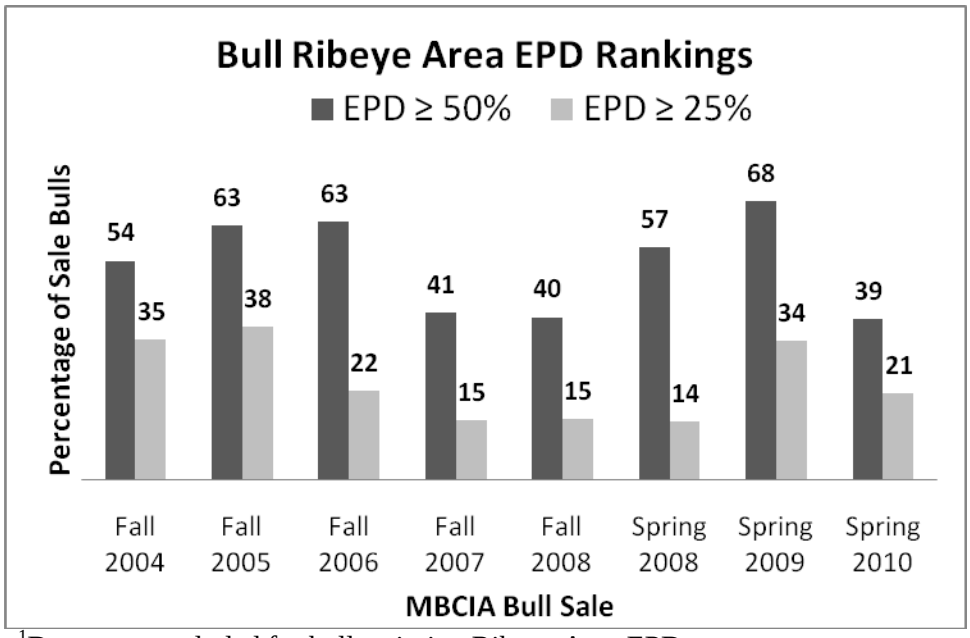
[1]Data were excluded for bulls missing Scrotal Circumference EPD.

Figure 4. Percentages of bulls catalogued for Mississippi Beef Cattle Improvement Association (MBCIA) bull sales with Scrotal Circumference Expected Progeny Difference (EPD) in top half or quarter of breed, 2004 to 2010[1]



[1]Data were excluded for bulls missing IMF or Marbling EPD.

Figure 5. Percentages of bulls catalogued for Mississippi Beef Cattle Improvement Association (MBCIA) bull sales with IMF or Marbling Expected Progeny Difference (EPD) in top half or quarter of breed, 2004 to 2010[1]



[1]Data were excluded for bulls missing Ribeye Area EPD.

Figure 6. Percentages of bulls catalogued for Mississippi Beef Cattle Improvement Association (MBCIA) bull sales with Ribeye Area Expected Progeny Difference (EPD) in top half or quarter of breed, 2004 to 2010[1]

Implications

Mississippi BCIA has a long history of promoting beef cattle improvement and quality genetics through annual bull sales. Review of EPD profiles of bulls in recent MBCIA sales show EPD reporting increasing over time for scrotal circumference and end product traits among consignments. Also, high proportions of consignments have growth, maternal, and end product EPD in the top half and/or quarter of their respective breeds. There is evidence of strong selection emphasis placed on growth traits and milk production, in particular, among sale consignments. The degree to which these selection decisions are being made in response to bull customer feedback is unknown. These findings indicate that the MBCIA bull sales are a consistent source of bulls with high EPD profiles for a wide range of economically relevant traits.

Mississippi Feeder Calf Board Sales Price Results, 2008 to 2010

J. A. Parish[1], J. M. Riley[2], L. Newman[3], M. Howell[4], M. Keene[4], and J. Kilgore[5]
[1]Department of Animal and Dairy Sciences, Mississippi State University, Mississippi State, MS
[2]Department of Agricultural Economics, Mississippi State University, MS
[3]Area Animal Science Agent, Mississippi State University Extension Service
[4]Mississippi Farm Bureau Federation and Mississippi Cattlemen's Association
[5]Mississippi Farm Bureau Federation, Jackson, MS

Extension Summary

Beginning in August 2008, two statewide feeder calf board sales have been held in Mississippi. The Mississippi Home Place Producers Sale is held annually the first Monday in August, and the Cattlemen's Exchange Sale is held annually the first Tuesday in April. In this analysis, board sale prices were compared to expected and actual Mississippi weekly average prices reported by USDA, Agricultural Marketing Service. The results indicate that the four board sales conducted to date in the state have, for the majority of the cattle sold, outperformed the price the cattle would have fetched if taken to auction at the specified delivery date. Steers add $5.85 above heifers to lot price. Each 100 pounds added to the average lot weight brought the lot price down by $3/cwt. Lot price was reduced by $1/cwt for each 100 pounds of range in lot weight. The larger the percentage of black-hided cattle in the lot, the higher price the lot commanded. An increase of one percentage point of black-hided cattle increased the lot price by 1.15 cents/cwt. Lots that mixed both steers and heifers reduced the lot price by $1.15/cwt.

Introduction

Since mid-July of 2007, beef cattle producers and commodity support groups have been working to provide a new marketing option for Mississippi feeder cattle. This is a collaborative effort of the Mississippi Cattlemen's Association, Mississippi Farm Bureau Federation, Mississippi State University Extension Service, and Mississippi Beef Cattle Improvement Association. After many meetings and input from interested parties, the group developed the Mississippi Home Place Producers Sale and the Cattlemen's Exchange Sale.

These auctions are managed as board sales by marketing cattle while they are not on site. Each lot is represented by video or picture of the cattle posted on the Internet at msucares.com/livestock/beef/feedercalf.html . Detailed descriptions of cattle type, weight, and management are also posted on the website and distributed to perspective buyers prior to the sale. The same videos and pictures are presented during the auction. Arrangements for delivery from the farm of origin to the buyer's location are made after the sale.

The primary advantage of these sales is that they accommodate a large number of feeder calves that might not all be ready to ship on a certain day by giving the flexibility to arrange for future delivery. Another advantage is offering all cattle in load-lots made up of single or multiple consignments of uniform calves. These consignments are received from across the state and loads are assembled with regard to region and type of cattle. Pencil shrinks agreed to for these

sales should prove to capture several dollars per head that would be lost in some other marketing scenarios. Other advantages include reduced handling and comingling prior to shipping and the ability to establish a reputation that could bring the same buyer year after year, willing to pay more for calves from producers whose cattle have performed well in the past.

Health management and preconditioning are always among the primary concerns with these types of sales. Consignors are encouraged to complete Mississippi Beef Quality Assurance training and to participate in the Mississippi Animal Disease and Disaster Preparedness Program. These sales do not require a single preconditioning and vaccination protocol. However, calves that have been managed similarly will be grouped in the same load. For example, consigners who have vaccinated with the same products and preconditioned their calves for a similar amount of time will be grouped together and represented as such in the sale. Furthermore, several facilities across the state have been identified to provide custom weaning services for producers who do not have adequate facilities or resources.

It is extremely important for the integrity of these sales that all cattle are represented truthfully and accurately. It is also essential that each consigner remains committed to the sale after completing a consignment form. This commitment is not only to the management and buyers but, more importantly, to the other beef cattle producers that will be marketing in this sale.

Procedures

To date, four board sales have taken place. Data were collected for each on the sale date. Prices for each lot were collected at the time of the sale. Descriptive information for each lot were assigned prior to the sale date and available to each buyer at the time of the sale. Prices were recorded in dollars per hundred weight (cwt). Descriptive information collected were: sex, average lot weight, lot weight variance, load-out date, percent of cattle in the lot that were black-hided, and seller allowable shrink. Mississippi prices are from the Mississippi Weekly Livestock Summary reported by USDA, NASS.

To assess sale performance, prices were compared to (1) the expected Mississippi price for the specified delivery date at the time of the sale and (2) actual Mississippi prices at the time of delivery. The expected Mississippi price was calculated using the previous three year average basis for the specific sex and weight group of the cattle in the lot. Basis is the cash price minus the futures contract price.

The comparisons of the board sale results versus Mississippi expected and reported prices were drawn to gauge the performance of the sale. To determine the impacts of certain lot traits on the sale price a hedonic regression model was estimated. The hedonic model is used to incorporate qualitative (non-numerical) data into the economic analysis. The following model was estimated:

$$\begin{aligned} SaleP_{t,i} = {} & \alpha_t + \beta_1 Sex_{t,i} + \beta_2 W_{t,i} + \beta_3 Var_{t,i} + \beta_4 Days_{t,i} \\ & + \beta_5 \%Blk_{t,i} + \beta_6 Mix_{t,i} + \beta_7 Shrink_{t,i} + \beta_8 HP08_{t,i} \\ & + \beta_9 EX09_{t,i} + \beta_{10} HP09_{t,i} + e_t \end{aligned}$$

where, SaleP is the sale price of each lot i at sale t; Sex is a dummy variable for the gender of the lot that takes a value of 1 if the lot was steers and 0 if the lot was heifers; W is the average weight of each lot; Var is the weight range of each lot as reported in the

sale catalog; Days is the number of days until the specified delivery for each lot; %Blk is the percentage of black-hided cattle in each lot; Mix takes a value of 1 if the lot contained both steers and heifers and 0 if only one gender; Shrink is the seller specified allowable shrink; the final three variables are for the 2008 Home Place sale, the 2009 Exchange Sale and 2009 Home Place sale, respectively, with the 2010 Exchange sale serving as the baseline.

Results

The first annual Mississippi Home Place Producers Sale was held on August 4, 2008 at Southeast Mississippi Livestock, in Hattiesburg, MS. The second annual sale was held on August 3, 2009 at the same location. Beef cattle producers from across the state marketed farm-fresh and assembled stocker cattle in 26 and 35 truck-load lots in the 2008 and 2009 Home Place sales, respectively.

The first annual Cattlemen's Exchange Producer Sale was held on April 7, 2009 at EE Ranches, Inc., in Winona, MS The second annual sale was held on April 6, 2010 at the same location. Beef cattle producers from across the state marketed farm-fresh and assembled stocker cattle in 32 and 18 truck-load lots in the 2009 and 2010 Cattlemen's Exchange sales, respectively.

Each lot price for the four board sales were compared to the expected price in Mississippi for the specified delivery date. This comparison analyzes the performance of the sale under the current market environment at the time of the sale. The second metric analyzed was the board sale price minus the actual reported Mississippi price during the specified week of delivery. This comparison analyzes the performance of the sale to how each producer would have fared if selling their cattle at a Mississippi market at the time they specified for delivery.

Table 1 reports the summary statistics of the board sale results as well as summary statistics for each sale compared to Mississippi expected and actual price. Based on the information in Table 1 the 2008 Home Place sale appears to be the best performing of the four in terms of overall sale price and when compared to Mississippi prices at the time of each delivery; however, keep in mind that this sale took place at a time of high commodity prices and just before the market moved sharply lower in mid-September 2008. Still, both Home Place sales performance against Mississippi expected and actual prices outperformed the Exchange sales. The Home Place sale takes place in early August at a time when the feeder calf market is at or near a seasonal peak and prior to a typical decline in prices throughout the fall months. Therefore, the timing of the Home Place sale is likely the contributor to these results.

Table 1. Board sale results and comparisons to expected and actual weekly average Mississippi reported price

	Steers			Heifers		
	Average	Minimum	Maximum	Average	Minimum	Maximum
2008 Home Place						
Sale Price	$108.95	$100.94	$113.00	$103.58	$94.94	$108.00
Sale Price vs Expected Miss. Price	$5.11	-$3.36	$10.38	$4.68	-$3.26	$10.33
Sale Price vs Actual Miss. Price	$13.89	$3.84	$31.63	$17.47	$5.38	$31.75
2009 Exchange						
Sale Price	$91.79	$87.00	$98.20	$89.77	$83.75	$92.50
Sale Price vs Expected Miss. Price	$1.71	-$1.93	$9.44	$8.20	$0.21	$13.15
Sale Price vs Actual Miss. Price	-$1.70	-$7.88	$7.20	$4.48	-$1.13	$9.70
2009 Home Place						
Sale Price	$98.79	$95.00	$101.75	$92.82	$89.00	$95.75
Sale Price vs Expected Miss. Price	$10.24	$5.38	$15.83	$10.38	$7.32	$14.03
Sale Price vs Actual Miss. Price	$8.32	-$0.66	$17.50	$9.48	$4.83	
2010 Exchange						
Sale Price	$107.10	$103.20	$109.20	$105.16	$99.25	$108.50
Sale Price vs Expected Miss. Price	$3.31	$0.08	$4.55	$8.51	$3.83	$13.08
Sale Price vs Actual Miss. Price	$1.13	-$0.55	$3.09	$7.03	$2.70	$14.67

Figure 1 shows the distribution of the board sale price minus the actual Mississippi price at the time of each lot delivery. Most lots outperformed the Mississippi price, with 81.8% doing better than the price they would have received if sold in Mississippi markets at the time of delivery. Some lots, one the other hand, did worse than the Mississippi price with 18.2% receiving a price that was lower than the Mississippi price at the time of delivery. Figure 2 reports the distribution of heifer prices versus the Mississippi actual price.

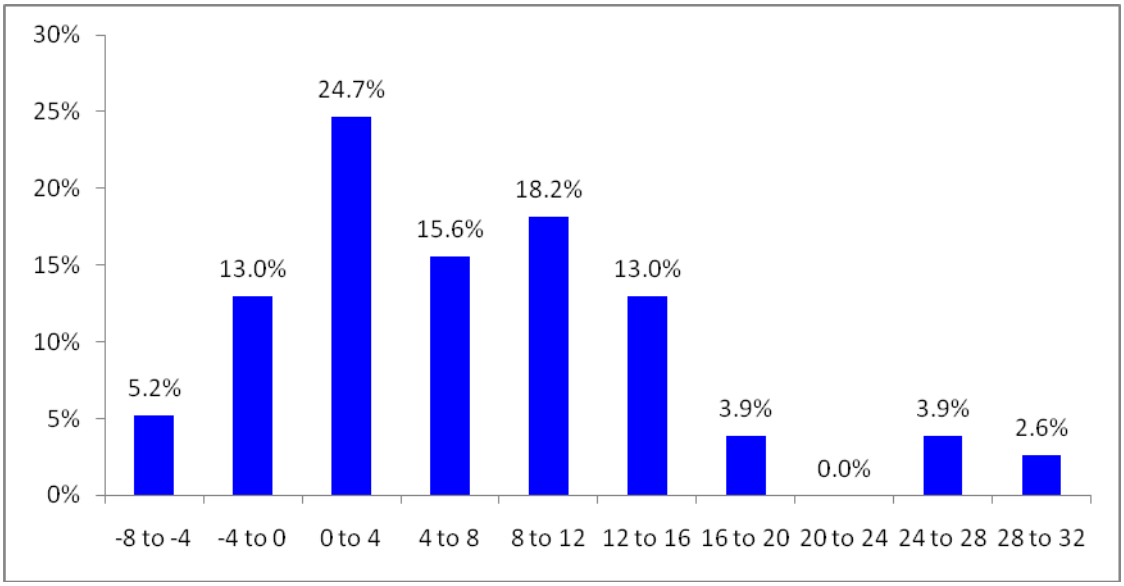


Figure 1. Distribution of difference between board sale price and actual Mississippi price for steers

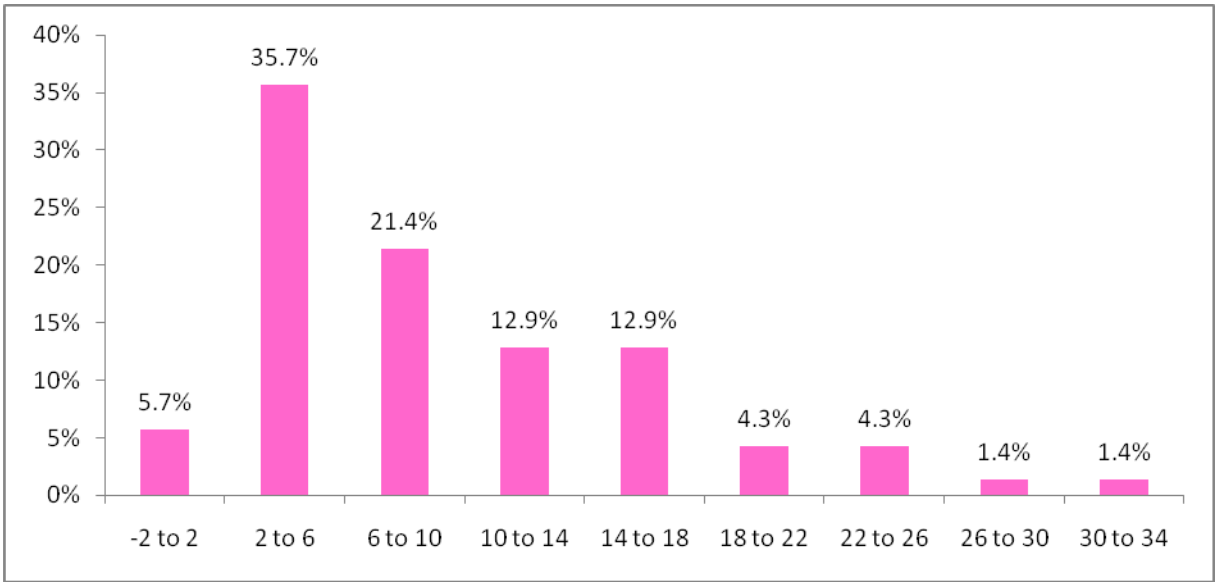


Figure 2. Distribution of difference between board sale price and actual Mississippi price for heifers

In this analysis, board sale prices were compared to expected and actual Mississippi weekly average prices reported by USDA, Agricultural Marketing Service. The results indicate that the four board sales conducted in the state have, for the majority of the cattle sold, outperformed the price the cattle would have fetched if taken to auction at the specified delivery date. It is important to keep in mind that comparisons were

drawn against an average price reported by USDA, AMS and as such the actual price the cattle would have received might have been above or below this benchmark. Based on the fact that the cattle were sold in the manner outlined here, it is likely the cattle were above average in type and kind and would most likely have received a premium at auction.

Various lot characteristics were regressed on lot price to determine their impact on the sale price. Table 2 reports the results of the hedonic model used for this estimation. Steers add $5.85 above heifers to lot price. This result is understandable given the pre-determined price difference for mixed lots set heifers at a six dollar per cwt discount to steers. Each 100 pounds added to the average lot weight brought the lot price down by $3/cwt. Lot price was reduced by $1/cwt for each 100 pounds of range in lot weight. The larger the percentage of black-hided cattle in the lot the higher the lot brought. An increase of one percentage point of black-hided cattle increased the lot price by 1.15 cents/cwt. Lots that mixed both steers and heifers reduced the lot price by $1.15/cwt.

Table 2. Hedonic regression model results

	Coefficients	*t Stat*	
Intercept	$122.92	48.15	***
Sex	$5.85	14.80	***
Weight	-$0.03	-8.82	***
Variance	-$0.01	-1.81	*
Days	-$0.01	-0.67	
%Black	$0.0115	1.78	*
Mix Load	-$1.15	-2.67	***
Shrink	$0.48	1.56	
2008 HP	-$1.11	-1.83	*
2009 EX	-$14.95	-24.41	***
2009HP	-$10.33	-14.23	***
R^2	0.931		

***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Implications

These sales have been successful in bringing together cattle producers and livestock marketers to improve the profitability of multiple sectors of the beef production chain. This type of marketing option is extremely efficient for all the parties involved. Since 2008, more than 7,700 head of cattle have been marketed in these board sales. Together, the receipts from these sales exceeded $3 million. For most cattle in these sales, price premiums were achieved above Mississippi average market prices when the cattle were loaded out.

Physical Units
°F = Degree Fahrenheit
cal = calorie
Da = dalton
Eq = equivalent
fl oz = fluid ounce
ft = foot(feet)
gal = gal
Hz = hertz
IU = international unit
in = inch(es)
J = joule
lb = pound(s)
Ix = lux
M = molar (concentration; preferred over mollL)
MPH = miles per hour
mol = mole
N = normal (concentration)
RPM = revolutions per minute
T = ton(s)
V = volt
W = watt
yd = yard(s)

Units of Time
s = second(s)
mm = minute(s)
h = hour(s)
d = day(s)
wk = week(s)
mo = month(s)
yr = year(s)

Statistical Symbols and Abbreviation
ANOVA = analysis of variance
CV = coefficient of variation
df = degree(s) of freedom
F = F-distribution (variance ratio)
LSD = least significant difference
LSM = least squares means
MS = mean square
n = sample size
NS = nonsignificant
p = probability
r = simple correlation coefficient
r^2 = simple coefficient of determination
R = multiple correlation coefficient
R^2 = multiple coefficient of determination
S^2 = variance (sample)
SD = standard deviation (sample)
SE = standard error
SED = standard error of the differences of means
SEM = standard error of the mean
SS = sums of squares
t = *t*- (or Student) distribution
α = probability of Type I error
β = probability of Type II error
μ = mean (population)
σ = standard deviation (population)
σ^2 = variance (population)
χ^2 = chi-squared distribution

Other Abbreviations
AA = amino acid(s)
ACTH = adrenocorticotropic hormone
ADF = acid detergent fiber
ADFI = average daily feed intake
ADG = average daily gain
ADIN = acid detergent insoluble nitrogen
ADL = acid detergent lignin
ADP = adenosine diphosphate
AI = artificial insemination
AIA = acid insoluble ash
AMP = adenosine monophosphate
AOAC = Association of Official Analytical Chemists International
ARS = Agricultural Research Service
ATP = adenosine triphosphate
ATPase = adenosine triphosphatase
Avg = average
BCS = body condition score
BLUP = best linear unbiased prediction
Bp = base pair
BHBA =β-hydroxybutyrate
BSA = bovine serum albumin
bST = bovine somatotropin
BTA = *Bos taurus* chromosome
BUN = blood urea nitrogen
BW = body weight
cDNA = complementary deoxyribonucleic acid
cRNA = complementary ribonucleic acid
CIEBP = CAAT-enhancer binding protein
cfu = colony-forming unit
CLA = conjugated linoleic acid
CoA = coenzyme A
CN = casein
CNS = coagulase-negative staphylococci
Co-EDTA = cobalt ethylenediaminetetraacetate
CP = crude protein (N x 6.25)
D = dextro
DCAD = dietary cation-anion difference
diam. = diameter
DE = digestible energy
DEAE = (dimethylamino)ethyl (as in DEAEcellulose)
DFD = dark, firm, and dry (meat)
DHI = Dairy Herd Improvement
DHIA = Dairy Herd Improvement Association
DIM =days in milk
DM = dry matter
DMI = dry matter intake
DNA = deoxyribonucleic acid
DNase = deoxyribonuclease
EBV = estimated breeding value
eCG = equine chorionic gonadotropin
EBV = estimated breeding value
ECM = energy-corrected milk
EDTA = ethylenediaminetetraacetic acid
EFA = essential fatty acid
EIA = enzyme immunoassay
ELISA = enzyme-linked immunosorbent assay
EPD = expected progeny difference
ETA = estimated transmitting ability
Eq. = Equation(s)
Exp. = experiment
FCM = fat-corrected milk
FDA = Food and Drug Administration
FFA = free fatty acid(s)
FSH = follicle-stimulating hormone
G = gravity
GAPDH = glyceraldehyde 3-phosphate dehydrogenase
GC-MS = gas chromatography-mass spectrometry
GE = gross energy
G:F = gain-to-feed ratio
GLC = gas-liquid chromatography
GLM = general linear model
GnRH = gonadotropin-releasing hormone
GH = growth hormone
GHRH = growth hormone-releasing hormone
h_2 =heritability
hCG = human chorionic gonadotropin
HCW = hot carcass weight
HEPES = *N*-(2- hydroxyethyl)piperazine-*N* -2ethanesulfonic acid)
HPLC = high-performance (pressure) liquid chromatogram
HTST = high temperature, short time
i.d. = inside diameter
Ig = immunoglobulin
IGF = insulin-like growth factor
IGFBP = insulin-like growth factor-binding protein(s)
IL = interleukin
IFN = interferon
IMI = intramammary infection
IVDMD = in vitro dry matter disappearance
IVTD = in vitro true digestibility
kb = kilobase(s)
KPH = kidney, pelvic, heart fat
L = levo
LA = lactalbumin
LD_{50} = lethal dose 50%
LG = lactoglobulin
LH = luteinizing hormone
LHRH = luteinizing hormone-releasing hormone
LM = longissimus muscle
LPS = lipopolysaccharide
mAb = monoclonal antibody
mRNA = messenger ribonucleic acid
ME = metabolizable energy
MIC = minimum inhibitory concentration
Misc. = miscellaneous
Monogr. = monograph
MP = metabolizable protein
MUFA = monounsaturated fatty acid
MUN = milk urea nitrogen
NAD = nicotinamide adenine dinucleotide
NADP = nicotinamide adenine dinudeotide phosphate
$NADPH_2$ = reduced nicotinamide adenine dinucleotide phosphate
NADH = reduced form of NAD
NAN = nonammonia nitrogen
NDF = neutral detergent fiber
NDM = nonfat dry milk
NDIN = neutral detergent insoluble nitrogen
NE = net energy
NE_g = net energy for gain
NE_l = net energy for lactation
NE_m = net energy for maintenance
NFC = nonfiber carbohydrates
NEFA = nonesterified fatty acid
No. = number
NPN = nonprotein nitrogen
NRC = National Research Council
NSC = nonstructural carbohydrates
o.d. = outside diameter
OM = organic matter
PAGE = polyacrylamide gel electrophoresis
PBS = phosphate-buffered saline
PCR = polymerase chain reaction
PG = prostaglandin
$PGF_{2\alpha}$ = prostaglandin $F_{2\alpha}$
PMSG = pregnant mare's serum gonadotropin
PMNL = polymorphonuclear neutrophilic leukocyte
PPAR = peroxisome proliferator-activated receptor
PRL = prolactin
PSE = pale, soft, and exudative (meat)
PTA = predicted transmitting ability
PUFA = polyunsaturated fatty acid(s)
QTL = quantitative trait locus (loci)
RDP = rumen-degradable protein
REML = restricted maximal likelihood
RFLP = restriction fragment length polymorphism
RIA = radioimmunoassay
RNA = ribonucleic acid
RNase =ribonuclease
rRNA = ribosomal ribonucleic acid
RQ = respiratory quotient
RUP = rumen-undegradable protein
SCC =somatic cell count
SCM = solids-corrected milk
SCS = somatic cell score
SDS = sodium dodecyl sulfate
SFA = saturated fatty acid
SNF = solids-not-fat
SNP = single nucleotide polymorphism
SPC = standard plate count
ssp. = subspecies
ST = somatotropin
spp. = species
SSC = *Sus scrota* chromosome
TCA = trichloroacetic acid
TDN = total digestible nutrients
TDS = total dissolved solids
TLC = thin layer chromatography
TMR = total mixed ration(s)
Tris = tris(hydroxymethyl)aminomethane
TS = total solids
TSAA = total sulfur amino acids
USDA = U.S. Department of Agriculture
UF = ultrafiltration, ultrafiltered
UHT = ultra-high temperature
UV = ultraviolet
VFA = volatile fatty acid(s)
Vol = volume
vol/vol = volume/volume
vs. = versus
wt = weight
wt/vol = weight/volume
wt/wt = weight/weight