

Prepare the Immune System

With understanding of diseases, response to treatment and the role of the immune system, producers can improve animal health and minimize long-term costs. That was the message Gordon Brumbaugh, veterinary specialist for Pfizer Animal Health, carried to attendees of the 2007 Range Beef Cow Symposium (RBCS) in Fort Collins, Colo., Dec. 12, 2007.

Brumbaugh called attention to the often-overlooked costs of disease. Despite producers' best efforts, some animals will become sick and require treatment. Calves

with bovine respiratory disease (BRD) that require more than one treatment may exhibit reduced performance, decreased carcass quality and lower economic returns than calves that did not develop BRD or those that responded to one treatment.

Brumbaugh said that illustrates why the health of young stock requires attention.

He explained that treatment with antibiotics serves only one purpose: to overcome the disease organism. It's then up

to the animal's immune system to clean up, repair and restore function to damaged tissue.

"What can producers do to help prepare the immune system to participate in healing? Most important are the simple things that we sometimes don't want to do," Brumbaugh stated.

Preparation starts with reducing exposure to infectious organisms. Cleanliness of feeders, water troughs or tanks, bedding, and handling facilities can reduce the number of organisms to which animals are exposed. Enhancement of the immune system usually

concentrates on vaccination against diseases. Appropriate use of biologics in the calf and the cow herd is necessary to prepare them for the challenges of infectious agents.

Preparation may start long before animals are eligible for vaccination, Brumbaugh added. Studies have identified genetic contributors to

disease resistance. As more is learned about particular genetic markers, selection for resistance to specific diseases may be possible.

Phenotypic profiles are now being used to identify cattle with desirable performance characteristics and those that are at greater



Gordon Brumbaugh

risk of contracting BRD. Behavioral traits are outward expressions (phenotypic traits) that have been shown to be associated with relative risk of illness, as well as performance characteristics.

"There is exciting potential for 'profiling' and managing cattle based on that risk," Brumbaugh said. "Targeted selection and management could lead to development of appropriate expectations for health care programs and could substantively enhance judicious use of medication."

— by Troy Smith

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Applying the Principles of the Sandhills Calving System

David Smith shared with producers attending the RBCS animal health session the principles used in the Sandhills Calving System to minimize the risk of calves developing scours. Smith is professor and Extension dairy/beef veterinarian with the Department of Veterinary and Biomedical Sciences at the University of Nebraska—Lincoln (UNL).

"There are numerous infectious agents that cause calf diarrhea," Smith said. "Probably too much time [is] spent in knowing the name of the agent responsible for the calf's illness or death, even though that knowledge rarely

explains the outbreak or provides a solution for treatment, control or prevention."

Calves that typically become ill or die from diarrhea do so within one or two weeks of age, Smith added. Regardless of the reason for this narrow range of age, the first seven to 14 days defines the age of susceptibility as well as the age calves are most likely to become infective and shed the agents in their feces.

The dam's age also explains a young calf's risk for diarrhea, Smith said. Calves born to heifers are at higher risk for diarrhea and have lower maternal antibody levels

than calves born to older cows. Researchers suggest calves born to heifers are probably more susceptible to disease, because heifers produce a lower volume and quality of colostrum, they don't have good mothering skills, and they are more likely to experience calving difficulty.

Although the adult cow herd likely serves as the source of calf scour pathogens from year to year, Smith said, the average amount of pathogen exposure to calves is likely to increase later in the calving season, because calves infected earlier serve as pathogen multipliers and become the primary

source of exposure to younger calves. This multiplier effect can result in higher infection rates and widespread environmental contamination.

While biosecurity is the total of actions producers can take to prevent the introduction of a disease agent into a pen or herd, that is not possible with scours since the pathogens for scours are already present in the herd. Biocontainment describes the actions taken to control a pathogen already present in the population, Smith said.

Various biocontainment systems for beef herds have been developed to prevent calf diarrhea. Each of these strategies, including the Sandhills Calving System, are designed to manage cattle in a way that prevents calves from having effective contacts with pathogens by reducing opportunities for exposure and transmission.

“The later a calf is born in the season, the

more likely it is to die from scours,” Smith said. “This is due to the calf’s lower level of immunity and its higher level of exposure.” The two management actions that will prevent or limit scours in beef calves are:

1. segregating calves by age to prevent direct and indirect transmission of pathogens from older to younger calves; and

2. scheduling movement of pregnant cows to clean calving pastures to minimize the pathogen multiplier effect in the environment and to limit contact time between calves and the larger portion of the herd.

“We try to recreate those conditions that exist at the beginning of the calving season,” Smith said. Producers using the Sandhills Calving System or a similar management system or strategy to control or prevent exposure have observed meaningful and sustained reductions in sickness and death

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due to calf scours and greatly reduced use of medications.

Biocontainment systems or strategies are not new ideas, Smith added, showing a textbook from the 1930s that suggested good hygiene was most important in maintaining calf health.

—by Linda Robbins



David Smith

Breeding Success is in the Details

Attention to detail is the secret to a successful herd synchronization and artificial insemination (AI) program.

It doesn't really matter which synchronization or AI protocol you choose to use. The key to getting cows bred is paying attention to the management details, University of Minnesota animal scientist Cliff Lamb said Dec. 12, 2007, at the Range Beef Cow Symposium XX (RBCS), in Fort Collins, Colo.

Lamb offered several key points on which producers should focus to enhance reproductive efficiency within their herds. Foremost, he said, is emphasis on nutritional management among heifers and cows.

"Don't think that a synchronization

program will get cows cycling if they've had poor nutrition," Lamb said. "You'll struggle and be disappointed if your cows aren't in good body condition at the start of breeding."

He suggested the common rule of thumb that cows be in a body condition score (BCS) of 5 or 6 on a 9-point scale at breeding. He cited research indicating that for good fertility rates it is more important that females be gaining condition prior to breeding, as opposed to simply maintaining.

Likewise, Lamb shared research indicating that fat heifers (BCS 7 or higher) tend to struggle with fertility if they lose condition and then have to regain it to start cycling again. "It takes them longer to start cycling," he said.

Lamb also stressed the importance of having cows in appropriate condition at calving.

"Condition in which cows calve is a critical indicator of when they'll come back into heat," he said. For instance, a cow with a BCS 3 at calving will, on average, take 89 days before she'll begin to start cycling for breed back; whereas, cows with a BCS 5 or 6 will typically cycle within the first 60 days after calving.

"Don't starve your cows through winter and plan to get them to gain body condition after calving," Lamb said. "It's too late." If they are in a BCS 5-5.5 at calving, they will respond better to estrus synchronization programs at breeding.

As final points for the breeding season, Lamb offered these recommendations:

- Minimize stress on the herd. "Stress affects pregnancy rates, ovulation and embryo survival," he said. Appropriate facilities can help decrease stress to both people and the cattle. He especially suggested the use of a breeding box.

- Follow the synchronization protocols outlined in the AI catalogs. Choose the protocol that suits your operation, and plan ahead because many of the protocols are 31-33 days in length.

- AI all cows. Even if the protocol you use requires heat detection, run all synchronized cows that have not shown heat through the chute and AI them at 72-84 hours. "It will increase overall pregnancy rates by 10%-15%," Lamb said.

"Synchronization will do a great job in herds where the details have been taken care of up front," he concluded.

— by Kindra Gordon

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Re-evaluate Traditional Postweaning Heifer Development

Traditional approaches to postweaning development of replacement heifers during the last several decades have primarily focused on feeding heifers to achieve or exceed a target weight to maximize pregnancy rates. But changes in cattle genetics, economics and research may suggest it's time to re-evaluate those traditional approaches.

"Intensive heifer development systems may maximize pregnancy rates, but not necessarily optimize profit or sustainability,"

Rick Funston of the University of Nebraska West Central Research and Extension Center at North Platte told RBCS attendees Dec. 12.

"Developing heifers in this manner requires significant use of fuel and feed, and high capital investment in equipment and facilities," Funston continued. "The fuel requirement to harvest and deliver feed to cattle creates high energy demands in the system. Cereal grains used in heifer diets detract from the system's sustainability due

to growing demand for human food and ethanol production."

Studies in numerous species provide evidence that diet during development can partially control physiological changes necessary for puberty. Energy balance and other nutritional factors influence reproductive performance in heifers and cows. In addition, previous research indicated that rate of postweaning growth was thought to be an important factor affecting age of puberty,

which in turn influenced pregnancy rates.

The universal thought process has been that “puberty occurs at a genetically predetermined size. Only when heifers reach their target weight can high pregnancy rates be obtained,” he said. “Replacement heifers have been fed to achieve 60% to 65% of expected mature body weight by the time breeding started in order to reach puberty.”

Fast-forward three decades, and more contemporary research has shown the pattern of growth heifers experience prior to achieving critical target weight could be varied. In fact, heifers may be developed to lighter-than-traditional target weights without any negative effects on profitability or future productivity.

“Numerous studies have been performed to determine how energy inputs affect heifer

development program success,” he said. “Limited research has been performed to determine whether inherent differences in development systems affect reproductive efficiency or future productivity of heifers ... And some studies provide evidence that heifer development systems can influence reproductive performance, but do not provide evidence of effects independent of energy intake and/or growth rate.”

Funston said producers can decrease feed costs by altering rate and timing of gain, which creates periods of compensatory

growth and allows producers to limit supplementation to critical periods. Total

energy intake, and possibly costs, may be reduced by limiting heifer gain early postweaning followed by accelerated gains before breeding season.

“Ongoing research evaluating lifetime productivity of heifers developed with either unlimited or restricted access to feed during postweaning supports the potential to reduce target weights when developing replacement heifers,” he said. “Age at the beginning of the breeding

season may be more critical for a successful pregnancy than body weight.”

— by Barb Baylor Anderson

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Nutrition During Gestation and Fetal Programming

The concept of fetal programming suggests that environmental stimuli during pregnancy establish permanent responses by the fetus, which are likely to be expressed at birth and even later in life.

The study of long-term effects on offspring due to a mother’s nutritional status began in the human health arena, but it also has application for livestock production.

During the Dec. 12 RBCS discussion of reproductive management topics, North Dakota State University animal scientist Kim Vonnahme said the theory of fetal

programming has been challenged and verified using multiple animal models. From the earliest stages of embryonic life, an unborn calf is sensitive to the dietary intake of its dam. A nutrient-restricted diet results in an undernourished fetus, which may be “programmed” for susceptibility to disease and poor performance at birth and later in life.

“While variations in the duration and severity of maternal undernutrition do not always result in a reduced birth weight, physiologic alterations such as glucose intolerance, skewed growth

patterns and even alterations in carcass characteristics have been reported,” Vonnahme said.

In a pregnant bovine, development of the fetal/placental vascular system begins around Day 90 of gestation. Subjecting the cow to nutritional insult during this early development period can affect the ability of the fetus to acquire proper amounts of nutrients and oxygen. While it is true that 75% of the growth of a ruminant fetus occurs during the last two months of gestation, Vonnahme said the

early phase of development is critical to growth of the placenta and subsequent fetal development.

Studies suggest a low-protein diet can result in lifelong elevations in blood pressure of offspring, which may compromise lung development in late gestation. Reduced lung function could then make calves more susceptible to respiratory disease.

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Vonnahme said that while the timing and the exact nutrients involved are not yet clearly delineated, it appears that multiple physiological systems, including skeletal muscle development, may be affected at different times during pregnancy. Further research is needed to better explain how maternal nutrition affects economical traits in beef cattle.

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Ultrasound's Evolution

University of Wyoming Extension beef specialist Steve Paisley shared some of the opportunities offered by ultrasound technology to the beef industry during his presentation at the Range Beef Cow Symposium (RBCS) XX in Fort Collins, Colo.

"Ultrasound offers us a way to evaluate the eating quality of the beef we produce by looking at carcass traits," he shared.

Giving a brief history of ultrasound, Paisley explained that research has shown that with this technology producers can estimate cattle's actual measurements for backfat, ribeye area and marbling pretty accurately and that heritability for these carcass traits is fairly high.

"So, there is opportunity to make genetic improvement using ultrasound data," Paisley said.

He also noted the ultrasound data being used by breed associations is interpreted by an independent third party to ensure accurate, consistent data. Further ensuring accuracy, ultrasound technicians must be certified every two years.

"Ultrasound has been around for quite a while, but the industry has struggled with its implementation as a management tool," Paisley noted. That is beginning to change, and more feeders and cattle producers are recognizing the value that ultrasound data can offer.

For example, many breed associations are

now building large databases of ultrasound data and using that information within carcass expected progeny difference (EPD) calculations or for separate ultrasound EPDs. Paisley said the industry now has an ultrasound database with 10 times the information compared to actual measurements.

The development of chuteside software that allows for real-time interpretation of ultrasound measurements is also advancing the use of this technology for management decisions, Paisley said. For instance, at the feedlot, chuteside ultrasound data allows

for immediate sorting of cattle into more uniform lots.

This is especially beneficial when marketing cattle on a grid, Paisley said. "The penalties for out cattle are higher than the premiums, so ultrasound can be an important tool to minimize those discounts."

At the ranch, chuteside ultrasound software is being used in some instances to gather information on calves at weaning. This can be beneficial if calves are marketed via retained ownership or simply to gather carcass data for future herd improvement.

Because of the heritability of carcass traits, Paisley said he is seeing more ranchers collect ultrasound data on replacement females as well.

In closing, Paisley pointed out that across the industry cattle producers are still

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PHOTOS BY TROY SMITH

struggling with the ideal quality and yield grade distribution. More Choice and Prime cattle are needed, while Yield Grade (YG) 4s and 5s need to be eliminated.

Paisley reiterated that ultrasound can be a valuable tool to improve the carcass quality of the cattle we are trying to produce. But, he added, it is a technology that needs to be used realistically.

"Ultrasound is a technology that needs to be used in the right context to make management decisions," Paisley said. "When ultrasound data is collected chuteside, it is a point-in-time measurement; carcass traits are still impacted by management and environment."

Ultrasound may not be an investment for every operation. "As we look at new technology, number 1, we want it to benefit our operation and our bottom line," Paisley noted.

— by Kindra Gordon

Gene Testing: What Does It Mean for Producers?

Application of genome technology in livestock production, while no longer in its infancy, has reached adolescence. Use of marker-assisted selection (MAS) for economically important traits is progressing,

said Bob Weaber, University of Missouri animal scientist.

Weaber shared his insights during Wednesday afternoon's RBCS discussion of cattle selection and genetics.

"Put simply, a DNA marker represents a way to track a piece of genetic material associated with a particular trait," Weaber said. "DNA markers can be used to track

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the inheritance of simple traits controlled by a single gene or complex traits controlled by many genes. Examples of simple traits include coat color, horned or polled, and some genetic diseases or defects. Complex traits include traits like weaning weight, tenderness and marbling, which are controlled by many genes. DNA markers simply identify a sequence of DNA just as ear tags identify individual calves.”

Marker-assisted selection can be used to increase the frequency of desirable forms of a gene within a population by selection of parent stock that carry the gene. The potential benefits are greatest for those traits that have low heritability, are difficult or expensive to measure, cannot be measured until later in life (carcass or maternal traits), are not routinely measured (tenderness), and are genetically correlated with another trait you do not want to change. An example of the latter would include selection for intramuscular fat (marbling) without affecting external fat.

Weaver said several limitations challenge implementation of DNA marker technology

by seedstock producers or commercial ranchers. One involves the frequency of a favorable gene variation. If it occurs with a frequency of 90% in a population, for example, the gene variation is almost fixed in the population, and it probably wouldn't be worthwhile to test all of the animals to find those that do not carry it. Alternatively, if the gene is at very low frequency, it may require selection over many generations to increase it to a beneficial level.

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—Bob Weaver

“If the population has [a gene variation] that is not very frequent but accounts for 80% of the genetic variation in a particular trait, it might be worth going after,” Weaver explained. “It’s important to know the frequency and the magnitude of the effect to know if you’re going to get enough bang for your buck.”

It’s also important to know if the trait is co-dominant or recessive. If it is recessive, both sire and dam must be carriers for the calf to have a high probability of inheriting the trait. Selection for recessive traits is



Bob Weaver

difficult and time-consuming.

Weaver stressed that marker-assisted selection is not a substitute for selection based on expected progeny difference (EPD) values. Both marbling and tenderness, for example, are complex traits controlled by many genes, but only a few genes have useful markers associated with them. More response to selection will be obtained if both marker-assisted selection and EPD values are used, with the latter being the primary driver of selection decisions.

— by Troy Smith

EPDs: Strike a Balance

To be successful, you have to match your cattle to your ranch environment, said Willie Altenburg, owner of Altenburg Super Baldy Ranch. Using proper genetics can help you achieve that goal.

When it comes to genetic evaluation, Altenburg said he is a strong proponent of EPDs. He noted that he and many others in the audience are hard-core EPD “number junkies,” who like to crunch the numbers, talk about the cattle and can’t wait for the next sire

summary to come out. While maybe not junkies, many other producers use the EPD numbers as a tool to breed cattle.

No matter what group you fit into, Altenburg said, “EPDs are the most important breeding tools implemented in the

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—Willie Altenburg

past century.” Throughout his presentation, he provided examples of how he uses EPDs in his ranching operation.

One of the benefits of using EPDs is being able to evaluate performance data.

For starters, EPDs can help you predict calving ease and birth weights. Altenburg called the calving ease EPD a better predictor of the trait than birth weight because there is more to calving ease, such as calf shape, and birth weight is already incorporated into the calving ease EPD. This becomes important when evaluating calving ease of sires to mate to first-calf heifers.

When it comes to growth traits, weaning and yearling weight EPDs are highly correlated. Altenburg said he tries to find the



Willie Altenburg

bulls that have offspring that calve easy and grow fast.

Maternal traits are another important area to look at with EPDs. He concentrates mostly on maternal calving ease and maternal milk,

especially a sire's ability to affect the calving ease of his daughters. "I don't think we pay enough attention to this one," he noted.

Carcass traits are another area of concentration for Altenburg. He said he considers emphasizing EPDs for ribeye, marbling and backfat to be important. "I have found backfat to be the best indicator of cow condition," he said. This helps him select sires that are at or slightly above breed average fat. Indexing plays a role with carcass traits as well.

A couple of other EPD features that come in handy, Altenburg said, are accuracy and percentile ranking. Using bulls with high-

accuracy EPDs increases the likelihood that his progeny will on average perform as predicted. Like high school test score rankings, percentiles indicate where an individual's EPD ranks in the breed for that particular trait.

In addition to using EPDs to select for more or less of a particular trait, Altenburg suggested cattlemen establish thresholds of acceptability for use in culling decisions.

On a final note, Altenburg said he couldn't talk about EPDs without discussing the importance of also assessing animal structure. Physical traits are hard to evaluate with EPDs

and are usually best evaluated by the eye of the producer, he said. Before purchasing a bull, he said he looks through the sale book to evaluate the performance, markings, EPDs and other data before arriving at the sale. Once there, he visually assesses the bull's muscle, structure and temperament, along with scouting the dam and other family members.

"I don't buy a bull without seeing his dam," he said. "EPDs are essential; physical traits are equally important. It's all about finding a balance."

— by Jane Messenger

Value of Heterosis in Cow Herds

Why crossbreed?" asked Matt Spangler, beef specialist for the University of Nebraska. "The answer is breed complementarity, capturing dominances and epistasis, and heterosis," Spangler said. "First must come the realization that no one breed excels in all areas that lead to profitability."

Spangler acknowledged to the Wednesday afternoon audience at the 2007 RBCS that he may offend everyone in the room at some point during his presentation.

"[In] every breed, no matter how good it is or how much we love it, there is some place that can be improved," Spangler said.

To select a crossbreeding program you must first know your marketing goals, Spangler advised. Knowledge of the production environment in which cattle are expected to perform, and the resources they will have available to them, is also very important.

He explained two types of systems — terminal and rotational. A terminal program takes straightbred cows from Breed "A" and crosses them with a straightbred bull from Breed "B" to get the AxB calves. A rotational system requires two sires, two pastures and approximately 50 cows (assuming one bull breeds approximately 25 cows). Females will be bred to Breed "A" and the replacement females will be bred to Breed "B" with those replacements going back to Breed "A" and so

on in a continued rotation.

Both terminal and rotational can be done with a two-breed or three-breed system. According to Spangler, a three-breed rotation can become "a bear" to manage.

"The goal of a crossbreeding system should be the optimization of labor (inputs) and heterosis gained (outputs)," Spangler said. "Minimizing inputs or maximizing outputs alone will not lead to a profitable or sustainable system."

Heterosis is a hybrid vigor, Spangler said, the superiority of crossbred animals as compared to the average of its straightbred parents. The more divergent the parental lines are, the more heterosis will occur. Spangler

explained there are three types of heterosis: individual, expressed in the crossbred calf; maternal, expressed in the cow; and paternal, expressed in the sire.

According to Spangler, the heterosis advantage would result in a better calving rate, survival to weaning, increased weaning and yearling weights and improved average daily gain (ADG) for crossbred calves. For crossbred cows and sires it would improve their longevity in the herd, fertility, number of calves, and cumulative weaning weights.

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dominances, whereas EPDs only take advantage of additive effects, Spangler noted. Stringent selection within parental lines is critical. Breed complementarity, he said, is why we crossbreed; heterosis is the reward. Producers should choose a system that makes them money and that they can maintain, he added.

In closing, Spangler said, "If you are raising purebred animals right now, seedstock, and you think that these crossbred sires are going to endanger your bull market, where do you think the animals come from that formed that composite? Purebreds, don't they? One doesn't endanger the other, they need each other."

— by Mathew Elliott

