Western Dairy News
for the West, about the West, from the West
September 2004
Volume 4, No. 7

Don't use bulls without breeding soundness evaluations

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Despite the benefits of artificial insemination, which include reducing disease transmission, allowing for genetic selection, and increasing milk yield, many dairy producers continue to use natural-service bulls.

Recent surveys of Western dairy producers revealed that up to 84% used bulls for at least a portion of their breeding program. However, the majority of producers that use bulls did not have a breeding soundness evaluation conducted prior to, or after, purchasing bulls. Clearly the exam is a misunderstood and underutilized economic tool. The objective of this article is not to promote the use of natural service, but rather to describe the components and the value of the breeding soundness evaluation.

A breeding soundness evaluation should be performed on all bulls: a) prior to purchase, b) after six months of service, and c) whenever there is concern relative to the potential fertility of a bull. Comprehensive guidelines for the breeding soundness evaluation were approved by the Society for Theriogenology in 1992. It consists of a physical examination, scrotal circumference measurement, and semen collection and evaluation.

The evaluation begins with a physical examination of the bull, with attention paid to the eyes, feet and legs. Vision plays a key role in identifying potentially receptive females. In order for copulation to occur, the bull must be able to physically support a large portion of his weight on his rear legs, extend his penis, and gain intromission to deliver the ejaculate. Bulls with sore feet, legs or back may not adequately service cows. Examination of the testes, epididymides, penis, and prepuce, as well as internal organs (seminal vesicles, prostate, and ampullae) are also performed. Scrotal circumference is highly correlated to sperm production, especially in young bulls. Consequently, bulls with insufficient scrotal circumference (relative to age) may not efficiently impregnate cows.

Following collection of a semen sample (usually by electroejaculation), spermatozoal motility and morphology are evaluated. Fertile bulls have a greater percentage of progressively motile sperm and a lower percentage of morphologically abnormal sperm than sub-fertile or sterile bulls.

At the end of the evaluation, bulls may be classified as: 1) a satisfactory potential breeder, 2) an unsatisfactory potential breeder, or 3) classification deferred. A bull must meet minimum criteria for scrotal circumference, spermatozoal motility and morphology to be classified as a satisfactory potential breeder. These bulls must also be free of other problems (feet, legs, eyes, penile, preputial, accessory sex glands) that may reduce fertility. Bulls with physical abnormalities, and (or) those bulls not meeting the required minimum standards should be classified as an unsatisfactory potential breeder.

Classification may be deferred at the discretion of the veterinarian for bulls that cannot be classified as satisfactory but may improve with time. This category includes young bulls with immature ejaculates and any bull with unacceptable spermatozoal motility and morphology, considered to be temporary, and capable of improving.

Sperm production is a continuous process that takes 60 days to complete. Consequently, stressful events (e.g. illness or environmental heat stress) may affect spermatozoal motility and morphology for nearly two months after the event. Therefore, bulls that receive a "classification deferred" status (due to poor spermatozoal motility and morphology) should be re-tested in 60 days.

Results from breeding soundness evaluations performed in California on over two hundred Holstein bulls (12-15 months of age) revealed that 36% of bulls failed or were given deferred classification. The primary reasons for bulls failing were testicular problems, spermatozoal morphology, lameness or sickness, seminal vesiculitis, and penile abnormalities. Supporting the importance of the physical exam portion of the breeding soundnesss evaluation, 57% of bulls classified as unsatisfactory potential breeders (failed) or classification deferred were found as a result of the physical exam alone.

The veterinary fee for an evaluation is typically between $35-$50 per bull. The cost of using sub-fertile and infertile bulls far outweighs the cost of veterinary services for the breeding soundness evaluations. For example, each 1% decrease in pregnancy rate results in the loss of $18-$25 per cow per year. Why? Because as pregnancy rate decreases, average days in milk increases, leading to increased management, feed, and veterinary costs for cows in the least profitable portion of lactation. Furthermore, dairy producers must recognize the costs of natural service, which include the purchase price of the bull, daily feed costs, veterinary costs, and increased maintenance and repairs of facilities.

The breeding soundnesss evaluation provides a "snapshot" regarding the reproductive status of a bull. The classification of a bull as a satisfactory potential breeder today does not guarantee the bull will be a satisfactory breeder at some time in the future. Nevertheless, it provides the dairy producer with the opportunity to eliminate sub-fertile and infertile bulls. With evidence that greater than one-third of Holstein bulls fail or receive classification deferred status, dairy producers that do not request a breeding soundness evaluation are losing money.

Western Dairy News is a collaborative effort of Dairy Specialists from:

Utah State University Extension; Cooperative Extension Washington State University; OSU Oregon State University Extension Service; NDSU Extension Service; New Mexico State University; Colorado State University Knowledge to Go Places; K-State Research & Extension; The University of California Davis; University of Idaho Cooperative Extension System; Texas Cooperative Extension, The Texas A&M University System; The University of Arizona Cooperative Extension, College of Agriculture and Life Sciences

Production effort for Western Dairy News — Pfizer Animal Health — is generously sponsored by Pfizer Animal Health

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National Johne's disease demonstration herd project

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Johne's disease is caused by the organism *Mycobacterium avium paratuberculosis* (MAP) and was first observed in the U.S. almost 100 years ago. Since the early 1900s the number of infected animals and operations have increased because both producers and researchers, for the most part, have ignored the disease. During this same time period, bovine tuberculosis and brucellosis infection have decreased tremendously. There are striking differences between these diseases that have led to the types of regulatory controls that are in place for each disease.

Brucellosis and TB are known to cause disease in humans and are referred to as zoonotic diseases. Pasteurization, which was instituted in the 1920s, was a critical step to prevent brucellosis and tuberculosis infections in people. Although not currently considered a zoonotic disease, there is some research that suggests MAP may play a role in Crohn's disease in humans. *(See April 25, 2004, Hoard's Dairyman:* "Where We stand in the Johne's war"*, an interview with Mike Collins.)*

USDA's Voluntary Bovine Johne's Disease Control Program has three main objectives:

1. Educate producers and veterinarians about Johne's disease.
2. Evaluate potential risks of spreading MAP based on management practices and develop a farm specific plan to decrease the risk.
3. Perform testing to determine the infection status of the herd.

The key feature of this program is that it is voluntary, and two of the three components of the program do not cost the dairy producer any money. In 2003, Colorado along with 39 other states with official control programs received federal funding that absorbs the cost of the third component of the program: testing. In many states, all aspects of the control program are free to the producer.

Johne's disease, or more correctly MAP infection, is a chronic disease with clinical signs usually not apparent until years after initial infection. This lag time between infection and clinical disease, and the fact that clinical disease is not always observed in infected (test positive) animals, makes Johne's disease a difficult problem for dairy producers and scientific investigators. Producers may not realize they have the disease in their herd or appreciate the impact it has on productivity. Scientific projects designed to answer the practical questions concerning Johne's disease must be conducted over several years, are expensive, and do not always offer concrete conclusions.

Recently, the National Johne's Working Group which is comprised of veterinarians, researchers and industry representatives, convened a committee to define specific goals to guide the direction of the control program and also define necessary research topics. A goal of the committee was "to define critical knowledge gaps that influence producer participation and affect Johne's disease control." One objective under this goal was "to develop and validate model strategies for control of Johne's disease," further stating that "demonstration herds … are critical and of the highest priority to provide the validated management tools to implement a science-based National Johne's Disease Program." Interestingly, if this research was promoted at the first observation of the disease, we might be close to have eradicated MAP infection from the U.S.

In 2003, Congress allocated approximately $18 million to support Johne's disease activities. A portion of these funds was then used to start a nationwide demonstration herd project, even though some states, such as Minnesota and Wisconsin, have had demonstration herds for the past few years. Demonstration herds are monitored for changes in disease prevalence and management practices. Although many management practices, such as feeding single source colostrum, have been advocated to reduce the prevalence of infection, there have been no published studies that have evaluated which practices are most critical in preventing infection

There are 18 states, including California, Colorado, Oregon and Texas, participating in the demonstration herd project nationwide. States chosen to participate represent the major dairy states in the U.S. There are approximately 60 dairy and 15 beef operations enrolled, with the potential of adding 30-40 more dairy herds in 2005.

Western Dairy News is published as a service to people interested in the health and welfare of the Western dairy industry. Archives of this publication may be found at:
http://animalscience-extension.tamu.edu/dairy/wdn.html

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The amount of personnel, laboratory and monetary resources required is substantial and requires approximately $1.5 million annually.

The demonstration herd project will be conducted over a five- to seven-year period. Farms are monitored during this period for changes in management practices and prevalence of MAP infection. The duration of the project is necessary because of the long time between exposure and subsequent clinical disease. The prevalence of infection in a herd today is a result of management practices in place over the last three to five years. The overall goal of the project is to identify management practices that will decrease the prevalence of disease over time.

Three specific measures will be evaluated in each demonstration herd in order to identify "best management" practices in respect to controlling MAP infection. The first measure is the annual incidence of clinical disease within a herd. Previous studies suggest that as infection rate in a herd decreases, the number of clinical cases observed will also decrease. Incidence of clinical disease along with whole or partial herd testing allows an estimate of herd level infection. The presence of clinical disease will be recorded for the duration of the entire project. Based on the size of the herd, either whole or partial herd prevalence testing will be completed once annually.

The second measure is to determine the percentage of test positive animals that are removed from a herd without any evidence of clinical disease. This data explains how producers use test results. This information along with incidence of clinical disease determines if infected animals are more likely to be removed from the herd compared to test negative cattle. Some research has shown that test positive cattle are more likely to be removed, but it is unclear whether removal is based on test status, or whether these cattle progress to clinical disease and then are removed. Animals that are removed from infected herds based on test results for MAP will be documented throughout the study.

The last measure, which may be the most difficult to obtain, is the risk of spreading the infection to other animals in the herd.

A risk assessment for the potential of disease spread and a management plan which outlines implementation of specific management practices will be conducted annually for each operation. Study investigators will visit operations quarterly to follow up on management changes and confirm the management plan is being followed. However, risk assessments rely on assumptions based on either knowledge of MAP gained in controlled laboratory experiments or expert opinion without confirmation from field based studies. Following the herds over multiple years will test the validity of the current risk assessment predictors.

The overall goal of the demonstration herd project is to determine the most critical management practices associated with decreased prevalence of infection. Ultimately, veterinarians may be able to prioritize management practices based on current herd practices and those that have been proven to decrease prevalence in other operations. Hopefully, with increased producer participation in the voluntary control program and using the data generated from the demonstration herd project, we can work together to stop this epidemic.