

PRODUCING BULLS FOR COMMERCIAL AI CENTERS

Donald R. Monke, DVM

Introduction

Raising a bull contracted to enter a commercial artificial insemination center (AIC) involves more than good calf management and preparation of an interstate health certificate. Qualifying a bull for entry to an AIC, or perhaps more accurately a semen collection center, is a detailed procedure. Bulls entering a commercial AIC are intended to be long-term residents. Managers of the AIC must apply risk management and risk reduction practices to protect the health of resident animals. Accordingly, new bulls must be physically healthy, free of visible evidence of disease, and must test negative to several diseases. The preventive medicine practices of the farm of origin may also be evaluated.

The health requirements for bulls entering a semen collection center will be briefly presented. However, *the primary focus of this article is to discuss current problems associated with the procurement of bull calves* from dairy herds in the United States and Canada. Sire analysts employed by the commercial semen collection centers work closely with dairymen to contract selected cows and mate them with elite bulls to develop the next generation of genetically superior bulls. Recently, however, the number of contract mated, genetically valuable bull calves that are rejected by semen collection centers have increased. The reasons associated with this loss of valuable genetics are reviewed.

Goals of a herd health program for bulls used for artificial insemination

Before a health program for any kind of herd can be designed, farm managers must recognize the business focus of the operation and then describe the herd health goals of the organization. The following goals for an AIC herd health program are suggested:

1. Each individual bull entering the AIC should receive an adequate examination to detect physical or congenital abnormalities as well as prior exposure to selected diseases of cattle.
2. The facilities and health program should be designed to prevent incursion of disease into the resident herds of the AIC and the health program should prevent transmission of disease within the herd so that all semen donor bulls remain healthy (1).
3. The health program should control contamination of semen by specific pathogens to prevent seminal transmission of disease to those female animals being bred by artificial insemination (1).

4. If the international exchange of semen is a component of the business operation, then the herd health program should enable semen donor bulls, or entire herds, to comply with international regulations for the export of semen (1).

The first three items should be important for any bull having semen collected for artificial insemination (AI). The fourth item is usually consistent with the focus of the other three goals but may necessitate redundant diagnostic testing of donor bulls to comply with specific international regulations. It may also be associated with a requirement to qualify individual semen donor bulls, or entire herds, as negative for a disease that may be unlikely to be transmitted by AI but for which an official disease control program has been established in the destination country. An example of such a disease is bovine leukosis virus (2, 3).

Admittance requirements for bulls entering an AIC

The admittance requirements discussed in this article are restricted to animal health and preventive medicine topics. The genetic requirements for a bull's sire and dam are variable among the commercial semen collection centers and are dependent on each business's marketing goals. A discussion of genetics and marketing are beyond the scope of this article.

The individual bulls should be physically healthy, be in good body condition, have two normally descended testicles, and be an appropriate weight for its age. An acceptable body weight for a large breed dairy bull is about two pounds per day of age, from six to 24 months of age (4). The bulls should *not* have a congenital heart defect (such as ventricular septal defect), *not* have an umbilical hernia or history of surgical correction, *not* have evidence of chronic pneumonia, and *not* be lame. It is preferable that bulls of horned breeds be dehorned at an early age. It is also preferable that bulls do not have active ringworm lesions when the driver arrives at the farm to pick-up the bull.

Bulls will be tested on the farm-of-origin to determine prior exposure to several diseases. This evaluation includes testing to assure that the bull is negative for tuberculosis and brucellosis, that the bull is not persistently infected with bovine viral diarrhea virus (BVDV), and that it does not exhibit a significant serologic response to leptospirosis. The industry program for these diseases is sponsored by Certified Semen Services (CSS), a subsidiary of the National Association of Animal Breeders (NAAB). Specific information may be procured from their website (5). Other disease agents for which pre-entry diagnostic tests may be requested are infectious bovine rhinotracheitis virus (IBRV), bovine leukosis virus (BLV), bluetongue virus (BTV), epizootic hemorrhagic disease virus (EHDV), and *Mycobacterium avium* subsp. *paratuberculosis* (Johne's disease). Tests for these diseases may be requested depending on the preventive medicine and international marketing programs of the AIC. Additional tests routinely conducted at the AIC are bovine genital campylobacteriosis, bovine genital trichomoniasis, and vesicular stomatitis virus.

Perhaps the most important distinction between the herd health program of an AIC compared to the health programs of most dairy and beef farms is the necessity for AICs to conduct repeated diagnostic testing to control disease rather than a tacit reliance on vaccination. For an AIC to comply with a variety of domestic and international regulatory programs and to permit an accredited veterinarian to issue international health certifications, the bulls must regularly test negative for many of the diseases previously mentioned. Bulls that were intentionally or inadvertently vaccinated for a disease such as IBRV on the farm-of-origin may not qualify as a semen donor sire to many countries. An alternative in some regulations permits several straws to be tested for the virus from every collection to be exported; such additional tests, however, not only cause delays in exporting the product but also add expense. Because of these restrictions, dairy bulls seropositive to IBRV are often prohibited entry to a semen collection center. It must be advised, therefore, that dairy bulls destined to enter an AIC should not be vaccinated for IBRV. This same condition would be preferable for beef bulls, but is apparently not consistent with current industry practices for performance testing. Other diseases for which AI bulls should *not* be vaccinated are leptospirosis, brucellosis, or *Mycobacterium avium* subsp. *paratuberculosis* (6).

Recent trends in dairy bull calf procurement evaluations

Most dairy bull calves destined to enter a semen collection center are the result of a contract mating. Because embryo transfer technique is used in over 90% of contract matings, at least one bull calf is usually born for each donor cow selected. It is not uncommon, therefore, to have two or more bull calves examined and tested during the on-farm evaluation.

The trend since 1986 for the percent of bulls rejected subsequent to an on-farm evaluation is shown in Figure 1 for one commercial AIC (7). Prior to 1991, few calves were rejected from on-farm evaluations. These rejections consisted primarily of bulls with an umbilical hernia, an incompletely descended testicle, a significant heart murmur consistent with a ventricular septal defect, or incorrect identification. Most bulls were transported to the AIC. Subsequent to 1991, the concern about positive serologic responses associated with prior exposure to BLV increased. Similar concerns about prior exposure or vaccination to IBRV followed several years later. These events were concurrent with the commencement of the European Union (EU) regulations for semen exported from the United States and resulted in a gradually increasing number of calves being rejected annually. The EU regulations stipulating entire resident herd seronegative status for BLV, IBRV, BTV, and EHDV caused concern among veterinarians, sire analysts, and marketing personnel of the commercial AICs to select only those dairy bulls that complied with most international semen export conditions. This was also concurrent with the reliance on international markets to achieve business growth because the domestic market for dairy semen is directly correlated with cow numbers, which have continued to gradually decline (8).

The top section of each bar of Figure 1, representing bulls rejected from on-farm evaluations between 1991 and 2001, is expanded in Figure 2. The primary reasons for

rejecting bulls from entering a semen collection center have been seropositive status for either BLV or IBRV. The concern about procuring dairy bulls seropositive for IBRV existed prior to 1996, but its impact on international marketing efforts became more pronounced at that time.

The percent of bulls rejected because of IBRV-seropositive status was highest in 1996 and 1997 when this policy was first implemented. Since that time, the commercial AICs have made a concerted effort to educate dairymen raising bull calves for progeny testing to **not vaccinate contracted bull calves for IBRV**. Furthermore, dairymen are advised to **segregate the contracted bull calves and not permit exposure to replacement heifers that are vaccinated**, especially with MLV vaccines.

The number of bull calves rejected because they are BLV-seropositive has been variable, but is of concern to the AI industry because the trend for rejections has been increasing. This situation may be associated with one or more of the following reasons:

- The gradual increase, nationally, in the size of dairy herds and the associated problems that accompany management of additional animals in an intensive housing environment without a concomitant increase in labor.
- A reduced ability for dairymen to apply the rigorous programs necessary to control the transmission of BLV. This could be a labor-related problem or expense-related situation associated with repeated use of needles, repeated use of palpation sleeves, inadequate cleaning and disinfection of specific medical instruments, inadequate cleaning of animal identification instruments, or inadequate control of hematophagous insects.
- A high prevalence of BLV on dairy farms, which may be associated with a higher incidence of *in utero* transmission. Bovine leukosis virus may be transmitted *in utero* during the second or third trimester of gestation in 3 to 18% of BLV-infected cows (9, 10).
- Inadequate educational efforts by the AI industry, breed associations, or AABP to inform dairymen about the trade-related problems associated with BLV.

It must be mentioned that bull calves less than six months of age and seropositive to IBRV or BLV are not automatically rejected. Most of these animals are permitted a retest to determine if the serologic response is associated with passive immunity or prior exposure to the virus or a biologic agent.

About 0.5 to 1% of dairy bull calves are rejected because they are persistently infected for BVDV, or are have tested positive to a viral detection test and are probable candidates to be persistently infected. A similarly small percentage of bulls are rejected because of possible exposure to Johnes disease. While the diagnostic tests available for detecting BVDV are highly effective, the opposite situation applies to Johnes disease. Recognizing bull calves that have a greater risk of exposure to *Mycobacterium avium* subsp.

paratuberculosis is difficult. Serologic tests have limited capabilities in this regard. Accordingly, AIC management must rely on comments provided by the local veterinarian regarding preventive measures employed on a farm and pertinent to the bull calf being considered.

Concluding remarks

The number of potentially valuable dairy bull calves being rejected from commercial AICs is increasing and is primarily associated with BLV infection, prior exposure to IBRV, or inadvertent vaccination with a biologic containing attenuated IBRV. Both conditions are largely preventable by raising the bull calf in its own pen and apart from replacement heifers or other bulls. Any medical instruments or identification tools used on the calf should be single use or have been adequately disinfected. The bull calf should not be vaccinated for IBRV and should not have exposure to other cattle recently vaccinated. Because embryo transfer is used in the development of most bull calves contracted to AICs, it would be preferable to use only recipient heifers that have previously tested negative for BLV (by ELISA or AGID), for Johnes disease (by ELISA), and are not persistently infected with BVDV.

It is hoped that greater recognition of this problem by bovine-specialty veterinarians, along with continued educational efforts of AI industry personnel, will achieve a reduction in the bull-wastage problem presently associated with positive diagnostic responses to BLV and IBRV in valuable dairy bull calves.

References:

1. Monke, D.R. 1999. Management considerations to minimize the potential for seminal transmission of disease in domestic animals. Proceedings, Society for Theriogenology, Semen Cryopreservation & Artificial Insemination Symposium; p. 363-372.
2. Monke, D.R. 1986. Noninfectivity of semen from bulls infected with bovine leukosis virus. *Jour Amer Vet Med Assoc* 188: 823-826.
3. Choi, K.Y., Monke, D., Stott, J.L. 2002. Absence of bovine leukosis virus in semen of seropositive bulls. *Jour Vet Diagn Invest* 14: 403-406.
4. Monke, D.R. 2002. Bull management: Artificial Insemination Centers. In: H. Roginski, J.W. Fuquay, & P.F. Fox (Eds.), *Encyclopedia of Dairy Sciences*, Vol. 1. London: Academic Press. 198-204.
5. Certified Semen Services. January 2002. Minimum requirements for disease control of semen produced for AI. Retrieved from http://www.naab-css.org/about_css/disease_control-2002.html
6. Monke, D.R. 2002. The modern dairy bull: Health programs and bull management issues. Retrieved from http://www.selectsires.com/news_lifecycle.html
7. Select Sires, Inc. 2002. Unpublished information.
8. United States Department of Agriculture - National Agricultural Statistics Services Historical Data. (1993-1997). Final Estimates: Milk cows and production. Bulletin No.952. Retrieved from <http://www.usda.gov/nass/pubs/histdata.htm>
9. Piper, C.E., Ferrer, J.F., Abt, D.A., et al. 1979. Postnatal and prenatal transmission of the bovine leukemia virus. *J. Natl. Cancer Inst.* 62:165-168.
10. Van Der Maaten, M.J., Miller, J.M., & Schmerr, M.J.F. 1981. *Amer. J. Vet. Res.* 42: 1052-1054.

Figure 1. Trend in rejecting dairy bulls as a percent of bulls considered for entry

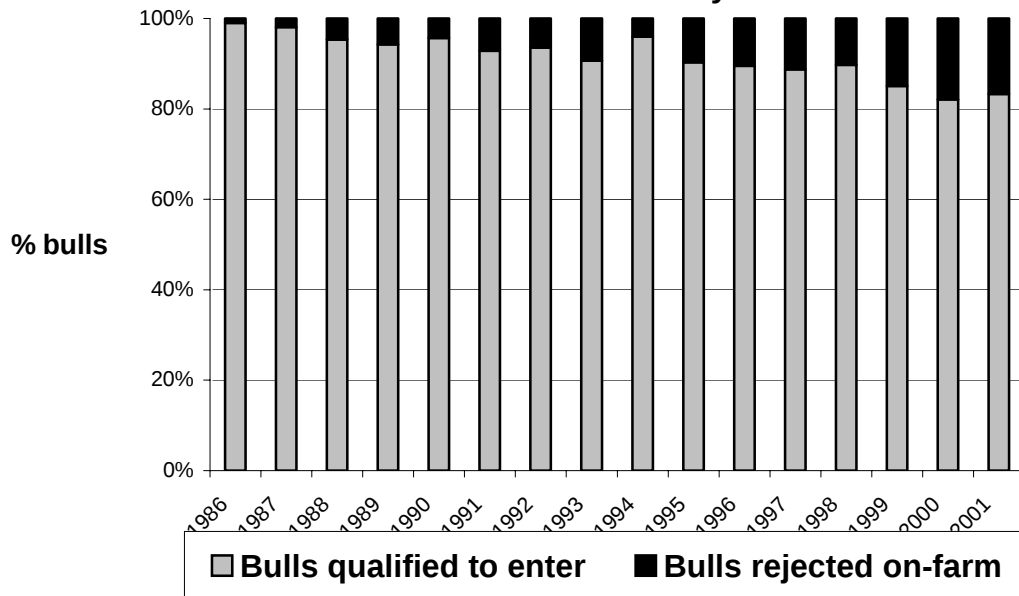


Figure 2. Reasons for rejecting dairy bull calves, prior to entry

