AGRICULTURAL
MU Guide
PUBLISHED BY UNIVERSITY EXTENSION, UNIVERSITY OF MISSOURI-COLUMBIA

Bovine Leukosis

Jeanette L. Floss, DVM, MS
College of Veterinary Medicine
Richard Randle, DVM, MS
Extension Ruminant Health Specialist
Commercial Agriculture Program

Enzootic bovine leukosis (EBL) is characterized by the development of tumors of lymphatic tissues (lymphosarcoma), such as the thymus, spleen and lymph nodes. These specialized organs are an integral component of the defense system that protects the animal against infection, producing antibodies and specialized cells which attack bacteria or viruses. Lymphoid cells are also found in other organ systems and circulating in the blood. Tumors may be found throughout the body; clinical signs of EBL depend upon their location. Enlargement of the external or superficial lymph nodes is common, but internal nodes may also be enlarged in the absence of external involvement.

Tumors often invade the gastrointestinal tract, particularly the abomasum. Ulcers or GI obstructions may result from abomasal tumors, leading to reduced feed intake, weight loss and poor milk production. Tumors in the spinal cord may give rise to incoordination, reduced muscle strength and potentially "down" cows. Signs of heart failure may result from tumors invading heart muscle. Retrobulbar tumors, masses behind the eye but within the orbit, occur frequently and cause the eye to protrude. The development of lymphosarcoma is a result of infection by bovine leukemia virus (BLV).

What is BLV?

Bovine leukemia virus can be identified in many cattle herds throughout the United States. Several surveys conducted in the past 15 years found that 10 to 42 percent of dairy animals and 1 to 6 percent of beef animals were infected with BLV. The percentage of infected cattle within herds ranged from 0 to more than 50 percent for dairy and from 0 to 20 percent for beef. The percentage of herds infected with BLV varies from state to state.

Bovine leukemia virus targets lymphatic tissues. Lymphocytes make up one of the classes of white blood cells. The virus is incorporated into the make-up of infected lymphocytes; therefore when these cells divide, the presence of the virus is maintained.

Less than 1 percent of BLV-infected cattle will develop lymphosarcoma. Approximately one third of cattle with BLV infection develop persistent lymphocytosis, an increase in the number of lymphocytes in circulation lasting from months to years. Animals with lymphocytosis and most animals that become infected with BLV do not develop clinical illness. In these animals, milk production and fertility are not adversely affected.

Whether or not EBL results from BLV infection, this virus is maintained in lymphocytes for the life of an infected animal. Antibodies against the virus are produced in response to the presence of the virus. When antibodies are identified in serum samples from cattle exposed to a disease agent, they are classified as seropositive. In the case of BLV, the virus is never eliminated; therefore seropositive cattle are a potential source of infection to susceptible animals within the herd.

How is BLV transmitted?

Because BLV is found in lymphocytes and rarely as free virus, exchange of infected cells to a susceptible animal is required. Three common routes are the transfer of blood, consumption of colostrum or milk and transfer across the placenta during pregnancy.

Management procedures that contribute to the transfer of infected blood include multiple vaccinations or collection of several blood samples with the same needle and syringe, dehorning with a gouge or sawing technique, tattooing, or using blood-contaminated surgical equipment. Susceptible animals may also be exposed if an infected herd-mate has a bleeding or weeping wound, whether from injury or surgery.

Table 1. Guidelines for on-farm control of BLV.

1. Use individual sterile needles for transdermal injection or blood collection.
2. Disinfect tattoo equipment between animals.
3. Use electric dehorners, or disinfect dehorning equipment between animals.
4. Replace examination gloves and sleeves between animals.
5. Use milk replacer to feed preweaned calves.
6. Heat-treat or pasteurize colostrum.
7. Use BLV-seronegative recipients for embryo transfer.
8. Wash and rinse instruments in warm water, then submerge in an appropriate disinfectant.

Rectal palpation has been implicated in the transmission of BLV. However, under normal herd conditions the use of common palpation sleeves failed to increase the incidence of seropositive cows when compared to non-palpated, seronegative herdmates. Biting flies (horse flies, deer flies) have also been studied as a possible source of transfer. The results of these studies are not conclusive, but intensifying fly control practices may reduce the risk of spreading BLV.

Seropositive cows secrete BLV antibodies into colostrum. Non-infected calves nursing these cows will acquire detectable antibody levels in their blood. The BLV-antibody levels in these calves should decline during the first six to eight months of life. Therefore, calves less than six months of age from seropositive cows are not routinely tested, because the presence of antibodies does not indicate infection. Milk from seropositive cows contains virus-infected lymphocytes. However, calves that have received BLV antibodies in colostrum are usually protected from milk-borne infection. Pasteurizing heavily infected milk to be fed to calves less than three days of age will lessen the risk of transferring infection. The temperature required for inactivating the virus is 60º C for 30 seconds.

The mechanism is not fully understood, but it is possible for BLV to cross the placenta and infect the fetus. Four to 8 percent of calves born to BLV-positive cows may be infected during pregnancy. These calves can be identified because they will have circulating antibodies to BLV prior to receiving colostrum.

What does BLV cost the producer?

Direct costs associated with BLV infections are most often a result of clinical illness from EBL. Costs include: loss of milk production, loss of carcass value because affected cows with tumors are condemned at slaughter, and loss of the calf if the cow was pregnant. Veterinary expenses will be for diagnosis only because the disease is not treatable. Seropositive, non-symptomatic cattle do not contribute to direct losses because production generally is not affected in these animals.

Indirect losses from BLV infection are associated with lost or limited sales of breeder stock, embryos or semen to interstate or international markets. Many countries have restricted the entry of infected cattle and/or their products. Although seronegative recipients and their calves fail to develop BLV infection when embryos from seropositive cows are transferred and processed, semen from commercial bull studs does not increase the risk of infection to either the calf or inseminated cow. There is a growing concern that foreign countries may require that the herd of origin or bull stud be free of BLV infection. The market value of BLV-seropositive cattle may be reduced if more producers participate in voluntary control or eradication programs that require seronegative replacement animals.

How can BLV be controlled?

Several methods for controlling the spread of BLV within a herd have been investigated: serologic testing of all animals greater than six to eight months of age for BLV antibodies and removal of positive animals from the herd, segregation of cattle into seropositive and seronegative herds, and strict management practices that will effectively reduce transmission to susceptible animals. Individual herd goals, number and age of seropositive animals, and available facilities will determine the most feasible management design to implement.

Smaller herds or herds with few infected animals may benefit by testing and removing seropositive animals from the herd. Those removed should

be replaced with seronegative animals. Periodic testing will identify additional animals that become seropositive. Test and removal may not be feasible for larger herds or herds with a large percentage of infected animals. The removal of genetically superior cattle may be undesirable, especially from herds that provide breeder stock, semen and embryos. However, those herds participating in foreign markets or providing bulls to artificial insemination organizations may have an economic incentive to consider a BLV control program.

Alternatively, test-positive animals may be retained but segregated from seronegative animals. In essence, two herds are created and should be managed independently. The infected herd may continue as a commercial operation and the BLV-free herd would then become the source for marketable seedstock. The BLV-negative herd should be tested on a regular basis and any newly identified seropositive animal should be moved. Movement of cows between herds should only occur in one direction, from negative to positive. Problems associated with a segregation program include the need to duplicate housing and feeding facilities and increased management responsibilities.

Segregating BLV-infected cattle from non-infected cattle may not be feasible in most commercial management systems. A third alternative for controlling BLV transmission is to leave the animal populations intact and initiate management procedures to prevent transmission. These are listed in Table 1.

If BLV transmission is prevented, the prevalence of BLV in herds will decrease as infected animals are culled for other reasons and replaced by seronegative animals. The major advantages of this type of control program are that facilities do not have to be duplicated and genetically superior individuals are not lost to culling as a result of BLV status.

A major disadvantage is the length of time required to observe favorable results or a drop in the prevalence of BLV-infected animals. Management costs may increase due to additional labor required to implement operational changes and the use of individual disposable needles and obstetric sleeves, disinfection of tattoo equipment and heat treatment of colostrum.

A few states have developed voluntary programs for the control of BLV. The programs are designed to eradicate BLV infections in the herd and to certify the herd as BLV-free. Programs may vary, but essentially all animals six months of age or older are tested to determine the prevalence of BLV-infected animals so that a plan can be developed to eradicate the infection from the herd. Some states require removal or segregation of infected cattle from non-infected cattle. In such cases, the whole herd is tested every six months until the entire herd tests negative. Three consecutive negative herd tests at 60- to 90-day intervals are then required for the herd to be certified as BLV-free. The herd must be recertified annually by a repeated negative test of the entire herd. At present, Missouri does not have a statewide control program, but testing is available through the state veterinary laboratory. The costs of blood collection and laboratory testing are the responsibility of the herd owner.

Other requirements of voluntary control programs include using individual disposable needles for all injections or testing procedures, disinfecting equipment between animals, and using individual obstetric sleeves. Feeding colostrum from BLV-seronegative dams and feeding pasteurized milk or milk replacer is encouraged, in addition to testing calves from BLV-seronegative dams as early as two months of age.

Conclusion

The development of programs for the control of BLV on commercial dairy operations is based on identifying infected and non-infected animals through serologic testing and selecting an economical strategy to interrupt virus transmission. Decreases in the herd prevalence of BLV infection can be accomplished using practical and economically sound control procedures.

This publication was adapted from Pelzer, K. D. and Sprecher, D. J. (1993), Controlling BLV infection on dairy operations. Veterinary Medicine 88:275-281.

University Extension
UNIVERSITY OF MISSOURI
COLUMBIA

■ Issued in furtherance of Cooperative Extension Work Acts of May 8 and June 30, 1914 in cooperation with the United States Department of Agriculture. Ronald C. Powers, Interim Director, Cooperative Extension Service, University of Missouri and Lincoln University, Columbia, Missouri 65211. ■ An equal opportunity institution.