SHORT COMMUNICATION

Relative Susceptibility of Beef and Dairy Calves to Infection by Bovine Leukemia Virus Via Tabanid (Diptera: Tabanidae) Feeding

D. L. HASSELSCHWERT, D. D. FRENCH,[1] L. J. HRIBAR, D. G. LUTHER,[1] D. J. LEPRINCE, M. J. VAN DER MAATEN,[2] C. A. WHETSTONE,[2] AND L. D. FOIL

Department of Entomology, Louisiana Agricultural Experiment Station, Louisiana State University Agricultural Center, Baton Rouge, LA 70803

J. Med. Entomol. 30(2): 472–473 (1993)

ABSTRACT Differences in susceptibility of beef (mixed breeds) and dairy (Holstein) calves to infection by bovine leukemia virus (BLV) were compared. Transmission was accomplished by interrupted feeding of horse flies, *Tabanus fuscicostatus* Hine, on a donor cow exhibiting persistent lymphocytosis. Flies were transferred individually from the donor cow to each of 11 beef and 10 dairy calves. Transmission of BLV was accomplished with groups of 50 and 250 flies for beef calves and 75 and 250 for dairy calves. These findings indicate that susceptibility of beef and dairy calves to transmission of BLV by tabanids is equivalent and that BLV prevalence differences previously observed among cattle breeds may be caused by management practices.

KEY WORDS horse flies, mechanical transmission, bovine leukemia virus

THE PREVALENCE OF BOVINE LEUKEMIA VIRUS (BLV) in cattle in the United States is higher in dairy than in beef cattle (Schultz et al. 1986). Baumgartener et al. (1975) found that 66% of the dairy herds and 10.2% of dairy animals were positive for antibody to BLV compared with 14% of the beef herds and 1.2% of the beef animals in six north-central states. The prevalence of BLV antibody increases with increasing age and is significantly associated with dairy breed but not with species or gender (Burridge et al. 1981).

Bovine leukemia virus primarily is transmitted horizontally by the transfer of blood between infected and susceptible ruminants. Although iatrogenic transmission is considered most important (Evermann et al. 1986), laboratory studies have demonstrated that tabanids can transmit BLV mechanically following interrupted feeding. Foil et al. (1989) accomplished transmission of BLV to goats and dairy calves with as few as 10 and 20 horse flies, *Tabanus fuscicostatus* Hine, initially fed on a cow with a lymphocyte count of 31,500/mm^3. Groups of 100 and 150 *T. fuscicostatus* transmitted BLV to beef calves from a donor cow with a lymphocyte count of 14,600/mm^3 (Foil et al. 1989), but studies directly comparing the susceptibility of beef and dairy breeds to fly transmission of BLV using a single donor cow have not been conducted. The purpose of this study was to determine whether differences in the prevalence of BLV in beef and dairy herds could be attributed to differences in susceptibility to transmission of BLV by horse flies.

Materials and Methods

The bovine leukemia immunodiffusion test of Miller & Van Der Maaten (1976) was used as an indication of BLV infection. The donor cow (lymphocyte count of 29,700/mm^3) was selected by screening Louisiana State University BLV antibody-positive dairy cows for persistent lymphocytosis. To prevent bias, calves were purchased at auction by an individual unfamiliar with the experimental design and instructed to buy "beef and dairy calves." Before experimentation, all calves were tested for BLV antibody, and only antibody negative animals were used.

Horse flies were captured in canopy traps (Catts 1970) baited with dry ice at the Thistlethwaite Wildlife Management area in St. Landry Parish, LA, between 15 and 17 July 1990; the flies were transported to the St. Gabriel Research Station, St. Gabriel, LA, and held for at least 24 h before experimentation. Between 16 and 18 July 1990, flies initially were fed on the donor cow, interrupted, and then immediately transferred individually to each of 11 beef and 10 dairy calves and allowed to complete feeding to engorgement. Total transfers of 5, 10, 25, 50, 59, 75, and 250 flies per animal were completed as previously de-

[1] Department of Veterinary Science, Louisiana State Agricultural Center, Louisiana State University, Baton Rouge, LA 70803.

[2] National Animal Disease Center, USDA–ARS, Ames, IA 50010.

0022-2585/93/0472–0473$02.00/0

Table 1. Mechanical transmission of bovine leukemia virus by horse flies from a donor Holstein cow to various breeds of beef and dairy calves

No. of flies per animal	Days until seropositive[a]	
	Beef (breed)[b]	Dairy (breed)[b]
250	50 (HH)	38 (HO)
75	NS[c] (XX)	46 (HO)
59	NS (XX)	ND[d]
50	30 (HH)	NS (HO)
50	NS (SM)	NS (HO)
25	NS (XX)	NS (HO)
25	NS (XX)	NS (HO)
10	NS (HA)	NS (HO)
10	NS (XX)	NS (HO)
5	NS (AN)	NS (HO)
5	NS (SM)	NS (HO)

[a] Determined by agar-gel immunodiffusion.
[b] Breed designation: HH, Hereford; XX, Brahman cross; HA, Hereford/Angus; AN, Angus; HO, Holstein; SM, Semmentol.
[c] NS, no seroconversion.
[d] ND, not done.

scribed (Foil et al. 1988). The calves subsequently were treated with permethrin (Delice, Coopers Animal Health Kansas City, KS) and pastured at the St. Gabriel Research Station. Serum samples were obtained weekly from 16 July to 31 October 1990, and final samples were taken on 31 November 1990.

Results and Discussion

Transmission of BLV by flies from the donor cow was accomplished with groups of 50 and 250 flies for beef calves and with groups of 75 and 250 flies for dairy calves. The two beef calves that received transfers of 50 and 250 flies seroconverted at 30 and 50 d after exposure, respectively, and the two dairy calves that received transfers of 75 and 250 flies seroconverted at 46 and 38 d after exposure, respectively (Table 1). The wide range of transfer group numbers was selected because the lymphocyte count of donors is a general rather than a specific indicator of infectivity of individuals (Schultz et al. 1986).

No differences between beef and dairy breeds were detected in their susceptibility to BLV infection mechanically transmitted by horse flies. The dairy calves in this study were all Holstein, and this fact should be considered before general interpretation of the data is made. However, our findings indicate that susceptibility of beef and dairy calves to transmission of BLV by tabanids is equivalent and that BLV prevalence differences previously observed among cattle breeds may be caused by management practices. There could be differences in the occurrence of potentially high sources of infection (animals with PL) related to breed or management (characteristics for selection linked to PL) differences. Management practices can influence the amount of exposure to insects (e.g., animals maintained on pastures versus barns or pens), and management procedures such as tattooing, dehorning, rectal palpation, and vaccinating have been associated with BLV transmission (DiGiacomo et al. 1985, Henry et al. 1987, Lucas et al. 1985).

Acknowledgments

We are grateful to Kerney Sonnier and his staff at the Louisiana Department of Wildlife and Fisheries, District 6, and the Thistlethwaite heirs for allowing us to use the facilities at the Thistlethwaite Wildlife Management Area. We would also like to thank E. Chris, D. Coleman, A. Pecquet, P. Roach, B. Myers, K. Middlebrook, and C. Pool, students of Louisiana State University, for their technical assistance. This study was supported in part by USDA–ARS Cooperative Agreement no. 58-5114-0-1020 and approved for publication by the director of the Louisiana Agricultural Experiment Station as manuscript no. 91-17-5338.

References Cited

Baumgartener, L. E., C. Olson, J. M. Miller & M. J. Van Der Maaten. 1975. Survey for antibodies to leukemia (C-type) virus in cattle. J. Am. Vet. Med. Assoc. 166: 249–251.

Burridge, M. J., D. M. Puhr & J. M. Hennemann. 1981. Prevalence of bovine leukemia virus infection in Florida. J. Am. Vet. Med. Assoc. 179: 704–707.

Catts, E. P. 1970. A canopy trap for collecting Tabanidae. Mosq. News. 30: 472–474.

DiGiacomo, R. F., R. L. Darlington & J. F. Evermann. 1985. Natural transmission of bovine leukemia virus in dairy calves by dehorning. Can. J. Comp. Med. 49: 340–342.

Evermann, J. F., R. F. DiGiacomo, J. F. Ferrer & S. M. Parish. 1986. Transmission of bovine leukosis virus by blood inoculation. Am. J. Vet. Res. 47: 1885–1887.

Foil, L. D., C. L. Seger, D. D. French, C. J. Issel, J. M. McManus, C. L. Ohrberg & R. T. Ramsey. 1988. Mechanical transmission of bovine leukemia virus by horse flies (Diptera: Tabanidae). J. Med. Entomol. 25: 374–376.

Foil, L. D., D. D. French, P. G. Hoyt, C. J. Issel, D. J. Leprince, J. M. McManus & C. L. Seger. 1989. Transmission of bovine leukemia virus by *Tabanus fuscicostatus*. Am. J. Vet. Res. 50: 1771–1773.

Henry, E. T., J. F. Levine & L. Coggins. 1987. Rectal transmission of bovine leukemia virus in cattle and sheep. Am. J. Vet. Res. 48: 634–636.

Lucas, M. H., D. H. Roberts & G. Wibberley. 1985. Ear tattooing as a method of spread of bovine leukosis virus infection. Br. Vet. J. 141: 647–649.

Miller, J. M. & M. J. Van Der Maaten. 1976. Serological detection of bovine leukemia virus infection. Vet. Microbiol. 1: 195–202.

Schultz, R. D., T. O. Manning, J. C. Rhyan, B. A. Buxton, B. S. Panagala, I. M. Bause & W. C. Yang. 1986. Immunologic and virologic studies of bovine leukosis, pp. 301–323. *In* L. A. Salzman (ed.), Animal models of retrovirus infection and their relationship to AIDS. Orlando, Academic Press.

Received for publication 13 November 1991; accepted 17 August 1992.