Korean J. Vet. Res., Vol. 22, No. 1 (1982)

Survey for Antibodies to Bovine Leukemia Virus in Dairy and Korean Native Cattle

Won-Pil Choi, D.V.M., M.S., Ph.D.

Department of Veterinary Medicine, College of Agriculture, Gyeongbug National University

Introduction

Bovine lymphosarcoma is a neoplastic disease of the lymphoid tissue and has shown a tendency to increase in incidence throughout the world.[1,2,5,7,13] Bovine lymphosarcoma may be classified into four types, epidemiologically and clinicopathologically. The adult type is commonest and a contagious disease induced by bovine leukemia virus (BLV). Several serological tests including immunodiffusion (ID), complement fixation (CF), immunofluorescence, early syncytium inhibition and radioimmunoassay have been designed and used for diagnosis of BLV infection. Recent comparative studies of serological tests revealed that the ID test using BLV glycoprotein (gp) antigens was the best test for the diagnosis of BLV infection.[7,8,9]

In Korea, the first survey for bovine lymphosarcoma in dairy cattle was performed by hematological test in 1969.[12] In 1981, seroepidemiological and hematological survey on BLV in several districts of the country was made by Jun.[3]

This paper will describe a seroepidemiological survey for BLV antibodies in dairy and Korean native cattle in Gyeongbug area.

Materials and Methods

Sera: Sera from 106 dairy cattle (Holstein) in 14 dairy farms and 699 Korean native cattle in the slaughter house were collected in 1981 in Gyeongbug area. The sera of dairy cattle were obtained from Gyeongbug Animal Health Division where they collected the sera for the detection of brucellosis. The standard anti-BLV serum which was obtained from a sheep (V 34) experimentally infected with BLV was used as a positive serum (CF titer 1: 64) control in gp-ID test. This serum was obtained from Dr. M. Onuma (Department of Epizootiology, Faculty of Veterinary Medicine, Hokkaido University, Sapporo).

Antigen: The protein (p) and gp antigens of BLV used for the ID test were obtained from Dr. M. Onuma. They were prepared from culture fluids of BLV-infected cell line (A-77 thv +). The antigens were concentrated to give 4 antigenic units using V 34 serum by the complement fixation test.

Immunodiffusion test: The ID test for detection of antibodies to p and gp antigens of BLV was performed by the method of M. Onuma et al[9] and M. Phillips et al[10]. ID tests were run with 1% noble agar (Difco) prepared with 0.05 M Tris-HCl buffer (PH 7.2) containing 8.5% NaCl. Six peripheral wells of 4 mm diameter were cut in 3.5 mm distance from the central well. A positive serum obtained from a sheep with lymphosarcoma was placed in two periperal wells as control. Wells were filled once only and incubated at room temperature in a humidifed chamber. After 72 hours of incuation, the results were read.

Results and Discussion

Results of the survey for antibodies to BLV p and gp antigens, using sera of the 106 dairy cattle which were over 2 years old and originated from 14 dairy farms of Gyeongbug area, are shown in Table 1. Thirty (28.3%) of 106 sera were positive for gp antibodies against BLV, and the rate of positive animals in each districts varied from 12.5 to 43.5%. The rate of reactors in each dairy farms varied from 0 to 60% except for N dairy farms where obtained one sample. Two of the dairy farms were BLV free, but the remaining 12 dairy farms were relatively heavily contaminated with BLV. On the other hand, detection of the same antibody was performed with 699 Korean native cattle sera obtained from the slaughter house in Taegu city. The cattle came from various areas and were at least 2 years old. Seventeen (2.4%) of 699 sera were positive in gp-ID test. of 30 gp-ID positive dairy cattle, 5 (16.7%) had antibodies to p antigens too, but no Korean native cattle had antibodies to p antigen and no cattle had antibodies to p antigen only.

Jun[3], in a recent serological survey on BLV in dairy cattle in Korea, reported that the antibody positive rates varied from 23.0 to 55.7% depending on districts and found 20 (30.3%) of 66 sera from 4 herds in Kyeongbug district were BLV antibody positive. The BLV positive rate (28.3%) in this experiment is similar to that reported by Jun[3]. The positive rate in dairy cattle in Korea was very high compared to those in dairy cattle in Japan[6,7] and North America[11,13] where BLV antibody carriers were less than 10%. However the positive rate of Korean native cattle (2.4%) is very low when compared to the positive rate of Japanese black cattle (8.1 ~ 52.1%).[6,7]

Recently, Kono et al[4] described that all the cattle, judged as subclinical and clinical cases

Table 1. Reactors to the Precipitatin Test for Antibodies to BLV Antigens (p and gp) in Sera of Dairy Cattle from 6 Districts in Gyeongbuk Area

Herds	No. of Sera Tested	No. of Reactive Sera (gp-ID)	%	Districts	%
A	9	4	44.4	Gyeongsan	22.6
B	12	3	25.0		
C	10	0	0		
D	10	4*	40.0	Goryeong	40.0
E	5	0	0	Suseong-Gu	26.1
F	5	3	60.0		
G	5	1*	20.0		
H	8	2*	25.0		
I	8	1*	12.5	Seo-Gu	12.5
J	8	1	12.5	Bug-Gu	18.2
K	3	1	33.3		
L	14	8	57.1	Dalseong	43.5
M	8	1*	12.5	Dalseong	43.5
N	1	1	100.0		
Total	106	30	28.3		

* : The sera had antibodies to both (p and gp) antigens.

of lymphosarcoma, possessed antibodies to gp antigen of BLV. But antibodies to p antigen were evident in 67 and 89%, respectively. In the present survey, of the 47 gp-ID positive cattle, 5 cattle (10.6%) possessed antibodies to p antigen. The positive rate of the antibodies to p antigen of BLV in Korea is very low compared to that in Japan. In this experiment, however, no exact reason are known as yet.

It is generally thought that distribution of BLV carrier is irregular according to geographical preference and history of herds.[7] Although the reason for the different positive rates in dairy and native cattle in Korea is not clear, it may be interesting to understand the transmission of BLV among cattle under natural conditions.

The results of the antibody survey for BLV in dairy cattle of Gyeongbug area have indicated wide-spread occurrence of BLV infection in Korea as in other countries. To eradicate bovine lymphosarcoma, it will be necessary to research further on lymphosarcoma from BLV infection in cattle in Korea.

Conclusion

A seroepidemiological survey for antibodies to bovine leukemia virus in dairy and Korean native cattle in Gyeongbuk area, Korea was performed using BLV p and gp antigens by the ID test. In the dairy cattle (Holstein), thirty of 106 sera (28.3%) from 14 dairy farms were positive for BLV antibodies and 12 of 14 pastures were contaminated with BLV. But in the Korean native cattle, seventeen (2.4%) of 699 sera from the slaughter house in Taegu city were positive for BLV antibodies. Of 47 gp-ID positive cattle, 5 (10.6%) had antibodies to p antigen.

Acknowledgement

I wish to express my appreciation to professor H. Izawa, Dr. T. Mikami, Dr. M. Onuma and Dr. H. Kodama, Department of Epizootiology, Faculty of Veterinary Medicine, Hokkaido University, Sapporo, for their advice. This work was conducted in this laboratory and supported by a grant from the Association of International Education of Japan in 1981.

References

1) Bendixen, J.J.: Bovine enzootic leukosis. Advances in Vet. Sci. (1965) 10:129.
2) Flensburg, J.C. and Streyffert, B.: The contral of bovine leukosis in Denmark, epidemiologic and diagnostic aspects. Nord. Vet. Med. (1977) 29:49.
3) Jun, M. H.: Epizootiological aspects of bovine leukosis in Korea. Seminar on animal Health preblems in the Asian and Pacific Region, Suweon, Korea (1981) 1.
4) Kono, Y., Hatakeyama, H., Ishikawa, H. and Sentsui, H.: Antibody titers in cattle clinically and subclinically infected with bovine leukemia virus. Veterinary Microbiology (1981) 6:167.
5) Olson, C., Hoss, H.E., Miller,J.M. and Baumgartener, L.E.: Evidence of bovine c-type (leukemia) virus in dairy cattle. J. Amer. Vet. Med. Ass. (1973) 10:129.
6) Onuma, M., Jonma, T. and Mikami, T.: Survey for antibodies to bovine leukemia virus in dairy and beef cattle in Japan. Jap. J. Vet. Sci. (1978) 40:691.
7) Onuma, M., Honma, T. and Mikami, T.: Studies on the sporadic and enzootic forms of bovine leukosis. J. Comp. Path. (1979) 80:159.
8) Onuma, M., Olson, C., Baumgartener, L.E. and Pearson, L.D.: An ether-sensitive antigen associated with bovine leukemia virus infection. J. Natl. Cancer Inst. (1975) 55:1155.
9) Onuma, M., Olson, C. and Driscoll, D.M.: Properties of two isolated antigens associated with bovine leukemia virus infection. J. Natl. Cancer Inst. (1976) 57:571.
10) Phillips, M., Miller, J.M. and Van Der Maaten,

M. J.: Isolation of a precipitating glycoprotein antigen from cell cultures persistently infected with leukemia-virus. J. Natl. Cancer Inst. (1978) 60:213.
11) Ressang, A.A.: Hematological, serological, virological and electron microscopical diagnosis of enzootic bovine leukemia (EBL). Vet. Microbilo. (1976) 1:159.
12) Son, J.Y. and Kim, K.J.: Hematological survey for lymphosarcoma in dairy herds in Korea. Korean J. Vet. Res. (1968) 8:31.
13) Theilen, G.H., Dungworth, D.L., Lengyel, J. and Rosenblatt, L.S.: Bovine lymphosarcoma in California. 1. Epizootiological and hematological aspects. Health Lab. Sci. (1964) 1:96.

韓牛 및 乳牛의 牛白血病 Virus에 대한 血清抗體 調査研究

崔 源 弼

慶北大學校 農科大學

抄 錄

韓牛 및 乳牛의 牛白血病 바이러스의 感染狀態와 牧場의 汚染狀況 등 疫學的인 研究를 위하여, 慶北地方의 14個牧場 乳牛 106頭와 大邱 屠畜場에서 韓牛 699頭의 血清抗体를 調査하였다. 牛白血病 바이러스의 바이러스의 本 바이러스의 蛋白抗原(P)과 糖蛋白抗原(gp)를 가지고 寒天 Gel 內沈降反応(ID)을 실시하였고 그 結果는 다음과 같다.

1. 乳牛 106頭에 있어서 gp-ID 陽性인 것은 30頭(28.3%)이었고, 14個牧場중 12個 牧場이 本 바이러스에 汚染되어 있었으며, 牧場別 感染率은 12.5에서 60%로 높은 感染率을 나타내었다.

2. 韓牛 699頭에서 gp-ID에 陽性인 것은 17頭(2.4%)로 낮았다.

3. gp-ID 陽性血清 47例중 P抗原을 가지고 있는 것은 乳牛 5頭에서만 認定되었다.