Sero-epidemiological studies of bovine leukaemia virus infection in Indian cross-bred zebu cattle

V.P. SINGH, M.P. BANSAL and K.P. SINGH*

Summary: Antibodies against bovine leukaemia virus were detected in 322 of 1,511 serum samples from cattle of various age groups and both sexes, in various herds of the country. A variable degree (5.4 to 75%) of positive reactors was recorded in individual herds where no systematic breeding policy had been followed. Antibodies were also detected in clinically healthy cattle, having normal haematological values which could be classified as healthy according to Bendixen's leukosis key.

KEYWORDS: Bovine leukosis - Cattle diseases - Epidemiological surveys - Gel precipitation tests - India - Zebu.

INTRODUCTION

A definite association between bovine leukaemia virus (BLV) and lymphosarcomatous lesions of cattle was first reported by Miller et al. (17) and later confirmed by other workers (7, 29, 30). Subsequently Miller et al. (19) and several other workers established that BLV is leukaemogenic and can cause lymphosarcoma in experimentally inoculated cattle. In India, bovine leukaemia virus infection in cross-bred zebu cattle was first reported by Bansal et al. (2) in two cattle herds of the country. In the present study the gel immunodiffusion (ID) test was applied to the detection of BLV antibodies in 1,511 serum samples collected from several cattle breeding and dairy herds of India.

MATERIALS AND METHODS

The serum samples were collected from zebu of various age groups and of both sexes. 10-15% of serum samples were also tested for confirmation of infection by other sensitive tests, namely the enzyme-linked immunosorbent assay (ELISA) and radioimmunoassay (RIA), and the presence of infection was confirmed. Serum samples were also collected from cattle abattoirs. The serum samples were stored at -40°C until use. The ID test was carried out as described previously by Bansal et al. (2).

As a general practice a single random collection of serum was made from cattle in all of the herds but three, where samples were available over a period of several years. The tabulated results are based mostly on a single serum sample from each herd.

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animal. In one herd in Uttar Pradesh where BLV infection was prevalent, and about 54% of cattle were positive for BLV antibodies, several animals of the herd had a high total leukocyte count (TLC) and a high absolute lymphocyte count (ALC) with a high percentage of lymphocytes in their peripheral blood. Several animals had persistent lymphocytosis. As soon as the BLV infection was detected serologically, lymphocyte cultures were established from selected animals to determine their ability to yield type C virus or BLV antigens, to confirm the presence of BLV infection. Lymphocytes were cultured by the method described by Bansal and Singh (1), and presence of BLV antigen was confirmed according to the method described earlier (18).

RESULTS AND DISCUSSION

Altogether, 1,511 serum samples from various herds and abattoirs were tested for antibodies against BLV by the ID test, and 322 serum samples were found positive. As seen from Table I, BLV infection was detected in 17 of 37 herds, and the overall percentage of animals showing positive reaction was 21.31%. The survey showed that the proportion of positive reactors varied from 1.9% to 75%. A wide range in positive reactors between 2 and 60% was reported in tests on 30 herds by Olson and Baumgartener (22, 23) and 7% to 36% by Bansal and Singh (3).

<table>
<thead>
<tr>
<th>Name of State</th>
<th>No. of herds tested</th>
<th>No. of herds positive</th>
<th>No. positive/No. tested</th>
<th>Percent of positive reactors</th>
<th>Percentage of positive reactors in various herds</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Uttar Pradesh</td>
<td>12</td>
<td>6</td>
<td>163/587</td>
<td>27.82</td>
<td>18.42; 19.25; 32.26; 34.04; 53.91; (100*)</td>
</tr>
<tr>
<td>2. Punjab</td>
<td>3</td>
<td>2</td>
<td>15/69</td>
<td>21.74</td>
<td>14.29; 29.79</td>
</tr>
<tr>
<td>3. Haryana</td>
<td>1</td>
<td>1</td>
<td>21/76</td>
<td>27.63</td>
<td>27.63</td>
</tr>
<tr>
<td>4. Himachal Pradesh</td>
<td>2</td>
<td>2</td>
<td>13/32</td>
<td>40.62</td>
<td>6.25; 75.0</td>
</tr>
<tr>
<td>5. Madhya Pradesh</td>
<td>2</td>
<td>1</td>
<td>2/105</td>
<td>1.90</td>
<td>5.40</td>
</tr>
<tr>
<td>6. Maharashtra</td>
<td>2</td>
<td>2</td>
<td>22/61</td>
<td>36.07</td>
<td>27.91; 55.56</td>
</tr>
<tr>
<td>7. Karnataka</td>
<td>4</td>
<td>1</td>
<td>36/183</td>
<td>19.67</td>
<td>19.67</td>
</tr>
<tr>
<td>8. Orissa</td>
<td>1</td>
<td>1</td>
<td>30/135</td>
<td>22.22</td>
<td>22.22</td>
</tr>
<tr>
<td>9. Tripura</td>
<td>1</td>
<td>1</td>
<td>20/168</td>
<td>11.90</td>
<td>11.90</td>
</tr>
<tr>
<td>10. Rajasthan</td>
<td>1</td>
<td>0</td>
<td>0/81</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>11. Delhi</td>
<td>1</td>
<td>0</td>
<td>0/7</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>12. Gujarat</td>
<td>3</td>
<td>0</td>
<td>0/36</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>13. Tamilnadu</td>
<td>1</td>
<td>0</td>
<td>0/6</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>14. West Bengal</td>
<td>2</td>
<td>0</td>
<td>0/11</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>15. Kerala</td>
<td>1</td>
<td>0</td>
<td>0/18</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>37</strong></td>
<td><strong>17</strong></td>
<td><strong>322/1511</strong></td>
<td><strong>21.31</strong></td>
<td></td>
</tr>
</tbody>
</table>

* Only one animal was screened and found positive for BLV antibodies.
BLV infection was recorded in nine States of the country (Fig. 1). In some States the sample size was too small to warrant a conclusion regarding the intensity of infection. The survey showed that BLV infection is widespread among cross-bred zebu in several herds situated in various parts of the country. The zebu had been crossed with Jersey, Holstein and Friesian breeds imported from various other countries. These findings are more or less in agreement with the observations reported by other workers (12, 13), while a high percentage of serological reactors has also been reported by several workers (5, 6, 16, 20, 26, 28).

FIG. 1
The location of herds seropositive for antibodies against glycoprotein antigen of bovine leukaemia virus
In the present study it was observed that prevalence of BLV infection varied between different districts of the same State or in the same region. Surveys carried out in USA, France and Japan indicate that BLV infection is more widespread in certain areas in comparison with others (4, 10, 11, 14).

In previous studies Bansal and Singh (3) reported a variable percentage (7 to 36%) of reactors, and at two farms the percentage of reactors was around 36%. A similar incidence has been reported in the USA by Ferrer et al. (8, 9) and in Japan by Onuma et al. (25). In the present survey, in eight herds where BLV infection was widespread and the sample size was more than 30, the positive reactor percentage varied from 22 to 54%. In the USA, Miller et al. (20) reported 37% to 86% serological reactors while Olson and Baumgartener (22) reported 24 to 42% reactors in various BLV infected herds. In Sweden 24 to 39% serum samples were found positive by Olson and Baumgartener (22).

In the present study there was a high rate of BLV infection in certain herds although several animals of the herds had normal haematological values. BLV infection rates of up to 76% of cattle with persistently normal peripheral lymphocyte counts in multiple-case herds have been reported by Ferrer et al. (9). Olson et al. (24) reported an average of 22% reactors among 1,000 cattle of 11 herds; five herds which had no cases of lymphosarcoma during the past 13 years had a lower percentage of reactors (2 to 16%), whereas six herds with histories of lymphosarcoma during the past ten years had 24 to 42% reactors. Olson and Baumgartener (22) and Baumgartener et al. (4) reported similar observations in which 2 to 6% BLV infected animals were detected among clinically normal cattle, and 66% in those cattle herds where lymphosarcoma was very common. Piper et al. (27) and Nakajima et al. (21) reported a higher percentage, ranging from 90 to 91.7% of BLV reactors in cattle having the adult form of lymphosarcoma, whereas in apparently normal cattle of various dairy herds the prevalence of BLV antibodies ranged from 7 to 12.3%. BLV antibodies at lower prevalence have also been detected in apparently healthy cattle with normal haematological values in various herds where BLV infection was not common, as reported by Ferrer et al. (8) in the USA, Levy et al. (15) in France, and Nakajima et al. (21) in Japan.

Confirming the previous reports (2, 3), the present sero-epidemiological survey shows that BLV infection as evaluated by the ID test is prevalent in certain cattle farms. An increase in the infection rate was seen when the data of the present survey was compared with the survey conducted by Bansal and Singh (3). These authors reported an overall percentage of 14% reactors in the total 447 serum samples. During the present study 21.31% positive reactors were detected among 1,511 serum samples. The percentage of animals reacting is higher than that obtained in the investigation of Bansal and Singh (3).

CONCLUSION

While the results of this sero-epidemiological survey represent only part of the country, they do give an indication of the prevalence of bovine leukosis in India. Further surveys using samples chosen on a statistical basis and from smaller herds should be made, State by State, to determine the real prevalence in the cattle population.
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Résumé : Des anticorps contre le virus de la leucose bovine ont été détectés dans 322 échantillons de sérum, issus de 1 511 zébus de groupes d’âge et de sexe différents, répartis dans plusieurs troupeaux du pays. Un pourcentage variable d’animaux réagissant (5,4 à 75 %) a été enregistré dans différents troupeaux malgré l’absence de programme systématique de reproduction. Des anticorps ont été détectés chez des zébus cliniquement normaux, ayant un profil hématologique normal et qui donc pouvaient être classés parmi les animaux sains selon la clé de Bendixen sur la leucose bovine.


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ESTUDIO SEROEPIDEMIOLÓGICO DE LA LEUCOSIS BOVINA ENZOOTICA EN CEBÚS CRUZADOS INDIOS. – V.P. Singh, M.P. Bansal y K.P. Singh.

Resumen: Se han detectado anticuerpos contra el virus de la leucosis bovina en 322 muestras de suero, procedentes de 1 511 cebúes de distintos grupos de edad y sexo, distribuidos en varios rebaños del país. Se registró un porcentaje variable de animales reactivos (del 5,4 al 75%) en distintos rebaños pese a la falta de programa sistemático de reproducción. Se han detectado anticuerpos en cebúes clínicamente normales, que tenían un perfil hematológico normal, por lo que se les podía clasificar entre los animales sanos según el baremo de Bendixen sobre la leucosis bovina.

PALABRAS CLAVE: Cebú - Encuestas epidemiológicas - Enfermedades de bovinos - India - Leucosis bovina - Pruebas de precipitación en agar.

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REFERENCES


