Seroprevalence of brucellosis in a few important Indian goat breeds

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Abstract

Caprine brucellosis is an endemic disease and is present in many countries. It causes heavy losses in goats and is transmissible to man. Assessment of incidence of the disease was seen in pure-bred goats (Jamunapari, Barbari and Beetal) of breeding age belonging to 241 farmers of 143 villages of seven districts of U.P. and Punjab, India. Rapid, easy, and field-based qualitative dot-Enzyme linked immunosorbent assay was used, for the first time in India, in the screening of field goats. Reactors in dot-Elisa were further tested with standard tube agglutination test (SAT). Incidence of brucellosis in farmers’ goat flocks was 0.8%. Incidence in organized state government goat farms was 4.9%. Incidence in goats slaughtered in local goat abattoir in Agra (U.P.) was 7.1%. The overall incidence of brucellosis in goats in areas surveyed was 4.0%. Dot-Elisa was found to be rapid, handy and suitable screening test in the field for the diagnosis of brucellosis in goats. © 1998 Elsevier Science B.V. All rights reserved.

Keywords: Goats; Brucellosis; Dot-Elisa; Agglutination test

1. Introduction

Goats are an important source of livelihood among rural people in Asia. Goat population has increased in India, despite 43% annual removal (Acharya, 1988). Of the 20 descript goat breeds in India, Barbari, Jamunapari and Beetal have been popular commercially. In Asia, poor goat owners share a very close relationship with goats. Therefore, abortions, infected births and carrier goats pose threat not only to susceptible animals but also to goat keepers (Nicoletti, 1987; Alton, 1982).

Caprine brucellosis is perhaps as old as animal husbandry (Alton, 1982) and goats are a reservoir of the most pathogenic species of Brucella (Kolar, 1987). Brucella infection is widely distributed in the world (Table 4). Information is scarce on brucellosis in farmers’ and organized goat flocks in India (Singh et al., 1994). During this study, sero-surveys were conducted in the home tracts of the few important Indian goat breeds.

2. Materials and methods

2.1. Blood/serum samples

2.1.1. Farmers’ flocks

Surveyed farmers’ flocks usually consisted of 1–5 goats and were kept in extensive system of management, in semi-arid climate. Blood/serum samples were
collected from pure-bred, Jamunapari, Beetal and Barbari goats of about one-year age from their home tracts.

Blood/serum samples of 193 does and 15 bucks of pure-bred Jamunapari goats, belonging to 76 farmer flocks of 21 villages in Chakarnagar block were collected. Blood/serum samples were collected by jugular vein puncture.

Blood/serum samples from 188 pure-bred Barbari goats (183 does and 5 bucks) of 1–2 years age and belonging to 139 farmer flocks of 107 villages spread in the Agra region (U.P.) were collected. Samples (14) were also collected from farmers’ Barbari goats suffering from reproductive disorders.

Blood/serum samples (77 in number) of Beetal goats (69 does and 8 bucks) of 1–2 years old belonging to 26 farmer flocks of 21 villages of Gurdaspur, Punjab, were collected.

2.1.2. Organized flocks

Serum samples (23 in number) of adult does were collected from 159 pure-bred Jamunapari goats located at the Jamunapari-Bhadawari Farm, Etawah (U.P.); serum samples of 6 pure-bred Jamunapari bucks used for the natural service of farmers goats, located at Chandi Farm, Chakarnagar, Etawah, were also collected. Blood samples were collected from 37 adult pure-bred black Bengal goats from two Orissa state government farms, which had severe problems of abortions and 76 healthy adult goats of Marwari flock located at Western Region Research Station (CIRG), Avikanagar, Rajasthan (Table 2).

Organized flocks under study were managed under semi-intensive system of management and the goats surveyed were not vaccinated against brucellosis.

2.1.3. Local abattoir

Serum samples from 380 slaughtered Barbari-type goats were collected from the abattoir located at Agra. Blood samples were processed immediately in the field itself, while serum was stored at −20°C, till further use.

2.1.4. Serological tests

Blood samples were first screened by the dot-Elisa and the reactors in the dot-Elisa were further tested by standard tube agglutination test (SAT) and microcomplement fixation test (CFT).

2.1.4.1. Dot-Enzyme linked immunosorbent assay. The dot-Elisa kit, recently developed at Defence R&D Establishment, Gwalior (Jana, 1994), for direct field application has been used, for the first time in the country, in the screening of goats. A drop of blood was collected directly on the sample collection combs (a plastic comb-like structure). In the experiment, 10 blood samples were collected on each comb along with built-in positive and negative controls and were immediately processed. The development of a blue dot on the antigen (B. abortus) coated nitrocellulose combs, as on positive control, was recorded as positive. Results of dot-Elisa test were available within 2 h in the field itself.

2.1.4.2. Standard tube agglutination test (SAT). Commercial plain B. abortus, strain 99 antigen for the SAT was procured from the Indian Veterinary Research Institute (IVRI), Izatnagar, and the test was performed as per the procedure of Alton (1970), with some modification (Anonymous, 1971). A titre of 1:40 and above was considered as a positive reactor.

2.1.4.3. Complement fixation test: (CFT). CFT was performed as per the method of Alton et al. (1975) using B. abortus S-99 antigen (IVRI) in 1 : 10 dilution. The test was carried out in micro-titration plates in warm fixation, using three units of fresh guinea-pig complement and four units of hemolysin procured from IVRI, Izatnagar. Serum samples showing titres of 1 : 8 and above were taken as positive reactors.

Goats reacted in dot-Elisa and SAT were considered as seropositive for brucellosis.

3. Results

The results reflect the status of Brucella infection in the farmers’ flocks located in the village area and in the Government farms, in the respective home tracts of the few important goat breeds of India.

3.1. Incidence of brucellosis in farmers’ goat flocks

Seroprevalence of brucellosis was investigated in Jamunapari, Beetal and Barbari goat breeds, belonging to 241 farmers’ flocks located in the 143 villages of seven districts of U.P. and Punjab. Of the 473 healthy goats tested, incidence of brucellosis was 0.8% in the areas surveyed.
3.1.1. Jamunapari flocks

Of about 7350 Jamunapari goats available in the Chakarnagar block, Etawah, 208 blood samples (193 does and 15 bucks) were screened using dot-Elisa and 36 goat sera (30 does and 6 bucks) were reactors. Further, screening of these 36 reactor samples by SAT showed that only two female goat sera were reactors. The incidence of brucellosis in farmers’ Jamunapari goats was 1.0% (Table 1).

3.1.2. Barbari flocks

Screening of 188 blood samples of the farmers’ pure-bred adult Barbari goats (183 does and 5 bucks) by dot-Elisa, showed that 42 (37 does and 5 bucks) were positive reactors. Further, screening of these 42 sera samples by SAT showed that only two does were reactors. The incidence of brucellosis in farmers’ Barbari goats was found to be 1.1% (Table 1). Of the 14 farmers’ Barbari goats, suffering from reproductive disorders, two were found reactors in SAT.

3.1.3. Beetal flocks

Screening of 77 blood samples of adult Beetal goats (69 does and 8 bucks) by dot-Elisa revealed that 12 does were reactors. Further screening of these 12 does by SAT showed that none of the goats was positive for brucellosis (Table 1).

Overall incidence of brucellosis in the farmers’ goat flocks was 0.8% by using dot-Elisa and SAT.

3.2. Incidence of brucellosis in organized flocks

Serum samples of 23 adult Jamunapari does available at Etawah were tested by SAT of which two goats were found to be reactors for brucellosis, whereas the screening of six adult breeding bucks located at Chandi Farm, Chakarnagar, by dot-Elisa, SAT and CFT revealed that five bucks were positive reactors. None of the Black Bengal and Marwari goats tested were positive in dot-Elisa.

The incidence of brucellosis, surveyed in the Government goat flocks, was 4.9% (Table 2).

3.3. Incidence of brucellosis in the abattoir

The 380 serum samples of Barbari-type goats collected from the abattoir (Agra), were screened by SAT and 7.1% sera samples turned out positive for Brucella

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**Table 1**

Incidence of brucellosis in farmers’ goat flocks by dot-ELISA and SAT

<table>
<thead>
<tr>
<th>Breed</th>
<th>Farmers flock</th>
<th>Villages</th>
<th>District</th>
<th>State</th>
<th>Dot-Elisa tested</th>
<th>+ve</th>
<th>SAT tested</th>
<th>+ve</th>
<th>Brucellosis Incidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jamunapari</td>
<td>76</td>
<td>21</td>
<td>1</td>
<td>U.P.</td>
<td>208</td>
<td>36</td>
<td>36</td>
<td>36</td>
<td>2(1.0%)</td>
</tr>
<tr>
<td>Barbari</td>
<td>139</td>
<td>107</td>
<td>4</td>
<td>U.P.</td>
<td>188</td>
<td>42</td>
<td>42</td>
<td>42</td>
<td>2(1.1%)</td>
</tr>
<tr>
<td>Beetal</td>
<td>26</td>
<td>15</td>
<td>2</td>
<td>Punjab</td>
<td>77</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>Nil</td>
</tr>
<tr>
<td>Total</td>
<td>241</td>
<td>143</td>
<td>7</td>
<td></td>
<td>473</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>4(0.8%)</td>
</tr>
</tbody>
</table>

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**Table 2**

Incidence of brucellosis in organized goat flocks

<table>
<thead>
<tr>
<th>Breeds</th>
<th>Locations</th>
<th>Total goats</th>
<th>Goats tested</th>
<th>Positive reactors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>dot-Elisa</td>
</tr>
<tr>
<td>Jamunapari</td>
<td>Chakanagar</td>
<td>6 a</td>
<td>6</td>
<td>Nil b</td>
</tr>
<tr>
<td>Jamunapari</td>
<td>Etawah</td>
<td>159</td>
<td>23</td>
<td>ND b</td>
</tr>
<tr>
<td>B. Bengal</td>
<td>Deogaon</td>
<td>112</td>
<td>26</td>
<td>Nil b</td>
</tr>
<tr>
<td>B. Bengal</td>
<td>Chiplima</td>
<td>225</td>
<td>11</td>
<td>Nil b</td>
</tr>
<tr>
<td>Marwari</td>
<td>Avikanagar</td>
<td>76</td>
<td>142</td>
<td>Nil b</td>
</tr>
</tbody>
</table>

a Breeding bucks.

b Not done.

c 2+5=4.9%.
antibodies (Table 3). On the basis of screening of farmers’ flocks, Government farms and slaughtered goats, it is concluded that the incidence of brucellosis in goats in India was 4.0%.

4. Discussion

Recently, commercial goat farming in India has picked up at a fast pace. It has become essential to know the incidence of brucellosis in farmers’ flocks of commercially popular breeds of goats. Because these flocks serve as nuclei for other upcoming commercial flocks throughout the country.

Studies conducted have shown that point prevalence of *Brucella* antibodies in three important goat breeds (Jamunapari, Beetal, Barbari) belonging to farmers’ flocks, in their respective home tracts in India was very low (0.8%). Goat flocks belonging to nomads have been shown to have the low (Hashim et al., 1987) and high (Kolar, 1982) infection rates depending on overall brucellosis incidence in the country. Like nomadic flocks, farmers’ goats are also kept on range in India and have very a low incidence of brucellosis in the country as shown by the present study.

Though the study was limited to a few flocks in the four states of U.P., Punjab, Orissa and Rajasthan, the incidence of brucellosis was moderate (4.9%), in the surveyed organised Government goat flocks in India. It is interesting to note that five breeding bucks (Chandi Farm, Chakarnagar) were positive in micro-CFT and were negative in SAT and dot-Elisa. On the basis of CFT, these bucks were withdrawn from the breeding. Use of these bucks in natural service may have led to the infection from served contaminated does. The incidence of brucellosis was only recorded from U.P. both, in the farmers’ and farm flocks. Flocks located in Punjab, Orissa and Rajasthan were having comparatively low incidence of *Brucella* infection. Similar regional variation within the same country has been recorded from other parts of the world (Table 4). Caprine/ovine brucellosis has been reported from 64/160 countries (WHO, 1991), where these figures may be even higher (Matyas and Fuzikura, 1983). Over 14 species of livestock and wild animals have been shown to be infected with brucellosis in China (Feng, 1992), due to many epidemiological conditions like close contact during adverse climate, community grazing, cross breeding, wild animals.

Mixing of two or more different animals species, increase in commercial farms, uncontrolled move-

<table>
<thead>
<tr>
<th>Breeds</th>
<th>Location</th>
<th>Age group</th>
<th>Goats tested</th>
<th>Results positive(1 : 40)</th>
<th>Results doubtful(1 : 20)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barbari and crosses</td>
<td>Agra</td>
<td>6 months–6 years</td>
<td>380</td>
<td>27(7.1%)</td>
<td>42(11.0%)</td>
</tr>
</tbody>
</table>

Table 4
Incidence of brucellosis in goats

<table>
<thead>
<tr>
<th>Authors</th>
<th>Country</th>
<th>Incidence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Low incidence of brucellosis in goats</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aquino Viegas et al. (1981)</td>
<td>India</td>
<td>2.2</td>
</tr>
<tr>
<td>Toma (1990)</td>
<td>France</td>
<td>0.033–0.1</td>
</tr>
<tr>
<td>Bekele and Kasali (1990)</td>
<td>C. Ethiopia</td>
<td>1.3</td>
</tr>
<tr>
<td>Singh et al. (1994)</td>
<td>India</td>
<td>0.4–1.9</td>
</tr>
<tr>
<td>b. Moderate incidence of brucellosis in goats</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Falade et al. (1974)</td>
<td>Nigeria</td>
<td>4.2</td>
</tr>
<tr>
<td>Karim et al. (1979)</td>
<td>Iraq</td>
<td>4.4</td>
</tr>
<tr>
<td>Kolar (1982)</td>
<td>Mongolia</td>
<td>2.9</td>
</tr>
<tr>
<td>Abdel Ghani et al. (1983)</td>
<td>Egypt</td>
<td>4.9</td>
</tr>
<tr>
<td>Touli (1984)</td>
<td>Tunisia</td>
<td>4.9</td>
</tr>
<tr>
<td>Hashim et al. (1987)</td>
<td>Saudi Arabia</td>
<td>4.2</td>
</tr>
<tr>
<td>Masoumi et al. (1992)</td>
<td>Pakistan</td>
<td>3.0</td>
</tr>
<tr>
<td>c. Higher incidence in brucellosis in goats</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sharma et al. (1979)</td>
<td>India</td>
<td>5.9</td>
</tr>
<tr>
<td>Okoh (1980)</td>
<td>Nigeria</td>
<td>5.2–38.5</td>
</tr>
<tr>
<td>Giantzis et al. (1984)</td>
<td>North Greece</td>
<td>33.3</td>
</tr>
<tr>
<td>Zowghi et al. (1984)</td>
<td>Iran</td>
<td>5.2–38.5</td>
</tr>
<tr>
<td>Kapoor et al. (1985)</td>
<td>India</td>
<td>5.7</td>
</tr>
<tr>
<td>Pittarello et al. (1987)</td>
<td>Switzerland</td>
<td>34.4</td>
</tr>
<tr>
<td>Ghosh and Nanda (1988)</td>
<td>India</td>
<td>6.9</td>
</tr>
<tr>
<td>Lord et al. (1989)</td>
<td>Venezuela</td>
<td>12.4</td>
</tr>
<tr>
<td>Boargob and Mohammed (1989)</td>
<td>Libya</td>
<td>27.2</td>
</tr>
<tr>
<td>Akhtar (1992)</td>
<td>Pakistan</td>
<td>32.8</td>
</tr>
</tbody>
</table>
ment of animals, introduction of new animals, etc. have helped in perpetuation of caprine brucellosis in many countries (Nicoletti, 1982; Cherif et al., 1987; Kolar, 1982; Hosie et al., 1985; Moegle et al., 1985; Okoh, 1980; Polydourou, 1990; Salem and Hosein, 1990; Hafez, 1986) including India, (Singh et al., 1994).

The incidence was highest among slaughtered goats when compared to goats located in farmers’ and farm flocks, which shows the tendency of farmers and farm managers to cull the goats suffering from either reproductive disorder or unproductivity. In the absence of any specific symptom, it has been very difficult to convince a farmer and farm manager on the basis of serological evidence, that the disease exists in his flock and that he too stands at risk. A similar problem has been reported from Zambia (Bell et al., 1977).

Overall point prevalence of brucellosis in goats in India on the basis of this study was quite low (0.8%), but the actual incidence may be higher, because the sensitivity of SAT is quite low. Among small ruminants, \textit{B. melitensis} remains localized where it is present (Gilles, 1977). Though the disease has been reported from farmers’ and farm goats from time to time, no major outbreak of the disease occurred in any part of the country/world.

Rapid on-the-spot screening of farmers goats was possible by the use of dot-Elisa for the first time in the country which, besides being a sensitive and specific test required minimum handling of goats and was easily performed in field conditions. It is not practical to bleed large numbers of animals in field situations. With the disinclination of farmers and farm managers towards bleeding of goats, dot-Elisa was handy in working with 60-80 samples simultaneously and the results were available within 2 h. Since it required only a drop of blood, farmers and farm managers had distinct preference for it, in comparison to other serological tests like SAT, which require bleeding of goats for serum collection. Use of dot-Elisa also limited the number of goats to be bled for serum collection. Incubation at room temperature and the use of ordinary water in the washing steps were the other added advantages. Moreover, cold chains are difficult to arrange in the field conditions.

Caprine brucellosis is a serious threat to man, especially during abortion and parturition season (Alton, 1982; Ansorg et al., 1983. Feng, 1992). Therefore, routine surveillance of farm flocks is essential, to know about the incidence of brucellosis and local infected areas, before implementing a wide-scale national programme of \textit{Brucella} control and eradication. There is an increasing need of educating farmers and farm managers about brucellosis and its public health significance.

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\section*{References}


