

Bovine Brucellosis Outbreaks and their Successful Management by Adulthood Vaccination at Udaipur Region of Southern Rajasthan

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Abstract

Outbreaks of bovine brucellosis and their successful management by adulthood vaccination in cattle at four peri-urban dairy farms in Udaipur city of Rajasthan have been reported in present study. Screening of brucellosis in these dairy farms has been carried out by RPBT and iELISA. Out of 255 animals tested 58 were found positive for brucellosis while 197 animals were seronegative. Storm of abortions was controlled with use of reduced dose (1/20th dose) of standard calf-hood vaccine (Brucella abortus S19) by conjunctival route in seronegative animals, along with adoption of proper hygienic measurements, and segregation of seropositive animals.

Keywords: Abortion, Bovine Brucellosis, Vaccination, Brucella Abortus S19

Introduction

Brucellosis an important disease of livestock is one of the common bacterial zoonosis. Brucellosis has worldwide distribution and affecting health of livestock and human especially in underdeveloped and developing countries in South Asia (Singathia *et al.*, 2012; Sharma *et al.*, 2018). All animal species including wildlife are affected by brucellosis (Dorneles *et al.*, 2015). Brucellosis is endemic in India and the disease is well documented on a large number of dairy farms (Isloor *et al.*, 1998; Chand *et al.*, 2004; Dhanda *et al.*, 2005; Brahmabhatt *et al.*, 2009; Senthil and Anantha 2013; Kumar *et al.*, 2017; Upadhyay and Mani, 2020). The disease responsible for economic losses by affecting the reproductive potential of animals and also reducing human's working potential (Chahota *et al.*, 2003). In India it has been estimated USD 3.4 million annually (Singh *et al.*, 2015). More than 500,000 cases of human being of this disease have been reported to occur annually globally (Pappas *et al.*, 2006). In humans, symptoms include fever, malaise, orchitis and a variety of non-specific symptoms (Simpson *et al.*, 2018).

For the diagnosis of Brucellosis, RBPT is seen as the best screening test (Godfroid *et al.*, 2010) and iELISA is seen as a confirmatory test as it is more specific than the RBPT (Guarino *et al.*, 2001; Corbel, 2006). Both of the tests are recommended by the OIE (OIE 2004). It is difficult to eradicate brucellosis from an area but it could be prevented and controlled to a great extent by vaccination of animals. Vaccination increases resistance of animals and interrupts transmission of brucellosis under natural conditions (Chand *et al.*, 2015).

In the study area many outbreaks of contagious abortion have been recorded at Regional disease diagnostic centre (RDDC), department of Animal husbandry, Udaipur and at department of Veterinary microbiology, college of veterinary and animal science, Navania, Udaipur. Presently no vaccination for adult animal is in practice. Segregation and treatment of positive animals though moderately effective but can't prevent the storm of abortions in herd (Radostitis *et al.*, 2007). Here in author documented the bovine brucellosis outbreaks and its successful management by adult hood vaccination in cattle in southern region of Rajasthan.

Materials and Methods

Sample Collection

The study was carried out on 255 adult Holstein Friesian cross bred cattle (170 pluriparous pregnant cattle, 9 were pregnant heifer and 76 were non pregnant animals) in four semi-organized dairy farms (two dairy farms at Rebario ki Dhani village, third dairy farm at Lakhawali dairy farm and fourth dairy farm at Sakroda village) located at periurban area of Udaipur, Rajasthan (Table 1).

Table 1: Detail of dairy farms and village scanned for Brucellosis

S. No.	Name of village and dairy farm	Year of outbreak reported	Number of animals	Brucellosis positive at the time of vaccination
1	Rabaariyo ki Dhani-I	2014	70	9
2	Rabaariyo Ki Dhani-II	2014	75	17
3	Sakaroda	2020	75	27
4	Lakhawali	2020	35	5
	Total		255	58

These herds have clinical history of storm of abortions (mainly during second half of gestation), stillbirths, weak calves, retention of the placenta, decreased lactation in females whereas testicular abscesses in male animals. Animals were maintained under good animal husbandry conditions however, vaccination of animals against brucellosis had never been practiced at any farm. On owner's request, the cattle population in the herd was screened for the brucellosis.

Serum Samples

Blood (10 ml) was collected aseptically from each animal by jugular vena puncture in vacutainer. The blood was allowed to clot for four hours at 4⁰C and centrifuged at 1900 rpm for 10 minutes to separate the serum. The separated

sera samples stored at -20°C until further use. The samples were obtained along with the information in respect to knowledge of brucellosis to dairyman, occurrence of abortion on the farm, area of purchase of animals, age of animal, and whether they are heifer, dry, pregnant, or lactating animals.

Serological Examination

All the sera samples (N=255) were screened for brucellosis using serological tests *i.e.*, Rose Bengal plate agglutination test (RBPT) and indirect enzyme linked immunosorbent assay (iELISA).

Rose Bengal Plate Agglutination Test (RBPT)

The colored antigen for the RBPT was procured from the Division of Biological Products, Indian Veterinary Research Institute (I.V.R.I.), Izatnagar, U.P. and the test was performed as per the manufacturer's instructions. Equal volume of antigen and serum were mixed and spread on a flat glass plate. The results in RBPT were considered negative or positive when there was absence or presence of agglutination, respectively.

Indirect Enzyme Linked Immunosorbent Assay (iELISA)

The iELISA was performed by IDEXX Brucellosis antibody test kit (IDEXX, Montpellier, France) which allows for the analysis of individual sera samples.

Control Strategy

The control strategy at dairy farms was executed employing following steps:

Testing and Segregation of Positive Animals

The sera samples from all animals above 4 months of age were tested by RBPT and iELISA for detecting *B. abortus* antibody and thereafter positive animals were segregated.

Decontamination of Farm Premises

The calving pens were white washed and disinfected with 1% solution of phenol. Housing shed and milking area were also cleaned and disinfected using 1% solution of phenol (Radositis *et al.*, 2007).

Vaccination of Animals

It was recommended to the owners of dairy farms for testing of their animals and to vaccinate all sero-negative testing female animals above 4 months of age with S19 vaccine. Males are not recommended for vaccination because of the potential complication of orchitis (Olsen and Palmer, 2014). The freeze dried S19 vaccine was procured from the MSD (Merck Sharp & Dohme) company. Vaccination of calves above 4-month age cattle were vaccinated with 1/20th dose of standard dose of S19 vaccine as described by Chand *et al.*, 2015. Total one hundred ninety-seven (N=197) cattle which were brucellosis sero negative included in this study (Table 1 and 2) and all were inoculated by 1/20th dose of S19 calf-hood vaccine by instillation on the conjunctiva in one eye of animal prescribed in the OIE manual (2004). In two farms vaccination was carried out in April 2014 where as in another two farms the vaccination has been done recently in Nov. 2020 (Table 1).

Monitoring of Animals After Vaccination

The dairy farms were monitored after vaccination since April 2014 and Nov 2020 to 2021). The dairy owners were advised to inform immediately if abortion in any animal was noticed. Further, it was recommended that replacement on the farm should only be introduced after testing. Positive testing animals should be managed separately and special care should be given to these animals at the time of parturition, and negative animal should be immediate vaccinate with reduced dose of S-19 vaccine.

Ethical Approval

Sample collection and disease diagnosis is part of routine work of RDDC, Department of Animal Husbandry, Udaipur and Disease Diagnosis Laboratory, Department of Veterinary Microbiology, College of Veterinary and Animal Science, Navania, hence no ethical approval required.

Results and Discussion

Present investigation and intervention was carried out to find out the etiology of abortion storm and control it. Out of total 255 adult animals of four dairy farms, 197 were serologically negative and 58 were found sero-positive for brucellosis. Vaccination of all negative female animals (N=197) above 4 months of age was carried out through conjunctival route by S19 vaccine. The S19 vaccine is a live attenuated strain of *B. abortus* which had been used worldwide to control brucellosis in cattle. The effect of reduced dose of vaccine results in increased resistance, in 65–75% of animals so these are protected completely from the subsequent exposure (Radostits *et al.*, 2007). The 25–35% of vaccinated animals could acquire infection in highly contaminated environment but many of these may not show symptoms like abortion (Radostits *et al.*, 2007). In a study of Mexico, the efficacy of S19 vaccine was shown to be 86% despite the fact that infected animals were reared with vaccinated animals on the farm (Cardena *et al.*, 2009). Further the almost same efficacy has been reported from India by Chand *et al.*, 2013; Chand *et al.*, 2015). Similarly in our study the efficacy observed is 94.33%. Thus, vaccination was found very effective in reducing abortion storms in dairy herds.

After the vaccination, only two pregnant pluripara animals aborted at Rabaariyo ki dhani dairy farm-I and two abortions were reported at Rabaariyo ki dhani dairy farm-II within 21 days of vaccination while three pleuraperous animals and one pregnant heifer aborted after the 21 days of vaccination at Sakroda dairy farm. Problem of retention of placenta was has reduced significantly in vaccinated animals (Table 2). This has been recorded only in 10 animals *i.e.*, two pregnant pluripara animal and eight pregnant heifers. All aborted animals have problem of repeat breeding and metritis before vaccination so all animals were treated with intrauterine (Oflokind-oz vetkind Pvt Ltd.) and systemic antibiotic therapy (Oxytetracycline LA I/M).

Table 2: Details of events

S. No.	Detail of events	Pregnant Pluripara	Pregnant heifer	Non pregnant animals	Total
1	Total animal in herds	170	9	76	255
2	Abortion reported before vaccination	23	-	-	23
3	Animal vaccinated	112	9	76	197
4	Animal aborted within 21 days of vaccination	4	-	-	4
5	Animal aborted after 21 days of vaccination but within two months of vaccination	3	3		6
6	Animal reported retention of placenta problem before vaccination				All aborted animal having retention of placenta after parturition
7	Animal reported retention of placenta problem after vaccination	2	8	-	10
8	Problem of infertility before vaccination	-	-	-	All aborted animals have problem of repeat breeding and metritis. These animals were treated with intrauterine and systemic therapy
9	Problem of infertility after vaccination	2	1	8	11
10	Effect on conception after vaccination	-	-	-	191 out of 197 vaccinated animals have either parturated or not aborted (till January- 2020)

Adulthood vaccination with reduced dose of S19 vaccine was remained successful in reducing the number of abortions in large dairy herds in which it was impossible to institute management procedures for the control of brucellosis (Radostits *et al.*, 2007). In low-income countries and in periurban areas due to limitation of space segregation of animals is not possible; even then, vaccination is useful as it interrupts transmission of the disease. In endemic areas breaking the transmission cycle from infected to susceptible animal is a right step towards controlling brucellosis on farms. Further, all brucellosis positive animals should give treatment with long acting oxytetracycline and streptomycin for one month (Radostits *et al.*, 2007). Though the above prescribed treatment is moderately effective but if applied with cleaning, disinfection and decontamination of premises particularly of calving pens and area surrounding the pen definitely help to reduce antigenic load at the farm, which help in prevention of spread of *Brucella* infection in near dairy farms. Because in semi-organized dairy farms, located in peri-urban areas space for segregation of animals is a major constrain. Further due to religious and ethical sentiments, culling of positive animals is impossible in India. So, keeping the positive animal at the farm and adopting the preventive strategy is the only practical measure. So, to reduce the economic losses and spread of disease, adulthood vaccination may be adopted as a routine practice.

Conclusion

Present study described outbreak of bovine brucellosis and its successful management in Holstein Friesian cross bred cattle herds by adulthood vaccination at reduced dose. Further we also use the vaccine in pregnant animal and found no any harmful effect. No undue effect on fertility and conception observed. So, if a dairyman wishes to control brucellosis on his infected dairy farm in the shortest possible time, then adult hood vaccination strategy may be adopted along with adoption of proper hygienic measurements, and segregation of seropositive animals.

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Conflict of Interests

There is no conflict of interest.

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