

A study on bovine ephemeral fever involving sentinel herds and serosurveillance in Saudi Arabia

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Summary

A nationwide study was conducted in Saudi Arabia to determine if bovine ephemeral fever (BEF) was present in cattle between 1993 and 1995. The study had two components: the first was establishment of sentinel herds of cattle in some localities, the second was to conduct a nationwide serological survey. The results indicated that Saudi Arabia was free of BEF during the period of study and that the cattle population was susceptible to the disease, which may have contributed to the fulminating epidemic of 1996. The epidemiological situation of the disease in Saudi Arabia is discussed in relation to the likelihood of introduction of the disease into the country.

Keywords

Bovine ephemeral fever – Saudi Arabia – Sentinel herd – Serosurveillance.

Introduction

Bovine ephemeral fever (BEF) or 'three-day stiff sickness' is a clinically severe, short duration, non-contagious arboviral disease of cattle and buffaloes (15). Salient features of the disease are its acute and aggressive clinical presentation and the rapid recovery.

The disease is caused by a virus belonging to the genus *Ephemerovirus*, which is a member of the family *Rhabdoviridae* (3). Mosquitoes and *Culicoides* midges may be involved in transmitting the virus (8, 10, 16).

Following the first record of the disease, in South Africa, in the mid-nineteenth century (7), it has been reported in Australia and Japan and in most countries of Africa, Asia and the Middle East (4).

The BEF situation in Saudi Arabia prior to 1995 was not clear. Two suspected outbreaks (based on clinical signs only) were reported. One was in 1980 (9) and the other from 1990 to 1991 (6; H. Seydon, personal communication). Virus isolation was not attempted on either occasion.

The present study was initiated to determine if there was evidence that the disease was present in the country between 1993 and 1995. The study had two components: the first involved the establishment of sentinel cattle herds to look for seroconversion and clinical signs suggestive of the disease. The other component was a serological survey of cattle above one year of age. As no routine vaccination was practised against BEF in Saudi Arabia before 1995, results of the survey provided useful epidemiological information about the disease.

Materials and methods

The sentinel herds

Two cattle sentinel herds were established in the Al-Kharj and Al-Ahsa areas (Fig. 1). These locations were chosen because they contain most of the cattle population of Saudi Arabia. The Al-Ahsa sentinel herd consisted of 44 locally-bred Holstein–Friesian BEF-seronegative calves. Serum samples were collected from each calf every month. The study of this sentinel herd extended from January 1993 to May 1995. The serum samples were heated for 30 min at 56°C and stored at –20°C until used.

The Al-Kharj sentinel herd consisted of 23 BEF-seronegative locally-bred Holstein–Friesian calves. Serum samples were collected monthly from each calf from April to November 1993. The sera were treated and stored in the same way as the samples from the Al-Ahsa sentinel herd.

Clinical observations on the sentinel herds

The cattle in the sentinel herds were observed closely for clinical signs of BEF infection throughout the study.

Cattle sera for the serosurveillance study

The cattle population in Saudi Arabia is located mainly on dairy farms in the Central region (Al-Kharj area) and the Eastern region (Al-Ahsa and Dammam areas), and most of the samples for this study were collected from farms and villages in these regions. There are a few cattle found elsewhere in Saudi Arabia, e.g. in the area around Tabouk in the north-west of the country, so samples were also

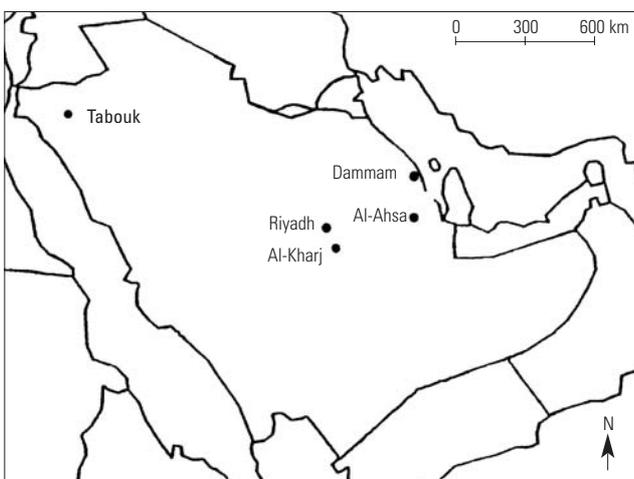


Fig. 1
Map of Saudi Arabia showing the locations in which sentinel herds were established (Al-Kharj and Al-Ahsa) and from which cattle sera samples were taken, 1993 to 1995

collected in this region. There was no history of vaccination against BEF and all the serum samples were collected between 1993 and 1995 from cattle over one year old. The collected sera were heated at 56°C for 30 min and then stored at –20°C until used.

Antibody detection

To detect antibodies against BEF virus in the sera from the sentinel herds and the serological survey, the micro virus neutralisation test (VNT) was employed as described by Nagano *et al.* (12). The BEF virus used was the Webster 919 strain, which was passaged twice in Vero cells; the tissue culture infective dose 50 (TCID₅₀) was calculated using the method of Reed and Muench (13).

The VNT was performed using serial two-fold serum dilutions in F-12 media without serum. Each serum dilution was mixed with an equal volume of the virus containing 200 TCID₅₀ per 0.1 ml. The virus/serum mixture was incubated for 1 h at 37°C and then overnight at 4°C. The Vero cells were added to each well at a concentration of 10⁶ cells/ml. The microplates were then incubated at 37°C for 7 days and examined for inhibition of cytopathic effect. The serum titre was calculated according to the method of Reed and Muench (13).

Results

Clinical observations on the sentinel herds

None of the sentinel cattle showed any clinical signs of BEF infection during the study period.

Seroconversion in the sentinel herds

All of the 1,460 serum samples which were collected from the sentinel cattle during the study period were negative for antibodies against BEF.

The serological survey

Table I shows the results of the serological survey for BEF antibodies in cattle. No serum antibodies against BEF virus were detected in any of the 910 surveyed cattle.

Discussion

The first report of BEF in Saudi Arabia was in 1983 (9). This report was based on clinical observations of a disease that appeared to be BEF. There was no attempt to confirm

Table 1
Bovine ephemeral fever serological survey results

(cattle sera were collected between 1993 and 1995 and were tested using the virus neutralisation test)

Locality	Number tested	Number positive (%)	Number negative (%)
Al-Ahsa slaughterhouse	305	0 (0%)	305 (100%)
Al-Ahsa farm	230	0 (0%)	230 (100%)
Dammam farm	65	0 (0%)	65 (100%)
Al-Ahsa villages	93	0 (0%)	93 (100%)
Al-Kharj farm	167	0 (0%)	167 (100%)
Tabouk farm	50	0 (0%)	50 (100%)
Total	910	0 (0%)	910 (100%)

the diagnosis by serology or virus isolation. A tentative diagnosis of BEF, based on clinical signs, was also made in 1990/1991 (6; H. Seydon, personal communication). Again, there was no attempt to isolate the virus. From 1991 until 1995 there were no reports of the disease in the country. However, in 1996 a devastating epidemic of BEF swept through the whole country (1, 2, 6).

The results of the present study filled an important gap in the knowledge of the epidemiological evolution of BEF in Saudi Arabia. They demonstrated the absence of BEF virus activity in Saudi Arabia between 1993 and 1995 and showed that the cattle population appeared to be completely susceptible to BEF virus infection.

The 1996 epidemic indicated that the ecological and meteorological conditions in Saudi Arabia were apparently ideal for the spread of arboviral diseases. In addition, ruminants were imported into Saudi Arabia from countries where BEF had been diagnosed. Thus, conditions were very favourable for the introduction of arboviral diseases into Saudi Arabia. Ruminants may have been introduced into the country while incubating the BEF virus, and this

could have coincided with the presence of competent local arthropod vector(s) in the country. It has been reported that, under these conditions, there is the potential for BEF to spread over a large area of the country within two weeks (T.D. St. George, personal communication, 1997).

An alternative explanation for the BEF epidemic would be the introduction of BEF virus-infected arthropod vector(s) into Saudi Arabia on the prevailing south-westerly winds from Africa (14).

Introduction of the BEF virus into Saudi Arabia, through any of the potential routes, found a susceptible cattle population and the result was the devastating 1996 epidemic (1, 2, 6). The same situation seems to have repeated itself during the Rift Valley fever epidemic in Saudi Arabia during 1999 and 2000 (5, 11).

Increased surveillance for arboviral diseases would help prevent these outbreaks. This could be done through monitoring of sentinel herds, monitoring of insects by virus isolation, intensification of clinical inspection of animals at ports and vector control.

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Étude de la fièvre éphémère bovine en Arabie saoudite à partir de troupeaux sentinelles et d'une surveillance sérologique

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Résumé

Une étude d'envergure nationale a été conduite en Arabie saoudite afin de déterminer si la fièvre éphémère bovine était présente sur le territoire entre 1993 et 1995. L'étude a comporté deux versants : d'une part, la mise en place de troupeaux sentinelles dans certaines localités ; d'autre part, une enquête sérologique sur tout le territoire. Les résultats indiquent que l'Arabie saoudite était indemne de fièvre éphémère pendant la période considérée et que la population de bovins était susceptible, ce qui peut avoir contribué à l'épizootie brutale de 1996. Les caractéristiques épidémiologiques de la fièvre éphémère en Arabie saoudite sont examinées au regard du risque d'introduction de la maladie dans le pays.

Mots-clés

Arabie saoudite – Fièvre éphémère bovine – Surveillance sérologique – Troupeau sentinelle.



Estudio sobre la fiebre efímera bovina con empleo de rebaños centinela y serovigilancia en Arabia Saudí

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Resumen

Los autores describen un estudio realizado en todo el territorio de Arabia Saudí para averiguar si la fiebre efímera bovina estaba presente en el ganado durante el periodo 1993 a 1995. El estudio se dividía en dos partes: en primer lugar, el establecimiento de rebaños centinela en algunas localidades; después, la realización de un estudio serológico en todo el país. Los resultados indican que Arabia Saudí estaba libre de fiebre efímera bovina durante el periodo en cuestión y que la población bovina era sensible a la enfermedad, hecho que quizá contribuyera a la fulminante epidemia que tuvo lugar en 1996. Los autores examinan la situación epidemiológica de la enfermedad en Arabia Saudí ante la posibilidad de que algún día penetre en el país.

Palabras clave

Arabia Saudí – Fiebre efímera bovina – Rebaño centinela – Serovigilancia.



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