Bluetongue in the Sudan

E.M.E. ABU ELZEIN

Summary: The epidemiological features of bluetongue (BT) in the Sudan are discussed with reference to future control policies to be implemented. BT virus type 5 and epizootic haemorrhagic disease of deer (EHD) virus type 2 are the only BT and BT-related viruses recorded so far in the country. Culicoides kingi and C. imicola act as vectors of the virus, and cattle are its reservoir.

Although a high incidence of BT antibodies has been detected among cattle, sheep, goats and camels in the Sudan, the clinical disease has been seen only in sheep.

No vaccination against the disease is practised in the country.

KEY-WORDS: Bluetongue virus - Camel - Cattle - Culicoides - Disease control - Epidemiology - Goat - Serotypes - Sheep - Sheep diseases - Sudan.

INTRODUCTION

Bluetongue (BT) is an infectious, non-contagious disease of sheep, cattle, goats, and other ruminants. It is caused by an orbivirus of the family Reoviridae. Twenty-four virus serotypes are known. They share a common antigen which cross-reacts in the agar gel immunodiffusion (AGID), complement fixation (CF), and fluorescent antibody (FAT) tests. Specific virus serotyping is achieved by using the classical serum neutralisation test (SNT), the micro SNT, plaque reduction (PR), plaque inhibition (PI) and haemagglutination inhibition (HI) tests using highly purified virus (16).

BT and related diseases are worldwide in distribution.

The first record of BT in the Sudan was made in 1953 (6) when samples from suspected sheep were confirmed by the Onderstepoort Laboratory to contain BT virus. In later years, BT virus isolations and antibody surveys of Sudanese animals revealed that the disease was widespread (9, 10, 1, 2, 3, 4, 5). In spite of this, no vaccination is practised against the disease in the country.

No reports regarding the introduction of BT into the Sudan are available.

SUDANESE STRAINS OF BLUETONGUE VIRUS

In the Sudan, strains of BT virus have been isolated so far from diseased sheep, apparently healthy cattle and the Culicoides vectors.

* Central Veterinary Research Institute, Alamarat, P.O. Box 8067, Khartoum, Sudan.
BT virus isolation from diseased sheep

The first record of BT virus isolation from sick sheep was made when samples from the Blue Nile Province were confirmed by the Onderstepoort Laboratory to contain BT virus (6). Subsequently, the virus was isolated from outbreaks involving sheep in Western Sudan (10) and from several outbreaks in lambs in Khartoum Province (2, 5).

BT is widespread in sheep in the Sudan, but the disease is often confused with other clinically similar diseases, and samples are rarely sent for virological investigation.

During an outbreak of the disease in sheep in Khartoum Province, BT virus-precipitating antigen was detected in serum and plasma from affected animals. Later, BT virus was isolated and identified from them.

BT virus isolation from apparently healthy cattle

In collaboration with the Animal Virus Research Institute at Pirbright, UK, and our laboratory at Soba, Suda, two strains of BT virus were isolated from the blood of apparently healthy cattle from the Sudan (Mr. K. Herniman, personal communication). These are being serotyped.

In a serological survey of apparently healthy Sudanese cattle, BT virus-precipitating antigens were detected in serum from some of these cattle. BT virus was later isolated and identified from them (3). That virus isolate was found to be pathogenic for sheep (to be published).

Several other BT virus isolates have been recovered from the blood of apparently healthy Sudanese cattle (3).

BT virus isolation from the Culicoides vectors

A comprehensive study by Boorman and Mellor (7) has shown that the Culicoides vectors of BT do exist in the Sudan, although they failed to isolate virus from them. In a further work, Mellor et al. (14) succeeded in isolating BT virus of serotype 5 and epizootic haemorrhagic disease of deer (EHD) virus of serotype 2 from C. imicola and C. kingi (respectively), suggesting that they could be involved in the biological transmission of BT virus in the Sudan.

ANTIBODY SURVEYS IN SUDANESE LIVESTOCK

Serological surveys of BT precipitating antibodies have been performed only on domestic animals so far (10, 8, 1, 4). Such antibodies were found to be widespread all over the country, with high incidence in sheep, cattle, goats, and relatively low levels in camels (4).

Attempts to use the micro SNT to detect neutralising antibodies against the specific serotypes of BT virus in the Sudanese sera were unsuccessful due to cross-reactions between the virus serotypes (Mr. K. Herniman, personal communication). This was attributed to repeated infection of animals by the different virus serotypes in the field.

In a recent serological survey (2), it was found that viraemic animals could be detected serologically by using the AGID test. Such animals do not contain BT antibodies in their serum and thus could have been judged as negative despite the fact
that they harboured infectious BT virus (3). Detection of such animals in a serological survey will undoubtedly increase the number of animals with evidence of exposure to BT infection (11).

NATURAL CLINICAL BLUETONGUE IN SUDANESE ANIMAL SPECIES

Sheep

The two forms of the disease seen in sheep in the Sudan are acute and mild.

1. *Acute form*

   This is usually seen in lambs (3-12 months old) with almost 100% morbidity rate and around 40% mortality rate (5). It is manifested by pyrexia, inappetence, salivation, nasal discharge, conjunctivitis, hyperaemia of the buccal cavity and nasal mucosae, cyanosis of the tongue, ulceration of the dental pad and the tongue epithelium, swelling of the knee joints and lameness, which is usually followed by recumbency and death.

2. *Mild form*

   This is mostly seen in adult sheep. It is manifested by high fever, nasal discharge and lacrimation. Some pregnant animals may abort.

Cattle

Despite repeated isolations of virus from apparently healthy cattle and the detection of precipitating antigens and antibodies to BT virus in their serum, the natural disease has never been seen in cattle. However, Mohamed *et al.* (15) believe they saw clinical BT in a calf in Khartoum Province. Unfortunately, they failed to isolate the virus and to reproduce the disease in experimentally inoculated lambs or calves.

Other animal species

The natural disease has never been seen in any other wild or domestic animal species in the Sudan.

LABORATORY DIAGNOSIS

Prompt serological detection of viral antigen in sick animals

In earlier years, early serological detection of BT virus was attempted on tissues from sick animals. Recently (2, 5), it was found that blood plasma and serum from naturally and experimentally infected lambs in the Sudan contain high titres of BT virus, and this may be employed for early serological diagnosis of the disease in sick animals. The procedure consists of collecting whole blood in edetic acid (EDTA) and centrifuging at 1000 rpm for 10 minutes to separate the plasma, which is collected and tested against a known group-specific BT antiserum in the AGID test (2). Precipitin lines are usually seen after 18 hours. This technique has been used to diagnose several outbreaks in sheep in the Sudan. Virus isolation from plasma of infected animals has always correlated well with the results of the AGID test (3).
Isolation of virus from animals

Early attempts to isolate virus depended on the inoculation of mice, the yolk sac of embryonated hens' eggs or tissue culture with citrated whole blood or other material. Later it was found that sonicated blood inoculated intravascularly into chick embryos gave the best results (5). This was usually followed by further passages in baby hamster kidney cells, primary bovine kidney, or chick-embryo fibroblasts (5).

Concentration of the isolated virus by ultracentrifugation (5, 3) provided good yields of virus suitable for the rapid AGID test. This gave better results than unconcentrated virus from cell culture material (Dr. M. Jeggo, personal communication).

CONTROL OF BLUETONGUE IN THE SUDAN

Neither vaccination nor any other control measure is employed in the Sudan.

ECONOMIC CONSIDERATIONS

Many range areas in the Sudan have suffered considerably from the drought of the past 3-4 years, which has been aggravated by encroaching of desertification. As a result, several thousands of sheep have been lost. Such losses are undoubtedly significant in an African country like the Sudan, where the contribution of animal production is vital to combat the shadow of famine in the area.

In an attempt to promote sheep production, several intensive sheep fattening and breeding farms have been established along the Nile banks in Khartoum Province and elsewhere in the country. Production flourished at first, but then the annual lamb crop was depleted by continuous outbreaks of BT, which have caused immense economic losses (5). Adult sheep were also affected, resulting in lowered feed conversion, abortion, and other ill-effects.

There has not yet been any detailed study of the economic effects of BT on cattle and other animals species in the Sudan.

DISCUSSION

In earlier years it was thought that BT was of little significance among the diseases of animals in the Sudan. Such a belief was founded solely on clinical observations without supporting virological evidence.

With the introduction of virological research in this field in the mid-seventies (9), BT was recognised as a real threat to Sudanese sheep, and the serious losses which were once attributed to other causes were discovered to be due to BT (9, 10, 1, 2, 3, 4, 5).

Although there has been little investigation of the reservoir(s) of BT virus in the Sudan, cattle have conclusively been shown to harbour the virus without showing signs of the disease (2, 3; Dr. M. Jeggo, personal communication).

Recent information has shown that susceptible calves in the Sudan can be experimentally infected with BT virus, contracting a severe form of the disease (Dr. Faysa A. Omer, personal communication). So, with the introduction of highly susceptible foreign breeds of cattle into the Sudan, it is expected that BT may infect them, bearing in mind that most of the dairy farms having foreign cattle are established in irrigated lands, where insect vectors of BT are available throughout the year.
Detection of BT virus in plasma or serum permits a rapid diagnosis of BT. This is because the blood of infected animals is the richest source of the BT virus (13). However, blood cannot be used directly for detecting the virus by means of the rapid AGID test, because haemolysis of the erythrocytes and the release of their pigments into the gel make reading of the results difficult or impossible. Instead, blood plasma and/or serum, which are equally rich in the virus (13) are used in the AGID test for the serodiagnosis of the BT virus (2, 5).

Despite the isolation of an appreciable number of strains of BT virus from sick and apparently healthy animals in the Sudan, few of them have been serotyped. The provision of an efficient BT serotyping unit in the Sudan would provide rapid information on the types of virus isolated from animals and insect vectors in the country. This would be of great value for international epidemiology and for any future vaccination scheme in the country. Until such a unit is established, virus isolates should be sent to reference laboratories abroad for serotyping.

There is little information on the insect vectors of BT in the Sudan. A continuous, long-term study of the vectors, their habitat and ecology would be vital for future control programmes.

Although results of BT antibody surveys conducted on Sudanese animals show that the incidence is highest in Southern Sudan and in other parts of the country where the insect vectors are abundant, incidence is still high in areas where insufficient water is available for the breeding of the vectors. In such a situation, infected midges might have been blown by prevailing winds to such areas, resulting in infection or seroconversion in animals. Thus, meteorological considerations should be taken into account when planning for the control of BT in the Sudan.

Animals found to be serologically negative during a survey should be tested for the presence of precipitating BT antigen. This is because such animals may have been viraemic at the time of bleeding (11, 2) and before BT antibodies have appeared in their serum, and thus could be overlooked as BT-exposed animals.

With all the information currently available, it is felt that a well-implemented control policy for BT is essential in the Sudan. This could entail the following:

1. Reduction of the populations of insect vectors.
2. Isolation and serotyping of as many strains of BT virus as possible from sick and apparently healthy animals, and from the insect vectors.
3. Formulation of the most appropriate vaccine, taking into account the latest theories concerning the composition of BT vaccines (12).
4. Vaccination of susceptible sheep in breeding and fattening centres, sheep at risk, and vaccination in the face of outbreaks.
5. Vaccination of foreign and cross-bred cattle.
6. Priority to vaccination in areas where the disease is endemic and where highly productive animals are kept. Such areas are Khartoum Province and the Central Region.

**CONCLUSION**

Bluetongue is highly endemic in the Sudan. Overt clinical disease has been seen only in sheep so far, causing great economic losses. Cattle harbour the virus
without necessarily showing symptoms, and thus can spread infection to sheep. BT virus type 5 and epizootic haemorrhagic disease of deer virus serotype 2 have been isolated from Culicoides midges. C. kingi and C. imicola are potential vectors of the disease in the Sudan. No vaccination or other control measures are practised in the country.

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LA FIÈVRE CATARRHALE DU MOUTON AU SOUDAN. — E.M.E. Abu Elzein.

Résumé : L'auteur étudie les caractéristiques épidémiologiques de la fièvre catarrhale du mouton ou bluetongue (BT) au Soudan sous l'angle des actions futures de prophylaxie à mettre en œuvre. Les seuls types de virus de la fièvre catarrhale ou apparentés reconnus jusqu'à présent dans le pays sont le virus BT de type 5 et le virus de la fièvre hémorragique épizootique (EHD) de type 2. Le virus BT a pour vecteurs Culicoides kingi et C. imicola, et pour réservoir les bovins.

Bien qu'une incidence élevée d'anticorps vis-à-vis du virus BT ait été décelée parmi les bovins, les ovins, les caprins et les chameaux au Soudan, la maladie clinique n'a été constatée que chez les ovins.

Aucune vaccination n'est pratiquée contre la maladie dans le pays.


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LA LENGUA AZUL EN SUDÁN. — E.M.E. Abu Elzein.

Resumen : Estudia el autor las características epidemiológicas de la lengua azul o bluetongue (BT) en Sudán desde la óptica de las actuaciones futuras de control que se hayan de emprender. Los únicos tipos de virus de la lengua azul o emparentados reconocidos hasta la fecha en el país son el virus BT de tipo 5 y el virus de la fiebre hemorrágica epizoótica (EHD) de tipo 2. El virus BT tiene por vectores Culicoides kingi y C. imicola, y por reservorio a los bovinos.

Aunque se haya descubierto una elevada incidencia de anticuerpos frente al virus BT entre bovinos, ovinos, caprinos y camellos en Sudán, únicamente se ha verificado la enfermedad clínica en los ovinos.

No se ha practicado ninguna vacunación contra la enfermedad en el país.

PALABRAS CLAVE : Bovinos - Cabra - Camello - Control - Culicoides - Enfermedades ovinas - Epidemiología - Ovinos - Serotipos - Sudán - Virus de la lengua azul.

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REFERENCES


