

Epidemiology of Botulism in Sheep and Goats in Northern Localities of North

Kordofan State, Sudan

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Abstract

Suspected cases of botulism were first noticed among sheep and goats flocks in Northern Localities of North Kordofan State, which was struck by waves of drought. Poor pasture and nutritional deficiency, forced the animal to develop pica and chew dead carcasses which were the major source of the toxin. The purpose of this study is to determine the factors associated with the occurrence of the disease and the source if intoxication. Methodology involved the description of the area of the disease outbreak, and the disease patterns. Attempts were made to reproduce the disease by drenching susceptible animals with extracts from carcasses and to trace the possible origin the disease agent. Observations revealed that the area of the outbreak was covered with only few plant species and animals developed pica. The disease occurred in sheep and goats only, and among these, pregnant, lactating, and yearlings were most affected. The temporal pattern of the disease showed a rapid increase in the number of new cases over a short period of time, while the spatial pattern showed wide a geographical distribution of the disease. Drenching susceptible animals with suspected carcass material, resulted in the production of the disease, with symptoms similar to those observed in the natural outbreak. As botulism was endemic in Libya since

1980s, It is possible that the organism and its spores were carried over from Libya to Sudan by carrion-eating birds and movement of animals, man, and vehicles.

المستخلص

تم التبليغ عن تفشي مرض التسمم الوشيقي في الضأن و الماعز لأول مرة بالمحليات الشمالية لولاية شمال كردفان. عزى المرض الى الجفاف الذي ضرب تلك المناطق و ما صاحب ذلك من نقص في غذاء الحيوان، الامر الذي ادى الى انحراف شهيتها و من ثم التهامها لجيف الحيوانات النافقة و التي هي المصدر المحتمل للمرض. هدفت الدراسة لتحديد مصدر المرض و اسبابه و العوامل التي ساعدت في انتشاره. شملت طريقة البحث وصفا للمرض و منطقتيه. شملت الطريقة ايضا انتاج المرض باطعام حيوانات سليمة بالجيف، و اجريت اصالات باشخاص لتتبع مصدر المرض. اظهرت نتائج المسح خلو منطقة الدراسة من الغطاء النباتي، و ان الضأن و الماعز هي الفصائل الوحيدة المصابة و من بين هذه لوحظ ان الحوامل و اللابنة و صغار السن (اقل من سنة) هي الاشد تآثرا بالمرض. ظاهرة اكل الجيف كانت واضحة في الحيوانات. اعراض المرض في الحيوانات التي اطعمت بالجيف، كانت مطابقة لاعراضه المشاهدة بالحقل. الاشخاص الذين تم الاتصال بهم شهدوا ان المرض ظل مستوطنا بليبيا منذ الثمانينيات. من ذلك خلصت الدراسة الى احتمال ان البكتيريا و ابواغها قد تكون انتقلت الى السودان عبر الطيور اكلة الجيف و عن طريق فضلات الحيوانات و الطيور و حركة الانسان والدواب ووسائل الحركة المختلفة.

Introduction

Botulism was first suspected in the Sudan during an outbreak in sheep and goats in North Kordofan State. Since then, and based on clinical signs, the disease was known to be endemic in those areas.

Dead animal carcasses usually constitute a source for the disease from which the etiological agent and its spores can be disseminated by migratory birds, animals, man and blowflies (Blood *et al.*, 1983). Flies, bees and ravens are known to be important means of spreading the spores of the organism (Made *et al.*, 2000 and Schoenbaum *et al.*, 2000).

The aim of this study was to trace the source of the organism and identify the factors associated with its spread during an outbreak in sheep and goats in the northern localities of North Kordofan State (Bara, Sodari, and Gabrat El-Sheikh).

Materials and Methods

An exploratory survey was conducted in the disease area. Environmental conditions including rainfall, soil type, climate, land topography, water sources, and species of animals raised, were described and recorded. Incidence, prevalence, pattern, distribution, seasonality, magnitude, and clinical signs of the disease, were documented through photographing, graphing and mapping.

Types of animals affected, management, feeding practices, were also recorded.

Carcass tissues, suspected as source of the disease, were given to susceptible sheep. 50 grams of bone and flesh from a suspected carcass were homogenized in 100 ml sterile physiological saline and divided into 2 equal volumes. Two animals were drenched with 25 ml of the homogenate. The other 2 were drenched with 25 ml of the homogenate, which had been boiled for 10 minutes and cooled to room temperature.

Information about the presence of the disease in Libya was obtained through personal contact (Mustafa, 2000).

Results

Sheep, goats, and camels were the major animal species raised in the localities and the disease was observed only among sheep and goats. It started by affecting few animals in the flock, then it reaches its peak during dry months (April, May, June, and July).

The main symptoms were ending in paralysis and death. Initially affected animal isolated itself from the flock, showed in-coordination, stiffness of muscles (Fig. 1), lowered head, (Figs. 2, 3), recumbence with tongue extruded, profuse

salivation, nasal discharge, and neck turned to one side (Figs. 4, 5), hence the local name “*Abu-Ragaba* or *Abu-Rigaiba*”.



Fig. 1: In-coordination and stiffness of muscles in a sheep (field observations)



Fig. 2: Lowering of the head and reluctance to movement in a sheep (field observation)



Fig.3: Lowering of the head and reluctance to movement in a goat (field observation)



Fig. 4: Twisting of the neck, protrusion of the tongue and salivation in a sheep (field observation)



Fig. 5: Twisting of the neck in goats (field observations)

Rapid frequent movement of the tail from side to side was also noticed. From this manifestation another local name “*Abu-Dinaib* or *Abu-Duail*” was derived. This stage was noticed to be followed by disturbances in food apprehension, chewing, swallowing, abdominal breathing, and paralysis followed by death (Fig. 6). The paralytic form of the disease is indigenously termed “*El-Raggama*, or *Abu-Radma*”.

Number of new cases relative to the passage of time (temporal pattern), is shown by the epidemic curve (Fig.7). The distribution of the disease is shown in Fig.8.



Fig. 6: Complete paralysis and death (field observations)

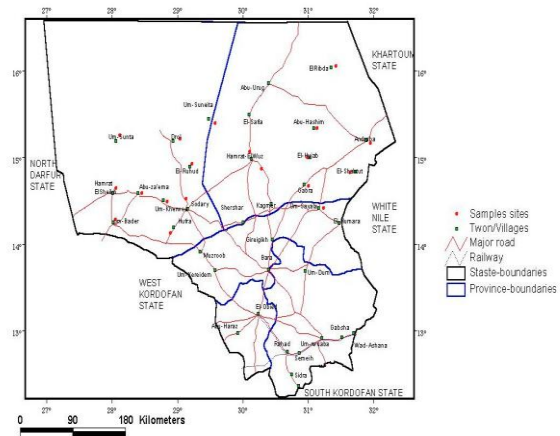


Fig. 8: Spatial pattern (distribution) of the disease in the northern localities (Bara, Sodari and Gabrat El-Shiekh)

Post mortem findings revealed no pathological lesions with the exception of accumulation of feed in the mouth and fragments of ingested carcasses

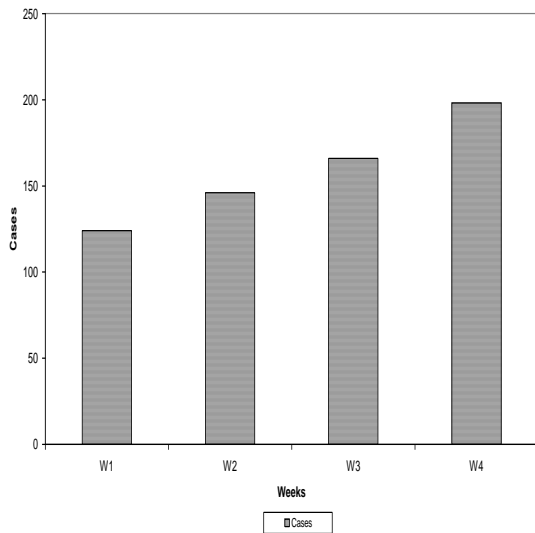


Fig. 7: Temporal pattern of the disease

in the contents of the rumen. The grazing land appeared to be of considerable desertification (Fig.9). Animals were seen wondering about during the day in search of food eating everything they find including carcasses, leather, bones and fleece which were scattered in the rangeland.

Animals drenched with the heated suspension of suspected carcass material, showed no disease symptoms, while those which were drenched with the untreated portion, produced typical disease symptoms as those observed in the field (Figs.10, 11, 12, 13 and 14).

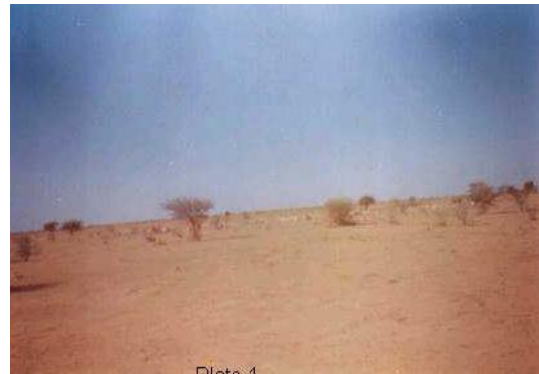


Fig. 9: Bare Rangeland



Fig. 10: Isolation and stiffness of muscles (experimental observations)



Fig. 11: Lowering of the head and reluctance to move (experimental observation)



Fig.12: Twisting of the neck (experimental observations)



Fig.13. Complete paralysis and death(experimental observations)



Fig.14: Death of the animal (experimental observations)

Discussion

Field observations made on the ecology of the disease area showed that the rangeland was desertified, harsh, arid, and contained only few plant species. These results are consistent with the earlier studies of Musa and Musa (2003). Due to the harsh environmental conditions, only sheep, goats, and camels were raised. Sheep and goats were the only animals affected. The disease was not noticed among camels, possibly because camels are browsers and do not chew carrion.

Results indicated that pica was observed among animals in the field. This fact is in agreement with the findings of Lisboa *et al.* (1996) who stated that animals grazing on extensive ranges with inadequate supply of nutrients, particularly when pregnant or lactating are liable to develop pica. When pica is seen in ruminants, it stands as strong evidence of botulism (Blood *et al.*, 1983).

Field observation showed that the disease was of descending pattern with incidence increases during dry seasons, a finding which is consistent with those of Susan (1998). Signs observed in sick animals at the field and the disease manifestations exhibited by the experimental animals were found similar to the typical symptoms of botulism as

described by Hirsh and Zee (1999) and Radostits *et al.* (2000). Pregnant and lactating ewes and yearlings were more affected, and there were no pathological lesions at necropsy. These results are in agreement with the findings of Jensen and Swift (1982).

According to personal communication, (Mustafa, 2000), the disease was endemic in Libya during 1980s. The bacterium and its spores may be carried and distributed by birds, animals, man, and blowflies. Spores can also be spread by flies and bees (Made *et al.*, 2000) and by ravens from copes (Schoenbaum *et al.*, 2000). Therefore it is likely that the organism and its spores were introduced to the Sudan by the same means.

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