

Aortic onchocerciasis in cattle in Zaria (Nigeria)

by T. SCHILLHORN VAN VEEN and M. G. ROBL (*)

RESUME

L'onchocercose aortique des zébus de la région de Zaria (Nigeria)

L'auteur décrit les lésions observées sur 210 zébus Fulanis et M'Bororos atteints d'onchocercose aortique, dont la gravité est fonction de l'ancienneté et du nombre de parasites présents.

L'élasticité de la paroi aortique subit une diminution sensible et les manifestations cliniques de la maladie sont discrètes. La place de ce parasitisme dans la pathologie du bétail de la région de Zaria est discutée.

INTRODUCTION

Aortic lesions in cattle caused by *Onchocerca armillata* have been reported in Israel (14), the Orient (3, 20) and in various countries in Africa, especially in the Sudan region (9, 12, 4, 17, 6, 1, 10). Reports from India indicate that *O. armillata* can also be found in buffalo and sheep (3, 20, 2, 16).

In Africa, however, the parasite has mainly been reported in cattle although camels may be infected as well (18).

CHODNIK (6, 7) has described the parasite and the histopathology of the lesions in the bovine aorta. The lifecycle and the pathological effects of the parasite on the host are not known. SOULSBY (19) indicated that this parasite had little significance. CHENG (5) however stated that cattle, in Africa, often died due to aortic aneurysms caused by *O. armillata*. PATNAIK (16) reported eye lesions and "fits" in cattle, but these observations have not been confirmed by other authors. The present paper concerns the incidence and

description of aortic lesions observed in cattle slaughtered in Zaria, Northern Nigeria.

MATERIALS AND METHODS

Cattle

During the 1969 rainy season (May-September) and dry season of 1971 (January-March), 253 slaughtered cattle were thoroughly examined once a week at the slaughterhouse in Zaria. The cattle were primarily trade cattle of White Fulani and N'bororo breeds that came from North-East Nigeria and Niger Republic. The ages of 131 animals were determined by examination of the teeth (fig. 1).

Age of 131 cattle at the Zaria slaughterhouse inspected on *Onchocerca* Lesions of the aorta

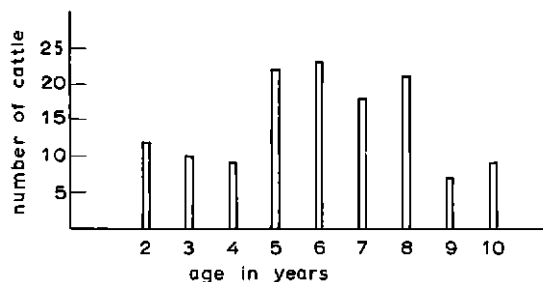


Fig. 1. — Age de 131 bovins examinés à l'abattoir de Zaria et présentant des lésions d'onchocercose de l'aorte.

Faculty of Veterinary Medicine, Ahmadu Bello University, Zaria (Nigeria).

(*) Present address: Dept. Pathology, Fac. Vet. Medicine, Kansas State University, Manhattan, Kansas, U.S.A.

Sampling techniques

The aorta and brachiocephalic arteries from the slaughtered animals were opened and examined for gross lesions. Sections of grossly affected vessels were taken for extraction of the parasite and for histopathological examination. Major organs, particularly the kidneys, were examined for infarcts or other lesions; the eyes were examined for lesions or opacity.

Laboratory techniques

The adult parasites were extracted manually from the nodules in the aortic wall and mounted in CMC-10 Turtox^R or in chlorlactophenol. Microfilariae were fixed in formalin 2 p. 100 and stained with Giemsa or with methylene blue. Measurements of 52 microfilariae were performed in methylene blue with an eye piece micrometer. Representative parts were fixed in 10 p. 100 buffered formalin and stained with Ehrlich's haematoxylin for histopathological examination. For extraction of the female helminth, some aortae were digested in pepsin-HCe 1 p. 100 during 2 days. Elasticity was estimated with pieces measuring 20 × 10 mm cut from the fresh aortic wall just behind the ductus arteriosus. The samples were attached to a myograph-transducer, charged with a weight of 45 grams, stretched maximally by using a magnet and released. The extension and the shape of the sinusoid were recorded with a Physiograph-recorder.

Classification of the lesions

The various lesions observed in the vessels were classified as follows :

- a) negative : no gross lesions and no adult parasites or microfilariae present;
- b) tunneling : a few helminths present, restricted to the subintimal layers in the arch of the aorta. No lesions of the aortic wall;
- c) marked tunneling : numerous parasites present; lesions located in the subintimal layers of the aorta over an area that extended posterior to the arch of the aorta. There were no gross lesions of the aortic wall;
- d) chronic infection : sinous tunneling with several thickened areas in the aortic wall, giving the intima-side of the aorta a rough corrugated appearance. Small nodules occurred in or outside the aortic wall;
- e) Marked chronic infection; as in d.; the

whole thoracic aorta was affected. The aorta had a markedly thickened rough inner wall. Nodules of various sizes on either or both the intimal and adventitial aspect of the vessel wall.

TABLE I
Number of infected aortae arranged by localisation and grade of infection during the rainy season.

	Thoracic aorta	Abdominal aorta	Brachiocephalic trunk
Tunneling	40 (0)	2 (0)	0 (0)
Marked tunneling	32 (0)	8 (0)	6 (0)
Chronic infection	57 (13)	22 (6)	8 (3)
Prolonged infection	40 (29)	28 (17)	13 (10)

Findings in dry season are listed in brackets.

RESULTS

Incidence

One hundred and sixty nine out of the two hundred bovine aortae (84.5 p. 100) inspected were infected with *Onchocerca armillata* during rainy season and forty two out of fifty three (79.2 p. 100) in the dry season. The infection was as frequently observed in female as in male animals.

Pathology

Generally, the helminths were found in the thoracic part of the aorta, but the infection often extended downwards to the abdominal part and upwards into the brachiocephalic trunk.

TABLE II
Measurements of 12 male *O. armillata* (in mm)

Length	78.2 (69.3 - 82.1)
Width	0.24 (0.15 - 0.33)
<i>Oesophagus (muscular)</i>	0.48 (0.45 - 0.52)
<i>Oesophagus (glandular)</i>	0.59 (2.42 - 2.90)
Nerve ring (distance from head)	0.21 (0.19 - 0.24)
Spicules : left	0.29 (0.24 - 0.32)
right	0.15 (0.13 - 0.18)

In 3 cases in rainy season and 6 cases in dry season, tunneling of the parasites was observed in the carotid arteries. Neither lesions nor helminths were seen in the coronary, pulmonary, mesenteric or renal arteries. Secondary changes

like ruptured aortae, fits or eye-lesions due to *Onchocerca* - infections were not noticed. One animal showed an old infarct of the kidney of undefined aetiology. The large nodules were generally located in the external wall of the aorta; sometimes, the inner wall was involved as well and the nodules could be seen under the intima. They were only observed in the "chronic" and in the "prolonged" infections.

The nodules contained yellow detritus: necrotic tissue, fat and some partly calcified parasites. Small nodules could also be seen in younger infections, generally localised in the media of the aortic wall. They contained the male helminth, anterior parts of the female, and microfilariae embedded in some yellowish fluid.

Microscopic lesions were variable in nature. The reaction in recent infections was predominantly cellular: polymorphonuclear leucocytes and a low number of eosinophils, all located around the parasite. In a later stage, the number of leucocytes decreased and the reaction consisted mainly of eosinophils, lymphocytes, histiocytes and a few plasma cells. In older lesions fibrous changes occurred: the fibro-elastic fibres in the media became discontinuous, distorted and infiltrated with cellular components.

The cellular reaction in general showed considerable variation, some parasites were only accompanied by a few inflammatory cells, whereas others were completely surrounded by high numbers of eosinophils and leucocytes.

Evidence of calcification was observed, especially in the nodules and in the old parasitic tunnels in the inner layers of the aortic wall.

Characteristics of the parasite

Male helminths were found in nodules of various sizes, along with the anterior portion of the female. The long posterior parts of the females were seen in the tunica intima and tunica media of the aortic wall, which made it impossible to extract, manually, a whole intact female. Fragments with a length up to 145 mm could be obtained by the pepsin-digestion method, but never a complete specimen. The female helminths were slightly affected by the digestion; the males were generally intact. No parasites were found free, or partly free in the lumen of the vessel. The measurements of twelve male helminths and 52 microfilariae obtained from the nodules are outlined in table 3.

TABL. III—Measurements of microfilariae from nodules of bovine aortae (in microns).

	Average	Range	Number measured
Length	298	242-330	52
Width	5	4.2-6.5	52
Nerve ring (from ant. end)	105	90-121	32
Last nucleus (from tip of tail)	10.1	14-16.5	32

Elasticity

As estimated by the simple stretch and release experiment, the elasticity of the infected aortae was considerably decreased, compared with normal uninfected aortae of animals of the same age. The maximal extension was reduced as well as the length of the sinusoid (fig. 2). This decrease in elasticity was mainly found in the "chronic" and "prolonged" infections.

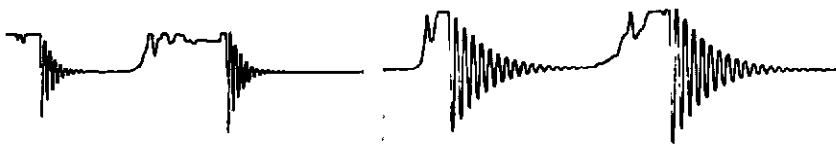


Fig. 2. — Extension and amplitude of infected (left) and non-infected aorta (right) after stretching with a 45 gram weight and sudden release.
Extension et amplitude de l'aorte infectée (à gauche) et indemne (à droite) après une tension de 45 g et un relâchement subit.

DISCUSSION

O. armillata proves to be a very common parasite of cattle in Northern Nigeria and adjoining area. The prevalence found in this survey is in accordance to the figures given by CHODNIK (6) in northern Ghana (95 p. 100), ABDEL MALEK (1) in Sudan (94-96 p. 100), as well as by NSANGANNO and OTHIENO (15) in northern Uganda (83.6 - 93.5 p. 100).

GRABER *et al.* (10) studied the incidence in northern Cameroons and in the Chad Republic, an area comparable the northern Nigeria. Their findings of 34.9 p. 100 in Cameroon and 40 p. 100 in Chad are considerably lower than in the Zaria area. In their survey carried out in Maroua, GRABER *et al.* observed a higher incidence in trade cattle from the Sahel zone (48,6 p. 100), mainly examined during the dry season, than in the sedentary cattle 29,5 p. 100) mainly examined during the wet season.

Comparing these observations with the figures in the Zaria area and with the findings of CHODNIK (6), ABDEL MALEK (1) and of NSANGANNO and OTHIENO (15), it appears that aortic onchocerciasis is common in cattle in the Sudan, and Northern Guinea vegetational zone, but that the prevalence in the Sahel zone and possibly in the highlands of the Cameroons is much lower. The condition is rarely observed in the Mambilla highlands of East Nigeria (SCHILLHORN VAN VEEN, own observations).

The pathological changes in the aorta are more severe than described in other studies (7, 16). Especially the extension of the infection into the anterior aorta and carotid arteries has seldom been reported whereas it was fairly common in the animals examined in Zaria. It should however be mentioned that the ani-

mals examined were in a poor condition. Zaria is situated along the trade route to southern Nigeria, and many of the animals slaughtered were too weak to travel further south.

One of the remarkable findings during the study of bovine aortic onchocerciasis is the fact that little evidence exists about the clinical symptoms due to the infection, despite the severe changes in the aorta. Even the symptoms described by PATNAIK (16), i.e. fits and eyelesions, are not related to the changes in the aorta. In fact, it is doubtful if PATNAIK'S observations concern *O. armillata*; the microfilariae of this helminth are generally found in the skin and seldom in the blood as erroneously suggested by PATNAIK (16) and NELSON (13). It is much more likely that the symptoms described by PATNAIK were due to *Setaria spp.*, which are known to cause neurological disturbances (11) and of which the microfilariae do occur in the peripheral blood. Neurological changes due to *O. armillata* have never been reported from Africa.

The lack of clinical symptoms is, in part, also due to the fact that aortic onchocerciasis does occur in cattle which are often already infected by a complex of parasitic and other diseases. The symptoms caused by these infections may overshadow the clinical evidence of onchocerciasis infections. The decrease in the elasticity of the aortic wall as well as the histopathological changes indicate however that a chronic *O. armillata* infection may at least be another contribution to the complex of parasitic diseases, malnutrition and other diseases commonly observed in northern Nigerian cattle.

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RESUME

Sur 253 zébus Fulanis et N'Bororos examinés à l'abattoir de Zaria (Nigeria) en 1969, des lésions d'onchocercose aortique ont été décelées sur 210 d'entre eux, dont 169 en saison des pluies (84,5 p. 100) et 42 en saison sèche (79,2 p. 100).

L'auteur décrit les lésions observées dont la gravité est fonction de leur ancienneté et du nombre de parasites présents. Elles affectent surtout l'aorte antérieure, plus rarement les carotides et l'aorte postérieure.

Dans la région de Zaria, elles sont plus étendues et plus graves que dans d'autres pays d'Afrique ou d'Asie. L'élasticité de la paroi de l'aorte subit une diminution sensible.

Les manifestations de l'onchocercose aortique chronique sont discrètes. La place qui revient à ce parasitisme dans l'ensemble des maladies qui frappent le bétail de la région de Zaria est discutée.

SUMMARY

Aortic onchocerciasis in cattle in Zaria (Nigeria)

A slaughterhouse survey on the prevalence of bovine aortic onchocerciasis revealed that 169 out of 210 cattle were infected during the rainy season and 42 out of 53 during the dry season.

The severity of the changes in the aortic wall were classified as: tunneling, marked tunneling, chronic and marked chronic infection.

Helminths and the lesions caused by them were mainly found in the thoracic aorta but did extend sometimes in the carotid arteries and in the abdominal aorta.

It appeared that the aortic changes observed in the Zaria cattle are more severe than described in other parts of Africa and Asia. The elasticity of the affected aortic wall was found to be decreased.

In spite of the severe changes in the aortic wall, the animals did not appear to show clinical signs due to the aortic infections; the abundant parasitic and other infections in the cattle could however conceal the signs due to *O. armillata*.

RESUMEN

La oncocercosis aórtica de los cebues de la region de Zaria (Nigeria)

Se examinaron 253 cebues Fulani y M'Bororo en el matadero de Zaria (Nigeria), en 1969. Se observaron lesiones de oncocercosis aórtica en 210 de ellos. 169 durante la estación de las lluvias (84,5 p. 100) y 42 durante la estación seca (79,2 p. 100).

El autor describe las lesiones encontradas cuya gravedad depende de su antigüedad y del número de parásitos presentes. Sobretudo atacan la aorta anterior, raras veces las carótidas y la aorta posterior.

En la región de Zaria, estan más extendidas y más graves que en otros países de Africa o de Asia. La elasticidad de la pared de la aorta disminuye sensiblemente.

Las manifestaciones de la oncocercosis aórtica crónica son discretas.

Se discute la importancia de dicho parasitismo con relación al conjunto de las enfermedades que atacan el ganado de la region de Zaria.

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