

## Endemic paragonimiasis in Africa

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### Abstract

*Human paragonimiasis has been recorded in 4 West African countries but there is clear evidence of endemicity only in certain parts of Nigeria and Cameroon. In Nigeria, the dominant parasite species is Paragonimus uterobilateralis, while in Cameroon it is P. africanus. Both the fresh water crab Sudanonates africanus and the land crab S. aubryi are proved vectors in Nigeria. Epidemiological studies using Paragonimus skin tests suggest an infection rate of between 5% and 10% in some endemic areas. African paragonimiasis, like its Asian counterpart, responds well to treatment with bithionol.*

Human infestation with a *Paragonimus* parasite (*Paragonimus westermani*) was first recorded in 1879. For a long time the parasite was regarded as an Oriental lung fluke, because practically all the literature about it originated from the Far East, mainly Korea, Japan, and China. Libert (3) recorded the first case of human paragonimiasis recognized on the African continent, in an 11-year-old Cameroonian. However, Zahra (13) was the first to produce clear evidence of endemicity of the disease anywhere in Africa. The dominant species in the part of Cameroon investigated by Zahra (see Fig. 1) was subsequently identified by Voelker & Vogel (9) as *Paragonimus africanus*. This parasite is somewhat smaller than *P. westermani*, and its eggs are also smaller. Sporadic cases of human paragonimiasis have also been recorded from Zaire (2) and Gambia (1), but the species responsible for the disease in these countries have not been identified and no evidence of endemicity has so far been adduced.

In Nigeria, where until recently only sporadic cases had been recorded (4, 5), the dominant parasite species has recently been identified as *P. uterobilateralis* (10). This species was originally described in Liberia as a natural infection of carnivorous mammals (9). Evidence is presented below of the existence of a relatively large endemic focus of over

20 000 km<sup>2</sup> on either side of the Imo and Cross Rivers in Eastern Nigeria.

### Methods

*Mapping endemic foci.* The homes of 501 consecutive patients seen between November 1970 and February 1974 and in whom paragonimiasis had been diagnosed by sputum examinations were identified on a map of Eastern Nigeria. All patients were clinically examined and chest radiographs were taken.

*Examination of intermediate hosts for infection.* Crabs obtained from various locations within and outside the main areas where patients were concentrated were examined for *Paragonimus* metacercariae by the method of Vogel & Crewe (11).

*Skin tests.* Intradermal skin tests (12) were carried out on 56 patients suffering from *P. uterobilateralis* infections and 56 healthy controls, using *P. westermani* extracts supplied by Professor M. Yokogawa of Chiba University, Chiba, Japan; 95% of the infected patients responded positively to the test as against only 2% of the controls. Subsequently, a group of 169 school children and 61 healthy young pregnant women in the endemic area (Okigwi) were skin-tested with *P. westermani* extracts.

*Specific therapy.* Three hundred and sixty patients were treated with bithionol<sup>a</sup> in 10 doses each of 50 mg per kg of body weight, administered on alternate days. Of these patients, 112 were successfully followed up for 6-12 months.

### Results

Table 1 shows the age and sex distribution of the 501 patients, while Fig. 1 shows the foci of endemicity of paragonimiasis based on clinical cases seen so far in Eastern Nigeria and the results of crab examinations.

Infected crabs were found in all areas of dense patient clustering, and the identity of the parasites

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<sup>a</sup> Proposed International Nonproprietary Name for 2,2'-thiobis(4,6-dichlorophenol).

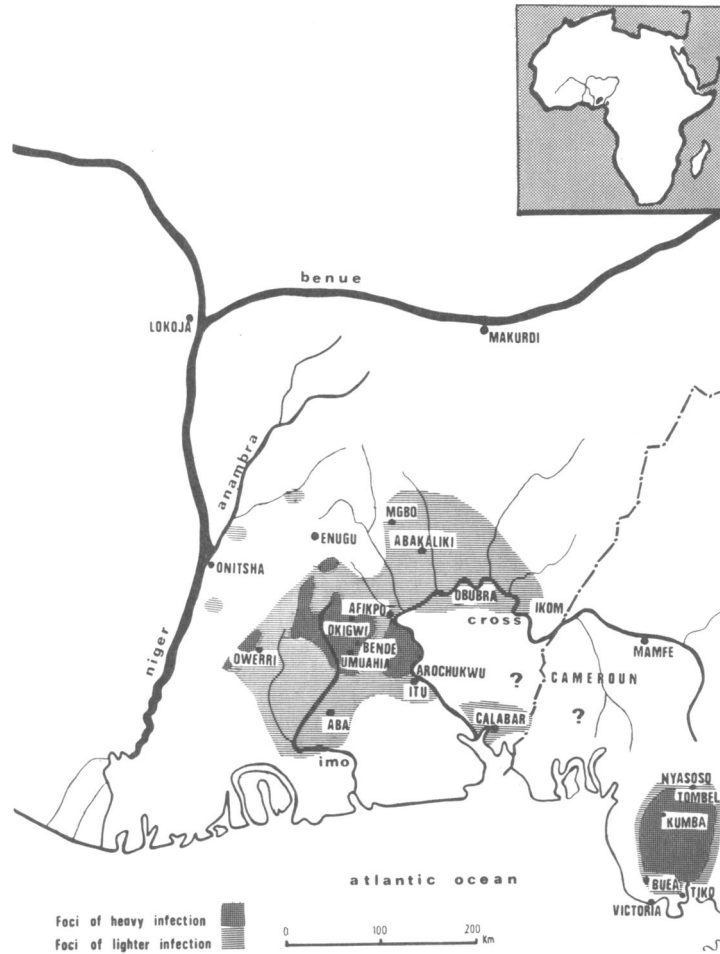


Fig. 1. Map of Eastern Nigeria and West Cameroon showing endemic foci of paragonimiasis. Inset shows map of the African continent.

was confirmed by infecting laboratory animals (10; C. Nwokolo, unpublished data, 1973). The crabs in which metacercariae of *P. uterobilateralis* were found were (1) *Sudanonautes africanus*, a fresh water crab, and (2) *Sudanonautes (Convexonautes) aubryi aubryi* or *Sudanonautes aubryi floweri* De Man. The latter species often behaves as a land crab and some individuals were collected more than 1 km from the nearest stream.

The major endemic foci identified so far are in the region of the upper reaches of the Imo River and along the banks of the Cross River (Fig. 1). The area between the known Nigerian and Cameroonian foci has not been studied in detail, but

physicians who have worked east of the Cross River have found patients with proved pulmonary paragonimiasis there (M. Okokon, personal communication, 1973). Intradermal *Paragonimus* skin tests were positive in 10% of 169 school children and 5% of 61 healthy pregnant women in the Okigwi area. The clinical and radiological features observed in the paragonimiasis cases studied in Nigeria have been described previously (7, 8).

Paragonimiasis in Africa has been found to respond well to specific treatment with bithionol in doses of 50 mg per kg of body weight administered on alternate days for 10 doses. Of the 112 treated patients successfully followed up, 24 relapsed within

Table 1. Age and sex of patients in 501 cases of pulmonary paragonimiasis

Age	Sex		All patients
	M	F	
0-4	12	5	17
5-9	62	38	100
10-14	89	60	149
15-19	75	32	107
20-24	35	20	55
25-29	11	9	20
30-34	10	14	24
35-39	4	6	10
40-44	4	4	8
45-49	2	4	6
≥ 50	3	2	5
Total	307	194	501

12 months but responded well to a second course of treatment. Trials with other specific drugs are in progress; the drug niclofolan seems particularly promising.

#### Discussion

The author has previously expressed the view (6) that the upsurge of human paragonimiasis in Eastern Nigeria was a direct result of the peculiar difficulties of the Nigerian civil war, when the severe shortage of traditional protein sources and poor cooking facilities led to greatly increased consumption of inadequately cooked crabs.

It seems most likely, however, that the disease existed in a zoonotic form before the favourable circumstances for its spread to man appeared. The crab intermediate hosts of the infection have been identified, but the snail hosts have not yet been found and an intensive search is also in progress for the mammalian definitive hosts other than man.

The intradermal immunodiagnostic tests carried out in an endemic area (Okigwi) were on too small a scale to justify a firm conclusion as to the overall

prevalence of the disease. However, the results suggest that in the endemic areas a prevalence of 5-10% of inhabitants under 40 years of age would probably be a reasonable estimate. The total number of patients suffering from active paragonimiasis in Nigeria is at present unknown and must await a study of the area east of the Cross River.

The most certain diagnostic method is the microscopic examination of a specimen of sputum for *Paragonimus* eggs. Sputum production can often be facilitated by brisk exercise followed by a forced cough. For epidemiological studies, we found the intradermal tests with *Paragonimus* tissue extracts most suitable, especially as there appear to be negligible cross-reactions with other local parasites. Preliminary experience with complement fixation tests has been disappointing.

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