Ecological and Cultural Aspects of Human Trematodiasis (Excluding Schistosomiasis) in Africa*

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In Africa, schistosomiasis is by far the most important and widespread of the trematodiases of man and it appears to be spreading. However, other species of trematode are also found in humans in Africa, although they tend to occur in localized foci and, with few exceptions have a low prevalence.

As well as having a low prevalence, most of these trematode infections in Africa have been recorded at low loads and consequently, in many cases the recorded symptoms are few and the effects in many cases are slight. However, one may get liver damage in cases of fascioliasis (Perry, Goldsmid and Gelfand, 1972), haemoptysis in cases of lung fluke infection (Nnochiri, 1968) as well as diarrhoea in cases of intestinal fluke infection (Conyngham, 1904; Watson, 1960). Of course other symptoms may occur especially when flukes of any species reach ectopic sites in the body.

Factors determining the distribution of trematodes in Africa and the infection of humans include climate, altitude (Diersfeld, 1969), population density, the presence of suitable reservoir hosts; the habits of the human population and finally the presence of snail vectors (which may be closely tied up with chemical composition of the water (Williams, 1964); the nature of the available water (i.e. fast flowering rivers, dams, etc.) Shiff, 1964; Shiff & Garnett, 1967).

Probably the most important factor limiting the distribution of the trematodes in Africa is the dry and often semi-desert conditions which prevail over much of the continent — the trematodes being mostly confined to areas of abundant water.

Thus surveys carried out on inhabitants of these relatively waterless areas often show a general lack of intestinal helminths, as shown by the study on the Kalahari Bushmen by Heinz (1961). These people were found only to harbour hookworm and Heinz concluded that all other species of worm commonly found in the Southern African people had been successively lost as the Bushmen retreated into their semi-desert wasteland. One can only assume that the trematodes which depend on free-water and aquatic snails for transmission were amongst the first species to disappear.

However, even in areas where water is more freely available or even abundant, trematode infections other than schistosomiasis do not seem to be particularly prevalent. Thus studies in Southern Africa have either recorded no or very few trematode infections — in fact the only non-schistosome species recorded in such surveys in the southern sub-continent are *Fasciola hepatica* in the more temperate regions and *Fasciola gigantica* in the more tropical parts. Even then, these species, when recorded were not found to be particularly prevalent in most cases (Buckley, 1946; Elsdon-Dew and Freedman, 1952; Heinz, 1961; McCullough and Friis-Hansen, 1961; Blackie, 1932; Goldsmid, 1968, Mahmud-Durrani, Desai and Tembo, 1970; Roberts, 1970; MacDonald and Goldsmid, 1972; Perry, Goldsmid and Gelfand, 1972). However occasionally outbreaks are recorded — as in Malawi by Speckhart (1969)

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who recorded 29 cases from one area in the country.

Even so, however, fascioliasis is not as commonly recorded from Africa as from other parts of the world, including the temperate regions (Dawes and Hughes, 1964; Facey and Marsden, 1960; Hardman, *et al.*, 1970; Ashton, *et al.*, 1970).

The reason for this overall paucity of human records of fascioliasis in the wetter areas of Southern Africa, even where fascioliasis in domestic stock is common — and in Rhodesia infection of domestic cattle may reach a prevalence of 43 per cent. (Goldsmid, 1970) — may be due to the fact that fascioliasis, being a rural infection, is often not diagnosed in such country clinics which have no laboratory facilities. Even where laboratory facilities are available, infected patients do not always pass eggs — as in the case recorded by Perry, Goldsmid and Gelfand (1972) where diagnosis was made on the findings of eggs in liver aspirate. This failure to find eggs in fascioliasis is not uncommon (Hardman, *et al.*, 1970; Naquira-Vildosa and Marcial-Rojas, 1971), and the condition may often present as a visceral larva migrans or be mild and sub-clinical (Swellengrebel and Sterman, 1961). This scarcity of eggs in human cases of *F. gigantica* infection may be due also to the fact that man is a poor host (Fain, *et al.*, 1973).

Even where eggs of *Fasciola* are found, one has to check against false fascioliasis and the passing of "transit eggs" due to ingestion of infected cattle liver — a condition commonly recorded in Rhodesia (Goldsmid, 1970).

It is interesting to note that Condy (1963) did not find game animals in the Wankie area of Rhodesia to be commonly infected with *F. gigantica* although Hammond (1972) records that giraffes in Rhodesia and wildlife in Uganda may possibly maintain the infection even in the absence of domestic ruminants.

Human schistosome infections are contracted mainly as a result of skin penetration and are common over much of Africa as one might expect, bearing in mind that so many social activities such as drinking, washing, bathing, etc., would expose the people to infection. However, another reason for the apparent lack of human cases of fascioliasis in Southern Africa may be the dietary habits of the Africans in this area, where water plants do not seem to be an important source of food or relish and anyway are mostly eaten cooked (Gelfand, 1971). However, Speckhart (1969) has pointed out that some vegetable plants are eaten uncooked, listing cabbage, tanaposi and mnadzi and these may serve as sources of infection in swampy areas. He also suggests that sugar cane grown in swampy areas may serve as a source of metacercarial ingestion — the cane commonly being stripped by Africans with their teeth.

In Rhodesia, although not common, European cases of fascioliasis are on record (Goldsmid, 1968, 1970), but as the population is more of British than European origin, watercress is not a popular dietary article. In Mozambique and in the former Belgian colonies, it is more popular and more cases have been recorded, for example, from Burundi, and Rwanda in whites of European extraction. Janssens, *et al.* (1968) recorded 3 cases and concluded that, "Watercress is being increasingly cultured in Rwanda", where with a 50 per cent. cattle prevalence, an increase in human cases might be expected. An interesting parallel here is that remarked upon in Algeria by Coumbarass (1966) who found that while outbreaks of fascioliasis occurred amongst Europeans living there, no cases were recorded from native Algerians who did not eat watercress (*Nasturtium officinale*). The odd human case of *F. gigantica* infection in Rhodesia may be explained by infection occurring as a result of the ingestion of metacercariae with drinking water.

Halzoun (parasitic pharyngitis) is today mainly ascribed to *Linguatula serrata* (Schacher, Khalil and Salman, 1965), but it may be caused by leeches and some authors believe this condition may be caused by immature or adult *Fasciola* which temporarily attach to the mucosa of the upper respiratory tract (Watson and Kerim, 1956, Naquira-Vildosa and Marcial-Rojas, 1971). This condition is common in the Lebanon where liver from freshly killed animals is eaten raw and cases of unknown aetiology and called Marrara syndrome, but which are believed by Schacher, Khalil and Salman (1965) to be identical to halzoun, have been recorded from the Sudan (Salman and Mahdi, 1955, as quoted by Schacher, *et al.*, 1965). Halzoun has not been recorded from most of Africa and never from the southern portion of the continent where, although cattle liver is commonly infected and is often eaten fresh from a killed animal, liver is roasted before ingestion (Gelfand, 1971).

Another liver fluke recorded occasionally from man in Africa is *Dicrocoelium dendriticum* which has been recorded rarely from Nigeria and North Africa (Berghe and Denecke, 1938; Watson, 1960), and Obei (1966), recorded

genuine and spurious infections from man in Ghana with *D. hospes*. In general however, spurious infections aside, dicrocoeliasis, while common in livestock in endemic areas, is rare in man (Witenberg, 1964) — possibly as the ingestion of ants is an unlikely event for humans. This species is reported to be absent in Central and Southern Africa (Sinclair, 1967).

Only one human case of *Watsonius watsoni* infection has ever been recorded, that of Conyngham (1904) from Nigeria, but the species has been found in baboons (*Papio cynocephalus*) (Deschiens, 1940) and monkeys (*Cercopithecus callitrichus*) (Stiles and Hassall, 1929) and one therefore concludes that this infection is an accidental zoonosis acquired by ingestion of metacercariae on vegetation (Fiennes, 1967; Marcial-Rojas, 1971).

W. watsoni has been found in the grey monkey, *Cercopithecus aethiops* as far south as Zambia (Buckley, 1946), and thus accidental cases could occur even in Southern Africa — although to date none has been recorded. Thus Goldsmid (1974) found no non-schistosome trematodes in 51 baboons (*Papio ursinus*) examined in Rhodesia, although it should be noted that these animals were from a dry part of the country.

Heterophyes heterophyes has been recorded in Africa from Egypt where, at Port Said, the prevalence among children was found to be between 60 and 90 per cent. Here, in the Nile Delta, infection was acquired by eating infected fish. These fish were bred in shallow brackish lagoons containing water snail *Pirenella* sp. Pollution of the water with faeces from humans and reservoir hosts such as dogs ensured infection of the snails and hence the fish. Human infection resulted from the habit of eating raw salted *Tilapia* and mullet (known as fessikh) especially during the religious feast of Sham-al-Nessim (Hackett, Buckley and Murgatroyd, 1954; Wells and Randall, 1955, 1956; Swellengrebel and Sterman, 1961; Watson, 1960; Witenberg, 1964; Belding, 1965; Marcial-Rojas, 1971). In an interesting recent study, Hamed and Elias (1970) showed that many food-processing methods are not adequate to kill the parasite in the fish and that even storage at —10° to —20°C was inadequate, while 20 - 30 per cent. of grilled fish still contained living metacercariae.

Certainly one of the most interesting fluke infections in Africa is that of paragonomiasis, found in Southern Cameroons, Nigeria and the Congo, and recently recorded from South Africa (Proctor and Gregory, 1974).

While described in some textbooks as *Paragonimus westermani* (Hackett, Buckley and Murgatroyd, 1954; Watson, 1960; Belding, 1965; Nnorchiri, 1968; Faust, Russel and Jung, 1970), some authors had expressed doubts as to the species of the African lung flukes (Yokogawa, Cort and Yokogawa, 1960a and b; and Swellengrebel and Sterman, 1961). Witenberg (1964) and Manson-Bahr (1961) considered that human cases on this continent might be due to *Poikilorchis congolensis,* following the theory put forward by Zahra (1952) and Fain and Vandepitte (1957), and recent work by Voelker and Vogel (1965) and Vogel and Crewe (1965) suggest that human paragonomiasis in Africa is possibly due to *Paragonimus africanus* or *P. uterobilateralis* (Yokogawa, 1965, 1969; Edington and Gilles, 1969).

Paragonimiasis is common in various countries of the Far East, due to a variety of cultural factors associated with heavily infected reservoir hosts and crabs and crayfish. Included in these cultural factors are diet (ingestion of raw crab and crayfish and of so-called "drunken crab" which is soaked alive in rice wine, brine or vinegar which does not necessarily kill the metacercariae (Suzuki, 1958 (as quoted by Faust, Russell and Jung, 1970); Huang and Chiu, 1958; Faust, Russell and Jung, 1970); food preparation such as chopping of the crab with resultant adherence of metacercariae to chopping boards and knives (Komiya, *et al.,* 1953; Swellengrebel and Sterman ,1961; Chung 1971) and the use of crab "juice" as antipyretic medicine for measles, whooping cough and other pyrexial illnesses (Walton and Chyn, 1959; Kim, 1960; Witenberg, 1964).

In Africa the prevalence of paragonimiasis was reported to be 4 per cent. in certain areas and a prevalence of over nine per cent. was found in the Cameroons (Zahra, 1952; Swellengrebel and Sterman, 1961), but because of the widespread occurrence of suitable intermediate hosts, Nnochiri (1968) believes the infection might be more widespread, a belief also expressed by Nwokolo (1964).

A recent and very interesting report is that of the finding of a number of cases of endemic paragonimiasis in Africans in Natal (Elsdon-Dew, personal communication; Proctor and Gregory, 1974). These are the first records of paragonimiasis in Southern Africa and it will be most interesting to learn more details of the species of *Paragonimiasis* involved and the intermediate and reservoir hosts concerned.

In Asia it was found that the infection rate in males was higher than that in females (Sadum, *et al.*, 1959; Kulka and Barabas, 1955) but in the Cameroons, three times more women than males were infected, with a peak prevalence between 11 and 35 years of age (Edington and Gilles, 1969). This was believed to be due to the fact that the women of these Bakosi people were said to eat raw crab to stimulate fertility (Zahra, 1952; Swellengrebel and Sterman, 1961).

In recent years, Nwokolo (1972) has reported an increase in the prevalence of paragonomiasis in Nigeria — probably due to the recent civil war and resultant lack of food which has forced people to eat crabs for survival — invertebrates not usually serving as a basic food for man, except in some Asian areas (Witenberg, 1961). Certainly in Southern Africa, these crustaceans are not considered as an important source of food (Gelfand, 1971).

It can thus be seen that, in general, non-schistosome trematodes are not widespread in Africa, but may be important in localised foci.

Undoubtedly the major factors limiting their widespread occurrence and influencing their local importance are:—

(a) the occurrence of plentiful fresh water,
(b) the occurrence or absence of suitable snail vectors,
(c) the occurrence or absence of suitable crustacean or fish intermediate hosts,
(d) water pollution with faeces,
(e) the mode of infection — explaining the wide occurrence of schistosomes which penetrate the skin as opposed to other trematodes which infect with ingested food (vegetable or fish) and which are consequently affected by food preferences and preparation,
(f) racial, tribal and religious customs.

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