RESEARCH NOTE

LYMPHATIC FILARIASIS (LF) *Aedes albopictus:* A NEW ENTRANT

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Abstract

Lymphatic filariasis, an ancient disease is a major global problem infecting more than 120 million men, women and children. Vectors for the causative agent *Wuchereria bancrofti* were investigated in Abia State, Nigeria. Of all the mosquito vectors encountered using sweep net, test tube and Pyrethrum Knockdown Count (PKC) methods, only *Aedes albopictus* has not been known to be implicated in the transmission of *W. bancrofti*-caused lymphatic filariasis. This is no good news considering the health implications and bearing in mind that *Aedes albopictus* is a competent vector for at least 22 arboviruses. The finding of *W. bancrofti* in *A. albopictus* (0.21%) in this study has thrown more light to it being a potential vector and possibly an actual vector of *W. bancrofti*.

Keywords: lymphatic filariasis, mosquito vectors, *Wuchereria bancrofti*, *Aedes albopictus,* new entrant.

Introduction

Lymphatic filariasis which is an ancient disease is a major global problem infecting more than 120 million men, women and children. Though it is rarely life-threatening, the disease causes wide spread chronic suffering, disability and social stigma (WHO, 1997; WHO, 2000; WHO, 2001). It can lead to grotesquely swollen limbs, a condition known as elephantiasis (Ottesen *et al* 1997; Merck, Sharpe and Dohme (MSD), 2002). Lymphatic filariasis has been identified as the second leading cause of permanent and long term disability and a major contributor to poverty in the world (WHO, 2000; WHO, 2001; *LF News, 2003;* Street and Lafontant, 2008). The disabilities caused by the disease have considerable impact on the affected communities in terms of lost productivity and the high cost of long term care (WHO, 2003).

Lymphatic filariasis is caused by parasitic nematodes of the family filariidae. Two genera with three species are of significance. These are *Wuchereria bancrofti*, *Brugia malayi* and *Brugia timor*i (Cheesbrough, 1995; WHO, 1997). In Africa, lymphatic filariasis is caused by *W. bancrofti* and is transmitted to man through the bites of a female mosquito. Mosquito problems and its diseases in contemporary Africa still present a strange picture especially in the parts of sub-Saharan region where the vector may be regarded as a major menace to public health (WHO, 1984). Availability of a vector is one of the factors that determines the importance of a vector in disease transmission (WHO, 1975). This study therefore set out to determine the vectorial competence of the mosquitoes caught in the study-area with respect to *W. bancrofti*, the causative agent of lymphatic filariasis.

There are many mosquitoes that transmit filarial parasites. The most important vectors for *W. bancrofti* are *Culex quinquefasciatus*, *Anopheles gambiae*, *An. funestus*, *An. nili, Aedes. polynesiensis, Ae. scapularis, Ae. pseudoscuttelaris, Ae. aegypti, Mansonia uniformis and M. africana* (WHO,1984; Cheesbrough, 1999; WHO, 2000). *Aedes* is a genus that includes species that transmit yellow fever, dengue and dengue haemorrhage fever. All the above mosquitoes have been implicated in the transmission of *W. bancrofti* but not *A. albopictus* (WHO, 1984; Markell *et al* 1992; Udonsi, 1999; Cheesbrough, 1999; WHO, 2000).

Materials and methods

The study was carried out in Arochukwu, Bende, Isuikwuato and Ohafia Local Government Areas of Abia State, Nigeria located between Latitudes $5^{0}4'$ N and $6^{0}3'$

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N and Longitudes $7^{0}5'$ E and $7^{0}55'$ E. The locations are rural areas with climate and vegetation that are consistent with those of a tropical rainforest region in eastern Nigeria. Different bodies of water are also present. These bodies of water together with the rainforest vegetation and swampy areas for rice cultivation constitute an environment which serves as potential breeding sites for mosquito vectors of lymphatic filariasis.

Sample collection

In-door and out-door catches of mosquitoes were made using sweep net, test-tubes on human baits and walls, and PKC methods. All mosquitoes caught were taken to the laboratory in the National Arbovirus and Vector Research Centre, Enugu, for sorting, identification and further analysis. The identification was done under a dissecting microscope using morphological features and a laboratory manual as a guide (Gillet and Smith, 1972). For further analysis, the female mosquitoes were dissected and separated into head, thorax and abdomen before a thorough search on teased out materials was done for the presence of the microfilaria of *W. bancrofti* in each mosquito.

Results

Of all the four hundred and seventy (470) mosquitoes dissected, only four out of twelve species were infected with *W. bancrofti*. These were *A. aegypti* (33.3%), *Ae albopictus* (11.1%), *Culex quinquefasciatus* (7.14%) and *Anopheles gambiae* (20.0%). The overall infectivity rate was 0.85%. Incidentally the first three vector species incriminated with *W. bancrofti* were encountered in Ohafia L.G.A and only one species, *Anopheles gambiae* was incriminated with *W. bancrofti* in Isuikwuato L.G.A. No vectors were incriminated with *W. bancrofti* in Arochukwu and Bende LGAs (Table 1).

Table 1: Vectorial Infectivity with *Wuchereria bancrofti* mf by L.G.A.

Mosquito species	Arochukwu			Bende			Isuikwuato			Ohafia		
	N.D	N.I	% INF	N.D	N.I	% INF	N.D	N.I	% INF	N.D	N.I.	% INF
Aedes albopictus	4	-	0	8	-	0	3	-	0	9	1	11.1
Aedes luteocephalus	3	-	0	5	-	0	2	-	0	0	-	0
Aedes africanus	3	-	0	0	-	0	1	-	0	2	-	0
Aedes aegypti	0	-	0	9	-	0	1	-	0	3	1	33.33
Anopheles gambiae	29	-	0	50	-	0	5	1	20	64	-	0
Anopheles funestus	5	-	0	17	-	0	0	-	0	23	-	0
Anopheles nili	3	-	0	1	-	0	0	-	0	1	-	0
Anopheles moucheti	0	-	0	0	-	0	0	-	0	2	-	0
Anpheles coustani	0	-	0	1	-	0	0	-	0	0	-	0
Culex quinquefasciatus	9	-	0	25	-	0	18	-	0	14	1	7.14
Mansonia africana	109	-	0	24	-	0	0	-	0	16	-	0
Eretmapodites chrysogaster	0	-	0	0	-	0	1	-	0	0	-	0
Total	**165**	**0**	**0**	**140**	**0**	**0**	**31**	**1**	**3.22**	**134**	**3**	**2.24**

Total No. dissected = 470; Total No infected = 4 (0.85%).
Key: N.D. = Number dissected; N.I. = Number infected; % INF = Percentage of infection.
LGAs = Local Government Areas; mf = microfilaria.

Discussion

In this work, *A. albopictus* was implicated in the transmission of *W. bancrofti*. It had an 11.1% infectivity rate in Ohafia, one of the local government areas of study. On the whole, *A. albopictus* had a 0.21% infectivity rate in the entire study-area. *A. albopictus* has therefore become a possible new entrant into the group of vectors that transmit bancroftian filariasis in Africa and Nigeria in particular.

Appawu *et al* (2001) in their work in Ghana recorded only two infected species of mosquitoes. They were *A. gambiae* which was encountered in this work and *A. funestus* which was not infected in this study. In their own work in Tamil Nadu,Ramaiah *et al* (1989) reported only *Culex quinquefasciatus* as being infected which was also observed in this work. *A gambiae*, *A funestus, A nili, Mansonia africana, M uniformis, Aedes, polynesensis, Ae scpularis, Ae. pseudoscuttelaris and Ae.aegypti* have all been incriminated in the transmission of *W. bancrofti* but not *Ae. albopictus* (WHO, 1980;

Markell et al, 1992; Udonsi, 1999; Cheesbrough, 1999; WHO, 2000-CD). Three species of mosquitoes found to be infected in this study corroborate these findings. These are *Ae. aegypti, C. quinquefasciatus* and *An. gambiae.* However the fourth species infected in this study – *Ae. albopictus* has not been implicated in the transmission of *W. bancrofti* and has therefore become a new entrant into the group of vectors that transmit bancroftian filariasis in Africa and Nigeria in particular.

The mosquito *A. albopictus*, originally indigenous to South East Asia, Islands of the Western Pacific and Indian Ocean, has spread during recent decades to Africa, the Middle East, Europe and the Americas (North and South) after extending its range eastwards across the Pacific Islands during the early 20th century. The majority of the introductions were apparently due to transportation of dormant eggs in used automobile tyres. Among public health authorities in the newly infested countries and those threatened with the introduction, there has been much concern that *Aedes albopictus* would lead to serious outbreaks of arbovirus diseases since *Aedes albopictus* is a competent vector for at least 22 arboviruses (Gratz, 2004). *Ae. albopictus* has also been implicated in the transmission of dog heartworm, *Dirofilaria immitis* in South East Asia and Italy (Cancrini *et al,* 2003; Gratz, 2004).

In Nigeria, the first report of a breeding population of *A. albopictus* was made from Delta State (CDC, 1991). Thereafter, almost immediately, another population of *A. albopictus* was found in Benue State (Savage *et al* 1992) but none was in relation to the transmission of lymphatic filariasis. It would however seem likely that the species had been present for sometime before the first finding of its breeding population (Gratz, 2004).The introduction of *A. albopictus* commonly referred to as "tiger mosquito" into countries in which it has not been previously found is considered a serious threat. It is also viewed as a potential or actual vector of arboviruses and other infections such as *Dirofilaria immitis* caused infections (Gratz, 2004). The finding of *W. bancrofti* in *A. albopictus* in this study has thrown more light to it being a potential vector and possibly an actual vector of *W. bancrofti,* the causative agent of lymphatic filariasis. This is no good news considering the health implications. This is because trade in used tyres has become an established lucrative business in some parts of the world such as Cape Town, Cameroon and Nigeria (Cornel and Hunt, 1991; Fontenille and Toto, 2001). It will mean increasing the risk of more people being infected not only with any of the arboviruses but also with *W. bancrofti* and subsequently with lymphatic filariasis. Based on this premise, further study is advocated on the vector competence of *A. albopictus* for the transmission of lymphatic filariasis.

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