TWENTY YEARS OF THE NATIONAL INSTITUTE FOR MEDICAL RESEARCH: CONTRIBUTIONS OF THE AMANI RESEARCH CENTRE

Amani Medical Research Centre, Amani, Tanga, Tanzania

L.E.G. Mboera, S.M. Magesa & M.M. Lemnge

Research

Research at Amani Research Centre of the National Institute for Medical Research has for the past twenty years centred on traditional infectious diseases including malaria, bancroftian filariasis, onchocerciasis, schistosomiasis and plague. Investigations in these areas have included studies on both parasites, and vectors of the respective disease, further studies on morbidity, pathophysiology and immunological aspects have been undertaken. Malaria is still the most studied disease at the Centre, probably due to the magnitude of the disease as a public health problem in Sub-Saharan Africa and Tanzania in particular. Another reason could be maintaining the tradition of the Centre as it was once officially (and is still locally) known as the Malaria Institute.

Over the years since 1980, there has been a steady increase in research activities as evidenced by the escalating number of scientific publications over the period (Figure 1). There was an increase in number of publications in most fields over the past 20 years. The last publication on schistosomiasis was in 1983 and for plague in 1989. This followed the abandoning of research in those areas by the Centre. Malaria continued to dominate the volume of research activities of the Centre.

Some of the notable achievements of the Centre in the past twenty years have included vast contributions to knowledge on the epidemiology of malaria in holoendemic areas. Substantial information on optimum therapeutic regimens for treatment of malaria in areas with varying levels of resistance to chloroquine and sulfadoxine-pyrimethamine has emerged from the Centre. This has eventually led to the establishment of the East African Network for Monitoring Antimalarial Testing (EANMAT), a network that monitors antimalarial drug resistance in East Africa. Studies carried out by Amani Scientists have provided the bulk of information on the ecology and spatial distribution of the major malaria vector, *Anopheles gambiae* sibling species on over half of the country. The Centre has tested a number of trials on the control of malaria by various methods. Scientists of Amani Centre were among the African pioneers in testing the efficacy of insecticide treated bednets. The Centre has worked in collaboration with the World Health Organization Pesticide Evaluation Scheme (WHOPES) in the development of insecticides for Public Health use, particularly those intended for malaria control.

Work on the role of chemical stimuli in host-finding oviposition-site selection of *Anopheles gambiae* and *Culex quinquefasciatus* formed the largest proportion of mosquito ecological studies during the past 5 years. It was confirmed for the first time in the field that *An. gambiae, An. arabiensis* and *An. funestus* attracted to human bait do so in response to the host's odours other than carbon dioxide. Body odours and carbon dioxide are thus the main olfactory cues that lead man-biting mosquitoes to a human host. It was further found that odours from soakage pit water or grass infusion and oviposition pheromone cause a synergistic effect in *Cx quinquefasciatus*.

During the period, a number of studies were carried out to complement previous ones in elaborating the epidemiology of plague in the active focus of Western Usambara Mountains. Of recent, the Centre has adopted relatively new areas of research. These include highland and epidemic malaria, health systems research, health economics and some aspects of immunology and molecular epidemiology of malaria and bancroftian filariasis. The Centre expects to broaden further on studies within these new areas of research. Records show that publications, involving Amani Centre scientists, during the 20-year period, are over 180.

1.0: Malaria

Area of Research	*Subject*	*Reference*
Epidemiology	Immunology	Elghazali et al. 1997
		Jakobsen et al. 1998
		Jakobsen et al. 1998
		Metzger et al. 1998
		Perlmann et al. 1997

Area of Research	*Subject*	*Reference*
Immunoassay		Matola et al. 1989
	Malaria in pregnancy and infancy	Mutabingwa 1992, 1994, Mutabingwa et al. 1992, 1993a, 1993b, 1994.
	Malaria morbidity	Sivananthan, 1995
	Childhood morbidity	Ellman et al. 1998
	Childhood mortality	Salum et al. 1994
	Malaria case definition	Kamugisha, 1999; Massaga et al. 2000.
	Malariometry	Lemnge, 1995; Wakibara et al. 1997; Matola et al., 1987; Matola & Magayuka, 1981; Warsame et al. 1997.
	Malaria parasite dynamics	Magesa, 1999; Magesa et al. 2000.
	Molecular epidemiology	Magesa et al., 2000a,b.
	Highland malaria	Matola et al. 1987; Lindsay et al. 2000.
	Cerebral malaria	Rutta, 1998.
	Knowledge, attitude, practice	Alilio et al. 1998.
Vectors	Taxonomy of An. gambiae	Marchand & Mnzava, 1986; Mnzava & Di Deco, 1986; Mnzava et al. 1989; Hoc & Wilkes, 1995.
	Malaria transmission	Lines et al. 1991; Hogg & Hurd, 1997; Ijumba, 1988; Lindsay et al. 1995; Malima, 1999; Maxwell et al. 1998; Salum, 1991; Wilkes et al. 1996.
	Viral infections	Rwegoshora et al. 2000 a, b, c.
	Larval bionomics	Njunwa, 1993.
	Behaviour	Mnzava & Curtis, 1989; Marchand, 1984; Knols et al.1995; Lines et al. 1986; Mboera et al. 1997.
	Sampling techniques	Lines et al. 1991; Braks et al. 2000; Mboera et al. 2000.
Chemotherapy	Drug discovery	Bray et al. 1989; Weenen et al. 1990; Malebo, 1999.
	Chloroquine resistance	Draper et al. 1985, 1988; Mutabingwa, 1985, 1993; Mutabingwa et al. 1985, 1986; Fowler et al. 1993; Kilimali, 1990; Kilimali & Mkufya, 1985a, b,c; Msangeni, 1995; Msangeni et al., 1998; Irare et al. 1991; Warsame et al. 1999.
	Chloroquine compliance	Lyimo, 1987; Matola, 1989; Matola & Malle, 1985.
	Sulfadoxine-pyrimethamine	Curtis et al. 1996; Jelinek et al. 1998a,b; Kilimali & Mkufya, 1985a; Msangeni, 1995; Trigg et al. 1997; Ronn et al. 1996; Warsame et al. 1999.
	Mefloquine	Kilimali et al. 1989.
	Proguanil	Mutabingwa, 1993.
	Amodiaquine	Msangeni, 1995; Msangeni et al. 1998.
	Chloroguanide	Skjelbo et al. 1996.
	Atovaquine	Wernsdorfer et al. 1995.
	Cotrimoxazole	Mutabingwa et al. 1999.
	Benflumetol	Wernsdorfer et al. 1998.
	Drug use pattern	Alilio et al. 1997.
Vector control	Insecticide resistance	Curtis et al. 1990; Magesa,1988; Rwegoshora, 2000.
	Repellents	Curtis et al. 1987; Trigg, 1996.
	Indoor spraying	Mnzava, 1991; Mnzava et al. 1990, 1993; Curtis et al. 1998; Kisinza, 1999.
	Insecticide-treated material	Lines et al. 1987; Curtis et al. 1989; Msuya & Curtis, 1991; Magesa, 1996; Magesa et al. 1991; Lyimo et al. 1991; Curtis et al. 1989; 1998; Njunwa et al. 1991; Finch et al. 1996; Maxwell et al. 1999.
	Biological control	Ijumba & Kilama, 1986; Ragoonanansigh et al. 1993.
	Decision making	Mboera, 1998.

1.2: Bancroftian Filariasis

Area of Research	*Subject*	*Reference*
Epidemiology	Symptomatology	Abaru et al. 1980.
	Pathology	Makunde, 1995.
	Prevalence	Meyrowitsch,1995; Meyrowitsch et al. 1995 a,b. Matola, 1985.
	Diagnosis	McMahon, 1982; Simonsen et al. 1995.
	Parasite behaviour	Simonsen et a. 1995, 1996.
	Tropical pulmonary eosinophilia	Magnussen et al. 1995.
	Immunology	Simonsen et al. 1996.
Vector	Transmission	Mosha, 1981;McGreev et al. 1982; Bushrod et al.1981; Mboera et al. 1997.
	Behaviour	Lyimo & Irving-Bell 1988; Mboera, 1999; Mboera et al. 1998; Mboera & Takken, 1999; Mboera et al. 1999; Mboera et al. 2000a, b; Takken & Mboera, 2000.
	Sampling techniques	Mboera et al. 2000a, b, c.
	Ecology	Irving-Bell et al. 1987; Mboera et al. 1997.
Control	Diethylcarbamazine	McMahon, 1982, 1983; Kolstrup et al. 1981; Temu & McMahon, 1981; Mosha,1981; Meyrowitsch et al. 1996 a,b, 1998; Simonsen et al.1995.
	Levamisole	McMahon, 1981; Temu & McMahon, 1981; Kolstrup et al. 1981.
	Larvicide	Kolstrup et al. 1981; Mwaiko, 1981, 1992, 1995; Mwaiko & Savael, 1994.

1.3: Onchocerciasis

Epidemiology	Prevalence	Mwaiko, 1992; Mwaiko et al. 1990.
	Disease burden	Makunde et al. 2000.
Vector	Ecology	Muro & Mziray 1990 a,b.
	Transmission	Mwaiko 1981; Muro & Raybould 1990.
	Taxonomy	Procunier et al. 1987; Procunier & Muro 1994.
	Bionomics	Hoc & Wilkes 1995.
Control	Insecticide	Muro & Alli 1991.

1.4: Schistosomiasis

Epidemiology	Diagnosis	Ansell et al. 1997.
Chemotherapy	Praziquantel, metrifonate, niridazole	McMahon 1981, 1983.

1.5: Plague

Epidemiology	Disease pattern	Njunwa et al. 1989.
	Immunology	Kilonzo 1980.
	Endemicity	Kilonzo & Mhina 1982, 1983.
Vectors	Transmission	Kilonzo 1980.
	Ecology	Kilonzo et al. 1981.

1.6: Others

Dirofilaria immitis	Parasite behaviour	Matola 1991.
Health economics	Willingness to pay	Mubyazi 1998.
Health systems	Health service	Alilio 1992,1999; Alilio et al. 1997, 1999.
Urban farming	Mosquito ecology	Mboera et al. 1997; Shabani & Mboera 2000.
Experimental animals	Immunology	

Training

The Centre has over the years involved itself heavily in various aspects of training. These have ranged from short- to long-term training. Short-term training have included attachment of staff from research institutions in Tanzania and overseas to learn particular techniques, or workshops and seminars.

Some of the important training activities include international courses on malaria and bancroftian filariasis. For a span of ten years from 1986 to 1996, Amani Centre in collaboration with WHO, the former Russian Soviet Republics, the United Republic of Tanzania and the Danish Bilharziasis Laboratory (DBL) have been conducting biennial courses on basic malariology and malaria control. The course drew participants from the African continent, most of them being malaria control managers from Ministries of Health.

From 1991 to 1995, Amani Centre in collaboration with the DBL conducted biennial international courses on lymphatic filariasis and its control. The courses attracted researchers and control managers from African countries. Amani scientific staff is currently involved in teaching and student supervision at the Vector Control Training Centre, Muheza.

As part of capacity building for the Centre scientific staff, training in form of MSc. and Ph.D. training have become part of the Centre's training activities. Financial support for training has come from WHO/TDR, Swiss Development Corporation, DANIDA, DBL, Dutch government and Belgium government. Most of the Ph.Ds were carried out as sandwich programmes where candidates were registered at local or overseas universities and carried out the fieldwork in Tanzania. During the past 20 years 14 candidates qualified for PhDs at Amani (Table 1).

Table 1: *The number of candidates qualifying for Ph.D. at Amani Research Centre*

Year	1981	1984	1989	1991	1992	1993	1994	1995	1999	Total
No.	1	1	1	1	1	3	1	2	3	14

References

Abaru, D.E., McMahon, J.E., Marshall, T.F. de C., Hamilton, P.J.S., Vaughan, J.P. & Wegesa, P. (1980) Tanzania Filariasis Project. Studies on microfilaraemia and selected clinical manifestations of Bancroftian filariasis. *Acta Tropica* 37, 63-71.

Alilio, M.S. (1992) *The Availability of Pharmaceutical in the Developing Countries: The Social Basis of Pharmaceutical Problems in Tanzania*. MSc. Dissertation, University of London.

Alilio, M.S. (1999) *Health Services at the District Level in Tanzania.: Service Throughput and Resource Levels: The Gap Between Promise and Performance*. PhD Thesis, University of Copenhagen.

Alilio, M.S., Eversole, H. & Bammeke, J. (1998) A KAP study on malaria in Zanzibar: Implications for prevention and control. A study conducted for UNICEF Sub-Office, Zanzibar. *Evaluation and Program Planning* 21, 409-413.

Alilio, M.S., Kamugisha, M.L., Msuya, F.H., Massaga, J.J., Salum, F.M. & Njunwa, K.J. (1997) Availability and utilisation of anti-malarial drugs at community level in Same District of north-eastern Tanzania. *Malaria and Infectious Diseases in Africa* 6, 8-12.

Alilio, M.S., Medina, M., Rønn, A., Mhina, J., Msuya, F., Mahundi, J., Whyte, S., Bygbjerg, I. & Krasnik, A. (2000) Measuring outcome of district health care service using verbal autopsy: experience from north-eastern Tanzania. *Journal of Health Services Planning and Management* (in press).

Ansell, J., Guyatt, H., Hall, A., Kihamia, C., Kivugo, J., Ntimbwa, P. & Bundy, D. (1997) The reliability of self-reported blood in urine and schistosomiasis as indicators of *Schistosoma haematobium* infection in school children: a study in Muheza District, Tanzania. *Tropical Medicine and International Health* 2, 1180-1189.

Braks, M.A.H., Mboera, L.E.G., Knols, B.G.J. & Takken, W. (1999) Outdoor trapping of the malaria mosquito *Anopheles gambiae s.s.* using odour-baited electric nets in the Kilombero Valley, South-east Tanzania. *Transactions of the Royal Society of Tropical Medicine and Hygiene* (in press).

Bray, D.H., Kilimali, V.A.E.B., Nkunya, M.H.H., Siemienska, J.J., Warhurst, D.C. & Weenen, H. (1989) Tanzanian plants with antimalarial activity. *Transactions of the Royal Society of Tropical Medicine and Hygiene* 83, 422.

Bushrod, F.M. (1981) The *Anopheles gambiae* Giles complex and bancroftian filariasis transmission in a Tanzanian coastal village. *Annals of Tropical Medicine and Parasitology* 75, 93-100.

Curtis, C.F., Hills, N., Ulloa, M. & Magesa, S.M. (1990) The possible impact of resistance on the effectiveness of pyrethroid impregnated bednets. *Transactions of the Royal Society of Tropical Medicine and Hygiene* 84, 445.

Curtis. C.F., Lines, J.D., Ijumba, J., Callaghan, A., Hill, N. & Karimzad, M.A. (1987) The relative efficacy of repellents against mosquito vectors of disease. *Medical and Veterinary Entomology* 1, 109-119.

Curtis, C.F., Lines, J.D., Lyimo, E., Njunwa, K.J. & Wilkes, T.J. (1989) Pyrethroid treated nets for malaria control. *Transactions of the Royal Society of Tropical Medicine and Hygiene* 83, 423.

Curtis, C.F., Maxwell, C.A., Finch, R.J. & Njunwa, K.J. (1998) A comparison of use of a pyrethroid either for house spraying or for bednet treatment against malaria vectors. *Tropical Medicine and International Health* 3, 619-31.

Curtis, C.F., Myamba, J. & Wilkes, T.J. (1996) Comparison of different insecticides and fabrics for anti-mosquito bednets and curtains. *Medical and Veterinary Entomology* 10, 1-11.

Curtis, J., Duraisingh, M.T., Trigg, J.K., Mbwana, H., Warhurst, D.C. & Curtis, C.F. (1996) Direct evidence that asparagine at position 108 of the *Plasmodium falciparum* dihydrofolate reductase is involved in resistance to antifolate drugs in Tanzania. *Transactions of the Royal Society of Tropical Medicine and Hygiene* 90, 678-680.

Draper, C.C., Brubaker, G., Geser, A., Kilimali, V.A. & Wernsdorfer, W.H. (1985) Serial studies on the evolution of chloroquine resistance in an area of East Africa receiving intermittent malaria chemosuppression. *Bulletin of the World Health Organization* 63, 109-118.

Draper, C.C., Hills, M., Kilimali, V.A. & Brubaker, G. (1988) Serial studies on the evolution of drug resistance in malaria in an area of East Africa: findings from 1979 up to 1986. *Journal of Tropical Medicine and Hygiene* 91, 265-273.

Elghazali, G., Perlmann, H., Rutta, A.S.M., Perlmann, P. & Troye-Blomberg, M. (1997) Elevated plasma levels of IgE in *Plasmodium falciparum*-primed individuals reflect an increased ratio of IL-4 to interferon-gamma (IFN-gamma)-producing cells. *Clinical and Experimental Immunology* 109, 84-89.

Ellman, R., Maxwell, C., Finch, R. & Shayo, D. (1998) Malaria and anaemia at different altitudes in the Muheza district of Tanzania: Childhood morbidity in relation to level of exposure to infection. *Annals of Tropical Medicine and Parasitology* 92, 741-753.

Finch, R.J., Maxwell, C., Mbwana, H. & Curtis, C.F. (1996) Bednet *vs.* spraying, a pattern emerging? *Annual Report of the National Institute for Medical Research* 15, 36.

Fowler, V.G. Jr., Lemnge, M., Irare, S.G., Malecela, E., Mhina, J., Mtui, S., Mashaka, M. & Mtoi, R. (1993) Efficacy of chloroquine on *Plasmodium falciparum* transmitted at Amani, eastern Usambara mountains, north-east Tanzania: an area where malaria has recently become endemic. *Journal of Tropical Medicine and Hygiene* **96**, 337-345.

Hoc, T.Q. & Wilkes, T.J. (1995) The ovariole structure of *Anopheles gambiae* (Diptera: Culicidae) and its use in determining physiological age. *Medical and Veterinary Entomology* 9, 16-24.

Hogg, J.C. & Hurd, H. (1997) The effects of natural *Plasmodium falciparum* infection on the fecundity and mortality of *Anopheles gambiae s.l.* in north east Tanzania. *Parasitology* 114.

Ijumba, J.N. (1988) *Studies on the Resting Behaviour, Parous and Sporozoite Rates of* Anopheles *Mosquitoes in the Mwea-Tebere Irrigation Scheme.* MSc. Dissertation, University of Nairobi, Kenya.

Ijumba, J.N., Mwangi, R.W. & Beier, J.C. (1990) Malaria transmission potential of *Anopheles* mosquitoes in the Mwea Tebere irrigation scheme, Kenya. *Medical and Veterinary Entomology* 4, 425-435.

Irare, S.G., Lemnge, M.M. & Mhina, J.I. (1991) *Falciparum* malaria fully cleared by amodiaquine, sulfadoxine-pyrimethamine and sulfalene-pyrimethamine in areas of chloroquine resistance in Dodoma, Tanzania. *Tropical and Geographical Medicine* 43, 352-356.

Irving-Bell, R.J., Okoli, E.I., Deyelong, D.Y., Lyimo, E.O. & Onyia, O.C. (1987) Septic tank mosquitoes: competition between species in central Nigeria. *Medical and Veterinary Entomology* 1, 243-250.

Jakobsen, P.H., Heegaard, P.M.H., Koch, C., Wasniowska, K., Lemnge, M.M., Jensen, J.B. & Sim, B.K.L. (1998) Identification of an erythrocyte binding peptide from the erythrocyte binding antigen, EBA-175, which blocks parasite multiplication and induced peptide-blocking antibodies. *Infection and Immunity* 66, 4203-4207.

Jakobsen, P.H., Lemnge, M.M., Abu-Zeid, Y.A., Msangeni, H.A., Salum, F.M., Mhina, J.I.K., Akida, J.A., Rutta, A.S., Rønn, A.M., Heegaard, P.M.H., Ridley, R.G. & Bygbjerg, I.C. (1996) Immunoglobulin G reactivities to rhoptry-associated PROTEIN-I associated with decreased levels of *Plasmodium falciparum* parasitaemia in Tanzanian children. *American Journal of Tropical Medicine and Hygiene* 55, 642-646.

Jelinek, T., Rønn, A.M., Lemnge, M.M., Curtis, J., Mhina, J., Duraisingh, M.T., Bygbjerg, I.C., Warhurst, D.C. (1998) Polymorphisms in the dihydrofolate reductase (DHFR) and dihydropteroate synthetase (DHPS) genes of *Plasmodium falciparum* and *in vivo* resistance to sulfadoxine-pyrimethamine in isolates from Tanzania. *Tropical Medicine and International Health* 3, 605-609.

Jelinek, T., Rønn, A.M., Lemnge, M.M., Curtis, J., Mhina, J., Duraisingh, M.T., Bygbjerg, IC. & Warhurst, D.C. (1998) Polymorphisms in the dihyrofolate reductase (DHFR) and dihydropterose synthetase (DHPS) genes of *Plasmodium falciparum* and *in vivo* resistance to sulfadoxine/pyrimethamine in isolates from Tanzania. *Tropical Medicine and International Health* 3, 605-609.

Kamugisha, M.L. (1999) *Does the Level of Endemicity Affect the Sensitivity and Specificity of Clinical Malaria Case Definition*? [MSc. Dissertation], University of London.

Keto, G.B. (1996) *Production of Polyclonal Antibodies Against the Mouse Lung GLP-1 Receptor.* MSc. Dissertation, Vrije University, Brussels, Belgium.

Kilimali, V.A. (1990) The *in vitro* response of *Plasmodium falciparum* to amodiaquine, quinine and quinidine in Tanga region, Tanzania. *East African Medical Journal* 67, 336-340.

Kilimali, V.A. & Mkufya, A.R. (1985a) *In vivo* and *in vitro* assessment of the sensitivity of *Plasmodium falciparum* to chloroquine in four districts of Tanga region, Tanzania. *Transactions of the Royal Society of Tropical Medicine and Hygiene* 79, 478-481

Kilimali, V.A. & Mkufya, A.R. (1985b) *In vivo* assessment of the sensitivity of *Plasmodium falciparum* to sulfadoxine-pyrimethamine combination (Fansidar) in six localities in Tanzania where chloroquine-resistant *P. falciparum* has been detected. *Transactions of the Royal Society of Tropical Medicine and Hygiene* 79, 482-483.

Kilimali, V.A.E.B., Mkufya, A.R. & Kilama, W.L. (1989) Low resistance of *Plasmodium falciparum* to mefloquine in Tanga region, Tanzania. *Transactions of the Royal Society of Tropical Medicine and Hygiene* 83, 162-164.

Kisinza, W.N. (1999) *Analysis of Field Trial of Bifenthrin 10 WP Insecticide for the Control of Malaria Vectors in Flores, Indonesia.* MSc. Dissertation, University of Liverpool, 73 pp.

Kilonzo, B.S. (1980) Studies on determining the involvement of domestic animals in plague epidemiology in Tanzania. I. Species and population densities of fleas found on farm and pet animals in north-eastern Tanzania. *Tanzanian Veterinary Bulletin* 2, 37-44.

Kilonzo, B.S. (1980) Studies on determining the involvement of domestic animals in plague epidemiology in Tanzania. II. Specific plague antibodies in sera of *Canis familiaris,* the domestic dog. *Tanzanian Veterinary Bulletin* 2, 56-59.

Kilonzo, B.S. & Mhina, J.I.K. (1982) The first outbreak of human plague in Lushoto district, north-east Tanzania. *Transactions of the Royal Society of Tropical Medicine and Hygiene* 76, 172-177.

Kilonzo, B.S. & Mhina, J.I.K. (1983) Observations on the current status of plague endemicity in the Western

Usambara Mountains, north-east Tanzania. *Acta Tropica* 40, 365-373.

Kilonzo, B.S. & Mtoi, R.S. (1983) Entomological, bacteriological and serological observations after the 1977 plague outbreak in Mbulu district, Tanzania. *East African Medical Journal* 60, 91-97.

Kilonzo, B.S., Patel, N.R. & Mtoi, R.S. (1981) Studies on the seasonal fluctuations of rodents and their fleas in north-eastern Tanzania. *Tanzanian Veterinary Bulletin* 3, 3-19.

Knols, B.G.J., Jong, R. de & Takken, W. (1995) Differential attractiveness of isolated humans to mosquitoes in Tanzania. *Transactions of the Royal Society of Tropical Medicine and Hygiene* 89, 604-606.

Knols, B.G.J., Mboera, L.E.G. & Takken, W. (1998) Electric nets for studying odour-mediated host-seeking behaviour of mosquitoes. *Medical and Veterinary Entomology* 12, 116-120.

Kolstrup, N., McMahon, J.E., Magayuka, S.A., Mosha, F.W., Bushrod, F.M. & Bryan, J.H. (1981) Control measures against eastern Tanzania. Bancroftian filariasis in coastal villages in Tanzania. *Annals of Tropical Medicine and Parasitology* 75, 433-439.

Lemnge, M.M. (1995) *Malaria and Filariasis at Magoda Village in North-eastern Tanzania. Epidemiology, Maloprim® Malaria Prophylaxis and Estimation of Blood Maloprim® Levels.* [PhD Thesis], University of Copenhagen, Denmark, 123 pp.

Lemnge, M.M., Msangeni, H.A., Rønn, A.M., Salum, F.M., Jakobsen, P.H., Mhina, J.I., Akida, J.A. & Bygbjerg, I.C. (1997) Maloprim malaria prophylaxis in children living in a holoendemic village of north-eastern Tanzania. *Transactions of the Royal Society of Tropical Medicine and Hygiene* 91, 68-73.

Lindsay, S.W., Armstrong-Schellenberg, J.R.M., Zeller, H.A., Daly, R.J., Salum, F.M. & Wilkins, H.A. (1995) Exposure of Gambian children to *Anopheles gambiae* malaria vectors in an irrigated rice production area. *Medical and Veterinary Entomology* 9, 50-59.

Lindsay, S., Bødker, R., Malima, R., Msangeni, H.A. & Kisinza, W. (2000) Effect of 1997 *El Niño* on highland malaria in Tanzania. *The Lancet* 355, 989-990.

Lines J.D., Curtis, C.F., Wilkes, T.J. & Njunwa, K.J. (1991a) Monitoring human-biting mosquitoes (Diptera: Culicidae) in Tanzania with light-traps hung beside mosquito nets. *Bulletin of Entomological Research* 81, 77-84.

Lines, J.D., Lyimo, E.O. & Curtis, C.F. (1987) Mixing of indoor and outdoor-resting adults of *Anopheles gambiae* Giles s.l. and *An. funestus* Giles (Diptera: Culicidae) in coastal Tanzania. *Bulletin of Entomological Research* 76, 171-178.

Lines, J.D., Myamba, J. & Curtis, C.F. (1987) Experimental hut trials of permethrin-impregnated mosquito nets and eaves curtain against malaria vectors in Tanzania. *Medical and Veterinary Entomology* 1, 37-51.

Lines, J.D., Wilkes, T.J. & Lyimo, E.O. (1991b) Human malaria infectiousness measured by age-specific sporozoite rates in *Anopheles gambiae* in Tanzania. *Parasitology* 102, 167-177.

Lyimo, E. (1987) Chloroquine administration in the treatment of malaria with reference to brands, specification and dosage: A survey in north-eastern Tanzania. *East African Medical Journal* 64, 551-557.

Lyimo, E.O. & Irving-Bell, R.J. (1988) Circadian flight activity of mosquitoes entering and leaving septic tanks in central Nigeria. *Insect Science and its Application* 9, 493-498.

Lyimo, E.O., Msuya, F.H., Rwegoshora, R.T., Nicholson, E.A., Mnzava, A.E., Lines, J.D. & Curtis, C.F. (1991) Trial of pyrethroid impregnated bednets in an area of Tanzania holoendemic for malaria. Part 3. Effects on the prevalence of malaria parasitaemia and fever. *Acta Tropica* 49, 157-163.

Magesa, S.M. (1988) *Testing Methods for Detecting Pyrethroid Resistance.* MSc. Dissertation, University of London, UK., 46 pp.

Magesa, S.M. (1996) Bed curtains made from polypropylene sacking material and impregnated with permethrin as protection against malaria vectors. *Transactions of the Royal Society of Tropical Medicine and Hygiene* 90, 474.

Magesa, S.M. (1999) *Malaria Parasite Dynamics: Epidemiology, Allelic Diversity and Turnover Rates of* Plasmodium falciparum *Infections in Tanzanian Children.* PhD Thesis. University of Copenhagen, 155 pp.

Magesa, S.M., Aina, O. & Curtis, C.F. (1994) Detection of pyrethroid resistance in *Anopheles* mosquitoes. *Bulletin of the World Health Organization* 72, 737-740.

Magesa, S.M., Mdira, K.Y., Babiker, H.A., Alifrangis, M., Farnert, A., Bygbjerg, I.C., Walliker, D. & Jakobsen, P.H. (2000) Diversity and turnover rates of *Plasmodium falciparum* subpopulations infecting children in a holoendemic area, north-eastern Tanzania. *Acta Tropica* (in press).

Magesa, S.M., Mdira, K.Y., Akida, J.A., Bygbjerg, I.C. & Jakobsen, P.H. (2000) Observations on the periodicity of *Plasmodium falciparum* gametocytes in natural human infections. *Acta Tropica* 76, 239-246.

Magesa, S.M., Wilkes, T.J., Mnzava, A.E., Njunwa, K.J., Myamba, J., Kivuyo, M.D., Hill, N., Lines, J.D. & Curtis, C.F. (1991) Trial of pyrethroid impregnated bednets in an area of Tanzania holoendemic for malaria. Part 2. Effects on the malaria vector population. *Acta Tropica* 49, 97-108.

Magnussen, P., Makunde, W., Simonsen, P.E., Meyrowitsch, D. & Jakubowski, K. (1995) Chronic pulmonary disorders, including tropical pulmonary eosinophilia, in villages with endemic lymphatic filariasis in Tanga region and in Tanga town, Tanzania. *Transactions of the Royal Society of Tropical Medicine and Hygiene* 89, 406-409.

Makunde, W.H. (1995) *The Role of Pro-inflammatory Cytokines and Nitric oxide in the Adverse Reaction to Diethylcarbamazine (DEC-C) in Bancroftian Filariasis in Tanzania.* [MTM Dissertation], University of Liverpool, UK., 37 pp.

Makunde, W.H., Salum, F.M., Alilio, M.S. & Massaga, J.J. (2000) The importance of clinical and parasitological aspects of irritable skin itching caused by onchocercal skin disease in Morogoro rural District Tanzania. *Annals of Tropical Medicine and Parasitology* (in press).

Malebo, H.M. (1999) *Antimalarial Flavonoids, Antifungal Pyrones and Hexalobines from Three Annonaceae Species.* MSc. Dissertation, University of Dar es Salaam.

Malima, R.C. (1999) *Sporozoite Rates and Species Identity of Mosquitoes Collected from Highland and Lowland Tanzania.* [MSc. Dissertation], University of London. 53 pp.

Marchand, R.P. (1984) Field observations on swarming and mating in *Anopheles gambiae* mosquitoes in Tanzania. *Netherlands Journal of Zoology* 34, 367-387.

Marchand, R.P. & Mnzava, A.E.P. (1985) A field test of a biochemical key to identify members of the *Anopheles gambiae* group of species in north-east Tanzania. *Journal of Tropical Medicine and Hygiene* 88, 205-210.

Massaga, J.J., Kamugisha, M.L. & Salum, F.M. (2000) Malaria presumptive treatment in Tanzania: Is it a rational approach for malaria management in rural health units in an area with low transmission? *African Journal of Health Sciences* (in press).

Matola, Y.G. (1985) Prospects of human malaria and Bancroftian filariasis infections in the Lower Rufiji Basin, Tanzania I. Malaria. *Tropical and Geographical Medicine* 37, 102-107.

Matola, Y.G. (1985) Prospects of human malaria and Bancroftian filariasis infections in the Lower Rufiji Basin, Tanzania II. Bancroftian filariasis. *Tropical and Geographical Medicine* 37, 108-113.

Matola, Y.G. (1989) Malaria chemosuppression with chloroquine in pregnant women at maternal and child health clinics: Some associated operational problems in parts of Tanzania. *Tanzania Medical Journal* 4,10-12.

Matola, Y.G. (1991) Periodicity of *Dirofilaria immitis* microfilariae in a dog from Muheza district, Tanzania. *Journal of Helminthology* 65, 76-78.

Matola,Y.G., Habluetzel, A., Mkufya, A.R., Irare, S.G. & Esposito, F. (1989) Introduction to, and evaluation of, immunoassays in a malaria research institute in Tanzania. *Transactions of the Royal Society of Tropical Medicine and Hygiene* 83, Suppl: 99-100.

Matola, Y.G. & Magayuka, S.A. (1981) Malaria in the Pare are of Tanzania. V. Malaria 20 years after the end of residual insecticide spraying. *Transactions of the Royal Society of Tropical Medicine and Hygiene* 75, 811-813.

Matola, Y.G., Malle, L.N. (1985) Factors affecting the compliance of malaria chemosuppression with chloroquine at some maternal and child health clinics in Tanga Region, Tanzania. *East African Medical Journal* 62, 720-724.

Matola, Y.G., Mwita, U. & Masoud, A.E. (1984) Malaria in the islands of Zanzibar and Pemba 11 years after the suppression of a malaria eradication programme. *Central African Journal of Medicine* 30, 91-92.

Matola, Y.G., White, G.B. & Magayuka, S.A. (1987) The changed pattern of malaria endemicity and transmission at Amani in the eastern Usambara mountains, north-eastern Tanzania. *Journal of Tropical Medicine and Hygiene* 90, 127-134.

Maxwell, C.A., Myamba, J., Njunwa, K.J., Greenwood, B.M. & Curtis, C.F. (1999) Comparison of bednets impregnated with different pyrethroids for their impact on mosquitoes and on re-infection with malaria after clearance of pre-existing infections with chlorproguanil-dapsone. *Transactions of the Royal Society of Tropical Medicine and Hygiene* 93, 4-11.

Maxwell, C.A., Wakibara, J., Tho, S. & Curtis, C.F. (1998) Malaria-infective biting at different hours of the night. *Medical and Veterinary Entomology* 12, 325-327.

Mboera, L.E.G. (1998) Decision analysis in malaria vector control programmes. *Tanzania Health Research Bulletin* 1, (2) 18-26.

Mboera, L.E.G. (1999) *Chemical ecology of the behaviour of the filariasis mosquito* Culex quinquefasciatus *Say.* [PhD Thesis], Wageningen Agricultural University, The Netherlands, 189 pp.

Mboera, L.E.G., Kihonda, J., Braks, M.A.H. & Knols, B.G.J. (1998) Influence of Centers for Disease Control light trap position, relative to a human-baited bed net, on catches of *Anopheles gambiae* and *Culex quinquefasciatus* in Tanzania. *American Journal of Tropical Medicine and Hygiene* 59, 595-596.

Mboera, L.E.G., Knols, B.G.J., Braks, M.A.H. & Takken, W. (2000) Comparison of carbon dioxide baited trapping systems for sampling outdoor mosquito populations in Tanzania. *Medical and Veterinary Entomology* (in press).

Mboera, L.E.G., Knols, B.G.J., Takken, W. & Della Torre, A. (1997) The response of *Anopheles gambiae s.l.* and *An. funestus* (Diptera: Culicidae) to tents baited with human odour or carbon dioxide in Tanzania. *Bulletin of Entomological Research.* 87, 173-178.

Mboera, L.E.G., Knols, B.G.J., Takken, W. & Huisman, P.W.T. (1998) Olfactory responses of female *Culex quinquefasciatus* Say (Diptera: Culicidae) in a dual-choice olfactometer. *Journal of Vector Ecology* 23, 107-113.

Mboera, L.E.G., Mdira, K.Y., Salum, F.M., Takken, W. & Pickett, J.A. (1999) Influence of synthetic oviposition pheromone and volatiles from soakage pits and grass infusions upon oviposition site-selection of *Culex* mosquitoes in Tanzania. *Journal of Chemical Ecology* 25, 1855-1865.

Mboera, L.E.G., Pedersen, E.M., Salum, F.M., Msuya, F.H. & Sambu, E.Z. (1997) Transmission of malaria and bancroftian filariasis in Magoda, north-east Tanzania. *Malaria and Infectious Diseases in Africa* 7, 61-67.

Mboera, L.E.G., Sambu, E.Z. & Wakibara, J.V. (1997) Cattle water troughs as sources of culicine mosquitoes in north-east Tanzania. *Tanzanian Veterinary Journal,* 17, 18-22.

Mboera, L.E.G. & Takken, W. (1997) Carbon dioxide chemotropism in mosquitoes (Diptera: Culicidae) and its potential in vector surveillance and management programmes. *Review of Medical and Veterinary Entomology* 85, 355-368.

Mboera, L.E.G. & Takken, W. (1999) Odour-mediated host preference of *Culex quinquefasciatus* in Tanzania. *Entomologia Experimentalis et Applicata* 92, 83-88.

Mboera, L.E.G., Takken, W., Mdira, K.Y., Chuwa, G.J. & Pickett, J.A. (2000) Oviposition and behavioural responses of *Culex quinquefasciatus* to skatole and synthetic oviposition pheromone in Tanzania. *Journal of Chemical Ecology* 26, 1193-1203.

Mboera, L.E.G., Takken, W., Mdira, K.Y. & Pickett, J.A. (2000) Sampling gravid *Culex quinquefasciatus* in Tanzania with traps baited with synthetic oviposition and grass infusions. *Journal of Medical Entomology* 172-176.

Mboera, L.E.G., Takken, W. & Sambu, E.Z. (2000) The response of *Culex quinquefasciatus* (Diptera: Culicidae) to traps baited with carbon dioxide, 1-octen-3-ol, acetone, butyric acid and human foot odour in Tanzania. *Bulletin of Entomological Research* 90, 155-159.

McGreevy, P.B., Kolstrup, N., Tao, J., McGreevy, M.M. & Marshall, T.F.C. (1982) Ingestion and development of *Wuchereria bancrofti* in *Culex quinquefasciatus, Anopheles gambiae* and *Aedes aegypti* after feeding on humans with varying densities of microfilariae in Tanzania. *Transactions of the Royal Society of Tropical Medicine and Hygiene* 76, 288-296.

McMahon, J.E. (1981) A note on drug trial in schistosomiasis. *Transactions of the Royal Society of Tropical Medicine and Hygiene* 75, 597-598.

McMahon, J.E. (1981) Chemotherapy with diethylcarbamazine and levamisole in bancroftian filariasis. *Tropenmedizin und Parasitologie* 32, 250-252.

McMahon, J.E. (1982) The examination—time /dose interval in the provocation of nocturnally periodic microfilariae of *Wuchereria bancrofti* with diethylcarbamazine and the practical use of the test. *Tropenmedizin und Parasitologie* 33, 28-30.

McMahon, J.E. (1983) A comparative trial of praziquantel, metrifonate and niridazole against *Schistosoma haematobium*. *Annals of Tropical Medicine and Parasitology* 77, 139-142.

McMahon, J.E., Magayuka, S.A., Kolstrup, N., Mosha, F.W., Bushrod, F.M., Abaru, D.E. & Bryan, J.H. (1981) Studies on the transmission and prevalence of bancroftian filariasis in four coastal villages of Tanzania. *Annals of Tropical Medicine and Parasitology* 75, 415-431.

Metzger, W.G., Maxwell, C.A. & Curtis, C.F. (1998) Anti-sporozoite immunity and impregnated bednets in Tanzanian villages. *Annals of Tropical Medicine and Parasitology* 92, 727-729.

Meyrowitsch, D.W. (1995) *Studies on the Epidemiology and Control of Bancroftian Filariasis in Tanga Region, North-eastern Tanzania*. [PhD Thesis], University of Copenhagen, Denmark, 138 pp.

Meyrowitsch, D.W. & Simonsen, P.E. (1998) Long-term effect of mass diethylcarbamazine chemotherapy on bancroftian filariasis: results four years after start of treatment. *Transactions of the Royal Society of Tropical Medicine and Hygiene* 92, 98-103.

Meyrowitsch, D.W., Simonsen, P.E. & Makunde, W.H. (1995) A 16-year follow-up-study on bancroftian filariasis in three communities of north-eastern Tanzania. *Annals of Tropical Medicine and Parasitology* 89, 665-675.

Meyrowitsch, D.W., Simonsen, P.E. & Makunde, W.H. (1996) Mass diethylcarbamazine chemotherapy for control of bancroftian filariasis: comparative efficacy of standard treatment and two semi-annual single-dose treatments. *Transactions of the Royal Society of Tropical Medicine and Hygiene* 90, 74-79.

Mnzava, A.P. (1991) *Epidemiology and Control of Malaria Transmission by Residual House Spraying with DDT and Lambdacyhalothrin in two Populations of the* Anopheles gambiae *complex in Tanga Region, Tanzania*. [PhD Thesis], University of Basel, Switzerland.

Mnzava, A.E.P. & Curtis, C.F. (1989) Test for variation in flight activity between chromosome inversion types within *Anopheles gambiae sensu stricto*. *Insect Science and its Application* 10, 513-520.

Mnzava, A.E.P. & Di Deco, M. (1986) Polimorfismo cromosomico in *Anopheles gambiae* e *Anopheles arabiensis* in Tanzania. *Parassitologia* 28, 286-288.

Mnzava, A.E.P. & Kilama, W.L. (1986) Observations on the distribution of species of the *Anopheles gambiae* in Tanzania. *Acta Tropica* 43, 277-288.

Mnzava, A.E.P., Kilama, W.L. & Kasigwa, P.F. (1989) Application of a biochemical key to study transmission of malaria and bancroftian filariasis in sibling species of the *Anopheles gambiae* complex in north-eastern Tanzania. *Acta Tropica* 46, 323-333.

Mosha, F.W. (1981) *Transmission and Control of Bancroftian Filariasis Using Diethylcarbamazine in an Area with a Predominant Anopheline Mosquito Population*. [PhD Thesis], University of Dar es Salaam, Tanzania, 343 pp.

Msangeni, H.A. (1995) *The Response of* Plasmodium falciparum *to Chloroquine, Amodiaquine and Sulfadoxine-pyrimethamine in Muheza, North-eastern Tanzania*. [MTM Dissertation], University of Liverpool, UK.

Msangeni, H.A., Irare, S.G.M., Mtui, S.N. & Malima, R.C. (1998) Re-assessment of chloroquine and amodiaquine for the treatment of falciparum malaria in under five children in Muheza, Tanzania. *Tanzania Health Research Bulletin* 1 (2) 14-15.

Muro, A.I.S. & Raybould, J.N. (1990) Population decline of *Simulium woodi* and reduced onchocerciasis transmission at Amani, Tanzania, in relation to deforestation. *Acta Leidensia* 59, 153-159.

Muro, A.I.S. & Mziray, N.R. (1990) Decline in onchocerciasis in the Eastern Usambara Mountains, north eastern Tanzania, and its possible relationship to deforestation. *Acta Leidensia* 59, 141-150.

Mutabingwa, T.K. (1993) *Studies on Malaria Chemosuppression During Pregnancy in Tanzania*. [PhD Thesis]. University of Amsterdam, The Netherlands.

Mutabingwa, T.K., Kilimali, V.A.E.B. & Kilama, W.L. (1986) Chloroquine resistant *Plasmodium falciparum* at the Tanganyika Planting Company (TPC) sugar estate, Moshi, Tanzania. *Tanzania Medical Journal* 3, 26- 30.

Njunwa, K.J. (1993) *Studies on the Productivity of Anopheles Breeding Sites in Relation to Adult Mosquito Density*. Ph.D. Thesis, University of London, UK.

Njunwa, K.J., Lines, J.D., Magesa, S.M., Mnzava, A.E., Wilkes, T.J., Alilio, M., Kivumbi, K. & Curtis, C.F. (1991) Trial of pyrethroid impregnated bednets in an area of Tanzania holoendemic for malaria. Part 1. Operational methods and acceptability. *Acta Tropica* 49, 87-96.

Njunwa, K.J., Mwaiko, G.L., Kilonzo, B.S. & Mhina, J.I. (1989) Seasonal patterns of rodents, fleas and plague status in the Western Usambara Mountains, Tanzania. *Medical and Veterinary Entomology* 3, 17-22.

Perlmann, P., Perlmann, H., Flyg, B.W., Hagstedt, M., Elghazali, G., Worku, S., Fernandez, V., Rutta, A.S.M. & Troye-Blomberg, M. (1997) Immunoglobulin E, a pathogenic factor in *Plasmodium falciparum* malaria. *Infection and Immunity* 65, 116-121.

Procunier, W.S., Maegga, B.T.A., Raybould, J.N., Muro, A.I.S. & Sheley, A.J. (1987) Cytological identification of anthropophilic *Simulium damnosum* Kibwezi form (Diptera: Simuliidae) a potential vector of human onchocerciasis in north-eastern Tanzania. *Tropenmedizin und Parasitologie* 38, 70.

Ragoonanasigh, R.N., Njunwa, K.J., Curtis, C.F. & Becker, N. (1991) A field study of *Bacillus sphaericus* for control of culicine and anopheline mosquito larvae in Tanzania. *Bulletin of the Society of Vector Ecology* 17, 79-83.

Rønn, A.M., Lemnge, M.M., Angelo, H.R. & Bygbjerg, I.C. (1996) High performance liquid chromatography determination on dapsone, monoacetyldapsone and pyrimethamine in filter paper blood spots. *Therapeutic Drug Monitor ing*17, 79-83.

Rønn, A.M., Msangeni, H.A., Mhina, J., Wernsdorfer, W.H. & Bygbjerg, I.C. (1996) High level of resistance of *Plasmodium falciparum* to sulfadoxine-pyrimethamine in children in Tanzania. *Transactions of the Royal Society of Tropical Medicine and Hygiene* 90, 179-181.

Rønn, A.M., Mutabingwa, T.K., Kreisby, S., Angelo, H.R., Fuursted, K. & Bygbjerg, I.C. (1999) A reversed-phase high performance liquid chromatography method for the determination of cotrimoxazole (Trimethoprim/ sulfamethoxazole) in children treated for malaria. *Therapeutic Drug Monitoring* 21, 609-614.

Rutta, A.S. (1999) *Cytokine Response and Genetic Regulation in Children and Adult with Cerebral Malaria Disease.* MSc. Dissertation, Mahidol University, Thailand.

Rwegoshora, R.T. (1988) *Infection and Transmission of Densovirus in Anopheles minimus in Relation to Local Distribution in Kanchanaburi Province,* MSc. Dissertation, Mahidol University, Thailand.

Rwegoshora, R.T. (2000) Lack of cross-resistance between DDT and permethrin in *Anopheles gambiae s.l.* from Zanzibar, Tanzania. *Medical and Veterinary Entomology* 14, (in press).

Rwegoshora, R.T., Baisley, K.J. & Kittayapong, P. (2000) Seasonal and spatial variation in Densovirus infection in *Anopheles minimus s.l.* in Thailand. *South-east Asia Journal of Medical Research* 31, 3-9.

Salum, F.M. (1991) *Determination of Risk Factors Associated with Abundance of* Anopheles gambiae *Population Density in Saruja Village, The Gambia.* MSc. Dissertation, University of London, UK.

Salum, F.M., Wilkes, T.J., Kivumbi, K. & Curtis, C.F. (1994) Mortality of under fives in a rural area of holoendemic malaria transmission. *Acta Tropica* 58, 29-34.

Shabani, R.A. & Mboera, L.E.G. (2000) The impact of urban dairy cattle farming on mosquito productivity in Tanga, north-east Tanzania. *Tanzanian Veterinary Journal* 20, (in press).

Simonsen, P.E. Lemnge, M.M., Msangeni, H.A., Jakobsen, P.H. & Bygbjerg, I.C. (1996) Bancroftian filariasis: the patterns of filarial-specific immunoglobulin G1 (IgG1), IgG4, and circulating antigens in an endemic community of north-east Tanzania. *American Journal of Tropical Medicine and Hygiene* 55, 69-75.

Simonsen, P.E., Meyrowitsch, D.W. & Makunde, W.H. (1997) Bancroftian filariasis: long-term effect of the DEC provocative day test on microfilaraemia. *Transactions of the Royal Society of Tropical Medicine and Hygiene* 91, 290-293.

Simonsen, P.E., Meyrowitsch, D.W., Makunde, W.H. & Magnussen, P. (1995) Selective diethylcarbamazine chemotherapy for control of bancroftian filariasis in two communities of Tanzania: compared efficacy of a standard dose treatment and two semi-annual single dose treatments. *American Journal of Tropical Medicine and Hygiene* 53, 267-272.

Skjelbo, E., Mutabingwa, T.K., Bygbjerg, I., Nielsen, K.K., Gram, L.F. & Brosen, K. (1996) Chloroguanide metabolism in relation to the efficacy in malaria prophylaxis and the S-mephentoin oxidation in Tanzanians. *Clinical Pharmacology and Therapeutics* 59, 304-311.

Steketee, R.W. & Mutabingwa, T.K. (1999) Malaria in pregnant women: research, epidemiology, policy and practice. *Annals of Tropical Medicine and Parasitology* 93, S7-S9.

Takken, W. & Mboera, L.E.G. (2000) Effects of chemical stimuli on oviposition of *Culex quinquefasciatus* (Diptera: Culicidae) in Tanzania. *Proceedings of Experimental and Applied Entomology.* Netherlands Entomological Society. 11, 181-188.

Temu, S.E. & McMahon, J.E. (1981) Chemotherapy with spaced doses of diethylcarbamazine preceded by levamisole in bancroftian filariasis. *Transactions of the Royal Society of Tropical Medicine and Hygiene* 75, 835-837.

Trigg, J.K. (1996) Evaluation of eucalyptus-based repellent against *Anopheles* spp. in Tanzania. *Journal of the American Mosquito Control Association* 12, 243-246.

Trigg, J.K., Mbwana, H., Chambo, O., Hills, E., Watkins, W. & Curtis, C.F. (1997) Resistance to pyrimethamine-sulfadoxine in *Plasmodium falciparum* in 12 villages in north east Tanzania and a test of chlorproguanil/ dapsone. *Acta Tropica* 63, 185-189.

Wakibara, J.V., Mboera, L.E.G. & Ndawi, B.T. (1997) Malaria in Mvumi, central Tanzania and the *in vivo* response of *Plasmodium falciparum* to chloroquine and sulfadoxine pyrimethamine. *East African Medical Journal* 74, 69-71.

Warsame, M., Kilimali, V.A.E.B., Wernsdorfer, W.H., Lebbad, M., Rutta, A.S. & Ericsson, O. (1999) Resistance to chloroquine and sulfadoxine-pyrimethamine in *Plasmodium falciparum* in Muheza district, Tanzania. *Transactions of the Royal Society of Tropical Medicine and Hygiene* 93, 312-313.

Warsame, M., Wernsdorfer, W.H., Perlmann, H., Lebbad, M., Ericsson, O., Matola, Y.G., Troye-Blomberg, M., Perlmann, P. & Berzins, K. (1997) A malariometric survey in a rural community in the Muheza district, Tanzania: age profiles in the development of humoral immune responses. *Acta Tropica* 68, 239-253.

Weenen, H., Nkunya, M.H.H., Bray, D.H., Mwasumbi, L.B., Kinabo, L.S. & Kilimali, V.A.E.B. (1990) Antimalarial activity of Tanzanian medicinal plants. *Planta Medica* 56, 368-370.

Wernsdorfer, M.G., Landgraf, B., Kilimali, V.A.E.B. & Wernsdorfer, W.H. (1998) Activity of benflumetol and its enantiomers in fresh isolates of *Plasmodium falciparum* from East Africa. *Acta Tropica* 70, 9-15.

Wilkes, T.J., Matola, Y.G., & Charlwood, J.D. (1996) *Anopheles rivulorum*, a vector of human malaria in Africa. *Medical and Veterinary Entomology* 10, 108-110.