WHO/GATES PROJECT ON MALARIA VECTOR BIOLOGY & CONTROL

Malaria vector control: Filling the gap between product development and effective delivery

TANZANIA REPORT

October, 2009

1. BACKGROUND

1.1 Malaria in Tanzania

In Tanzania malaria is the leading cause of morbidity and mortality, especially in children under five years (MoH, 2006). The disease ranks number one in both outpatient and inpatient statistics. The socioeconomic impact of malaria is so high that it contributes highly to poverty and underdevelopment (Mboera et al., 2007). Malaria is the single most significant disease in Tanzania affecting the health and welfare of its 37.6 million inhabitants. The climatic conditions are favourable for mosquito breeding almost throughout the country. The transmission is stable perennial to stable seasonal in over 80% of the country and about 20% of the population live in unstable malaria transmission areas prone to frequent malaria epidemics.

The number of clinical malaria cases per year is estimated to be 17–20 million resulting in approximately 100,000 deaths. The population groups most vulnerable to malaria are children under five years and pregnant women, due to their particular immunity status. However, all age groups are equally susceptible in epidemic prone areas. The goal of the proposed NMCP strategic plan (2008-2013) is to reduce the burden of Malaria by 80% by the end of 2013 from current levels.

During the past decade, malaria control in Tanzania has relied solely on case management and insecticide treated nets. Recently, efforts to control malaria using indoor residual spraying (IRS) and larviciding have been revived. Currently the use of indoor residual spraying is restricted to five epidemic prone districts and larviciding to the Dar es Salaam city only.

1.2 Project Rationale and Objectives

The currently used insecticides in malaria vector control have been available for many years and there is an extensive experience in their performance and the manner in which they should be used under different epidemiological situations. When new insecticides become available, and with the urgency imposed by the current situation of resistance, there will be a need to rapidly introduce them in the package of vector control program and carefully monitor their performance under local circumstances.

The B&M Gates Foundation is involved in the development of new or improved insecticide products for malaria & dengue vector control. It is essential to ensure that conditions are met at country level to allow optimal use of available and newly developed insecticide products in order to safeguard immediate and long-term benefit of these tools. This requires that malaria endemic countries have the necessary capacity to use it properly and to prevent the development of resistance in malaria vectors, or when resistance is recognized, to deploy effective resistance management tactics. Therefore, the National programs require scientific support from local research institutes at the initial stages of use of these new insecticides. Such institutions must be well prepared to provide such services.

The B&M Gates Foundation through WHO funded the project on "Malaria Vector Control: filling the gap between product development and effective delivery" in seven African countries. Tanzania is one of those countries. The overall goal of the project is to strengthen national capacities for an effective delivery of vector control interventions in order to safeguard the efficacy of current tools and to ensure a smooth introduction of newly developed tools into malaria control packages. Specific objectives of the project are: (i) to strengthen infrastructure, technical and institutional capacities for effective vector control in malaria endemic countries, with a particular emphasis on resistance management; (ii) to facilitate collaboration between control programs and in country research institutes for the sound collection, analysis interpretation and use of entomological information for decision making in vector control and (iii) to facilitate the harmonization of methodologies and protocols in entomological monitoring and support to countries in adopting it.

The project requires advanced and high level vector surveillance activities related to the identification of operational research needs, selection of sentinel sites for resistance testing and monitoring, studies on vector behaviour, biochemical and molecular assays for vector incrimination, determination of the genetic structure of vector populations and characterization of resistance mechanisms, data analysis and interpretation, and operational research. This is the vocation of research institutes that have to be the scientific support arm to national malaria control program (NMCP). The NMCP in Tanzania has indentified and developed a formal collaboration with National institute for Medical Research (NIMR), Amani centre to provide the technical / scientific support to the programme.

2. METHODOLOGY

2.1. Developing Update Country Database on the Status of Malaria Vectors Resistance to Insecticides

This was done through insecticide resistance surveillance activities in 13 selected sentinel districts by the pre-trained data collectors**.** The activity commenced in late December 2008 and continued in the year two of the project using the funds for year one. The delayed onset of the rain season in some sentinel districts continued to be a constraint. So far insecticide resistance surveillance have been completed in 11 sentinel districts (Moshi, Handeni, Kyela, Kilombero, Muheza, Ilala, Mvomero, Arusha, Babati, Lushoto and Uyui); and is the arrangements are underway to have it done in another 3 (Magu, Muleba and Dodoma) [refer Fig. 1 for the distribution of these sentinel sites].

2.1.1 Sample collection and mosquito identification

Indoor resting blood-fed adult female Anopheline were collected in houses using aspirators and kept in paper cups, during the hours of 6a.m. to 9a.m. The collected mosquitoes were transported to the stationed laboratory for testing. The wild caught mosquitoes were fed with 6-10% sugar solution embedded in a cotton wool while being transported from the field. Caught mosquitoes were morphologically identified using identification key (Gillies and Coetzee, 1987; Gillies and De Meillon, 1968) before testing.

2.1.2 Insecticide susceptibility tests

The susceptibility tests were carried out using the World Health Organisation (WHO) standard method (WHO, 1998). The papers impregnated with the WHO-recommended discriminating dosages of 0.75% Permethrin, 0.05% Deltamethrin, 0.05% Lambdacyhalothrin and 4% D.D.T were used for the test.

Tested mosquitoes were preserved with *silica gel* in 1.5 ml eppendorf tubes and transported to Amani Medical Research Centre for detection of biochemical and molecular mechanisms of insecticide resistance and molecular identification.

2.1.3 Local insecticide use

A questionnaire focusing on the history of insecticide use i.e. types of the insecticides used, mode and frequency of application and on the kinds of crops and animals on which insecticides were used was administered to agriculture and public health officers in the districts. In addition a survey of shops and agrovet stores was conducted to take an inventory of insecticides available on the market during the time of the study.

2.2. Strengthening infrastructure, technical and institutional capacities for effective vector control in malaria endemic countries, with a particular emphasis on resistance management

2.2.1. Supply of laboratory equipments and supply needed to meet advanced or high level capacity requirements

The equipments and supplies earmarked to strengthen the NRU for year one and two of the project have all been received by WHO country office and delivered to NRU, Amani centre for installation/use. There were some equipments and supplies earmarked to strengthen the NMCP laboratory and NRU for the second year of the project. However, the NMCP failed to obtain a room to convert it to an insectary. It was therefore agreed that the laboratory equipments and supplies earmarked for NMCP to be given to NRU to strengthen its insectary capacity

2.2.2. Hands-on training of field implementers on basic entomology and insecticide resistance surveillance in malaria vectors

The Amani Medical Research Centre of the National Institute for Medical research in collaboration with the National Malaria Control Programme (NMCP) indentified the **11** focal personnel for training and conducted a one week hands-on training workshop of field implementers on basic entomology and insecticide resistance surveillance between 3rd and 8th November 2008 at Amani Medical Research Centre (National Reference Unit for the project) in Tanga. This was part of the preparation towards the implementation of a surveillance activity on malaria vectors resistance to insecticides in the country. The major aim of this training was to impart basic entomological skills, with a particular emphasis on resistance management to the technical staff of malaria control program. Training on basic entomological skills included mapping and characterization of breeding sites (in areas where larvicides can potentially be used), adult mosquito

collection and morphological identification, vector density, susceptibility testing, malaria vector control and resistance management. The trainees gained this knowledge through lectures and through laboratory and field practicals. In the implementation of surveillance activities, the trainees transferred this knowledge to the malaria focal persons in the 13 selected sentinel districts. Though this was the project activity for the 1st year of the project, it continued in the 2nd year. This is because the implementation of surveillance activities to update the country database on the status of malaria vectors resistance to insecticides has been continuing in this 2nd year.

2.2.3 Training of NMCP staff on insectary practices and surveillance skills

The NRU provided training to all NMCP Officers from the vector control cell in insectary management and vector surveillance for two weeks.

2.3. To Facilitate the Development, Harmonization and use of Methodologies and Decision Support Systems

The NRU organized the standardization workshop on "Standard procedures for surveillance of disease vectors within the context of integrated disease surveillance and integrated vector management". The SOP has been revised and adapted accordingly to fit the local settings for vector surveillance activities. Similarry the SOP was pretested in the field using the normal insecticide resistance surveillance activities in the sentinel districts. The purpose of the SOP is to improve the implementation of vector surveillance activities in the national disease control programmes through the harmonization of existing entomological methods and procedures with the Integrated Disease Surveillance and Response (IDSR) guidelines.

The NRU, NMCP and the project officer have been hand in hand with PMI/RTI to provide technical advice in planning and implementation of entomological monitoring in Kagera region where the same SOP is used in the monitoring.

2.4. To Develop Country Capacities to Evaluate and Introduce New Tools in Malaria Vector Control including Insecticides and Technologies

A one week training workshop on the familiarisation of WHOPES guidelines and procedures was conducted in August 2009 in Tanga city. A total of 12 participants from

different institutions working on vector control benefited from the workshop. Senior Research Scientists with trainings and knowledge of WHOPES guidelines and procedures from Amani Medical Research Centre (NRU) facilitated the workshop.

The NRU using its staff trained on WHOPES guidelines and procedures is currently evaluating Syngenta LN and Icon maxx products. Syngenta LN trial is the WHOPES phase II trial to evaluate if Syngenta LN product meets WHO criteria for Long-lasting net while Icon Maxx is in phase I trial to evaluate its efficacy as treatment kit on different netting materials.

2.5 Coordination and evaluation

The WHO/IS evaluation mission was provided between 23rd and 29th August 2009 by Dr. John Govere (VBC/IST ESA) with the aim of providing technical support and assessing the level of implementation of WHO/Gates project activities for the second fiscal year ending August 2009. The WHO/AFRO mission was satisfactory with level of implementation of WHO/Gates project activities in Tanzania. However, two recommendations were made, namely (1) the WHO HQ to speed up purchase and delivery of reagents and PCR primers to allow identification of mosquitoes that were collected from the sentinel sites, and (2) WCO and AFRO to extend the contract of the Project Officer to avoid disruption of project implementation

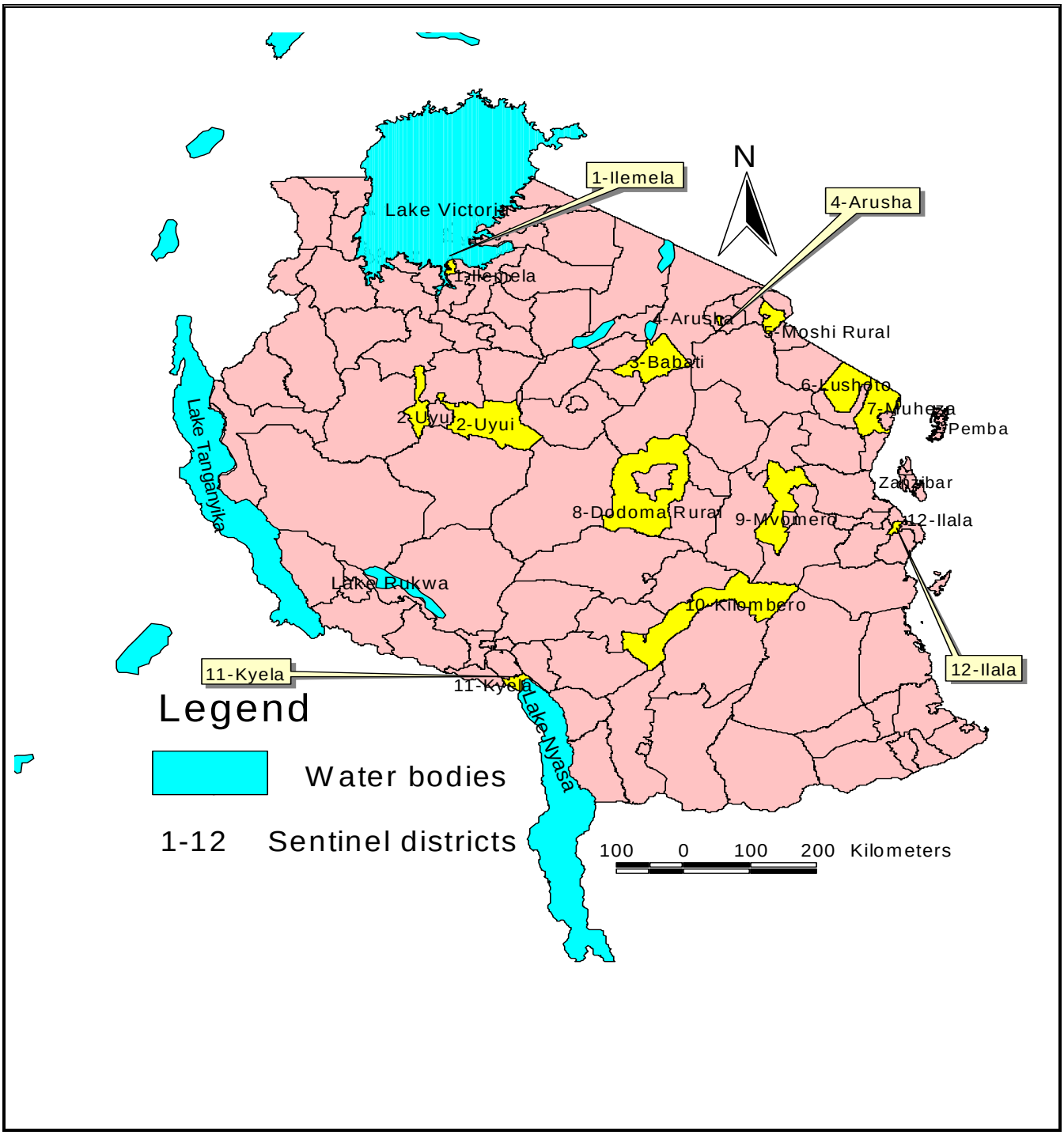

Figure 1: Map of Tanzania showing the distribution of the sentinel districts

3. RESULTS

3.1. Susceptibility tests

A total of 5166 female *Anopheles gambiae* mosquitoes were tested for susceptibility to deltamethrin (0.05%), permethrin (0.75%), Lambdacyhalothrin (0.05%)or DDT (4%) in 11 different sentinel districts which we have received results. The preliminary results are shown in figures 2-5 below. The susceptibility status of mosquito populations was based on decrease of mortality rates according to WHO criteria (WHO, 1998). In addition, knockdown time (KDT) status which is known to be a more sensitive measure of susceptibility changes will be estimated (Etang *et al,* 2003).

Results from all of the sites recorded reduced susceptibility to Lambdacyhalothrin. The mortality due to exposure to Lambdacyhalothrin ranged from 71.3% to 94.7%. DDT recorded high susceptibility in all sites except Kyela & Ilala where mortality rate of 90.4% and 66% was recorded respectivelly. Similarly, reduced susceptibility to permethrin and deltamethrin were recorded in Handeni and Ilala districts. The fact that reduced susceptibility to insecticide tested was recorded in some districts, is an indication of presence of low level frequency of resistance in Tanzania as recently reported by Kulkarni et al (2006). This observation calls for vigilant monitoring of malaria vectors for their susceptibility to pyrethroids. It is our hope that this data will serve as a baseline for malaria vector resistance management in Tanzania.

The "full" resistance data from these sentinel districts are being analysed to make a country database and will be shared soon together with data from other sentinel districts where the surveillance is ongoing. Similarly, the analytical technical report will be available after that.

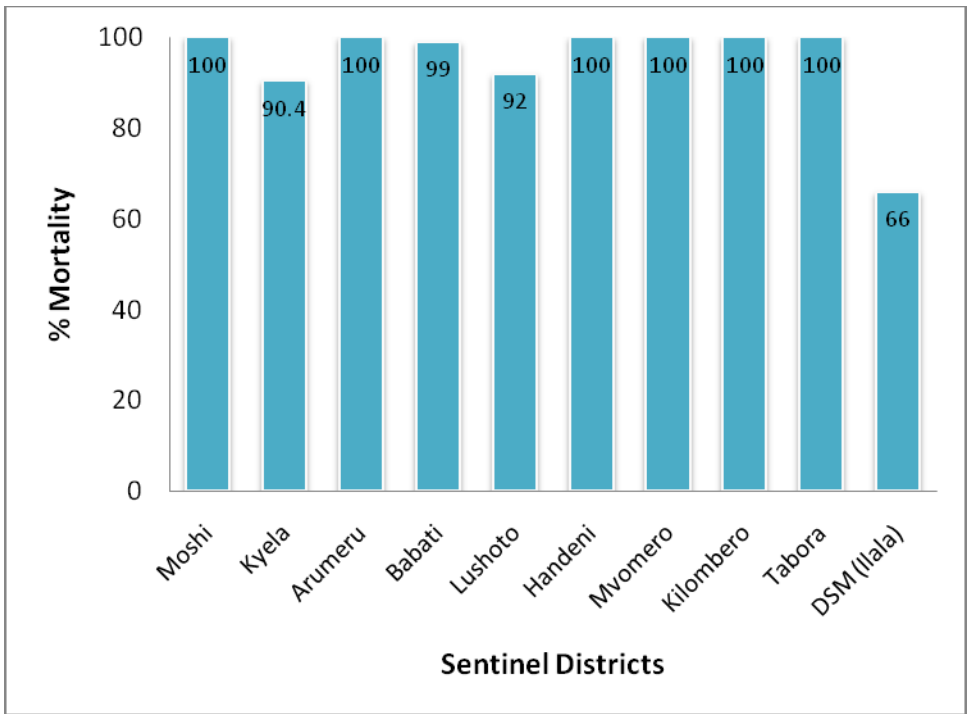

Figure 2: Susceptibility status of anopheles mosquitoes to 4% DDT

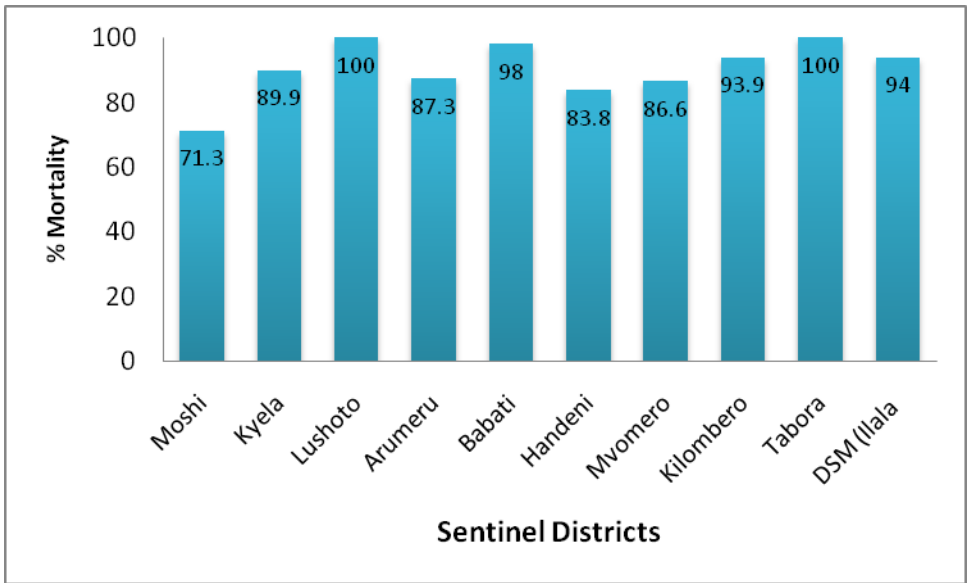

Figure 3: Susceptibility status of anopheles mosquitoes to 0.05% Lambdacyhalothrin

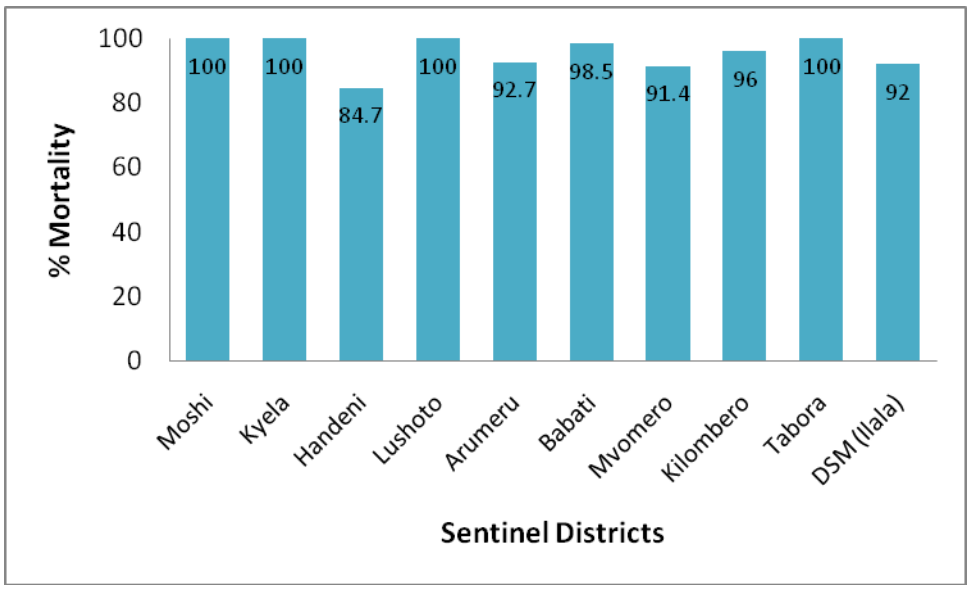

Figure 4: Susceptibility status of anopheles mosquitoes to 0.75% Permethrin

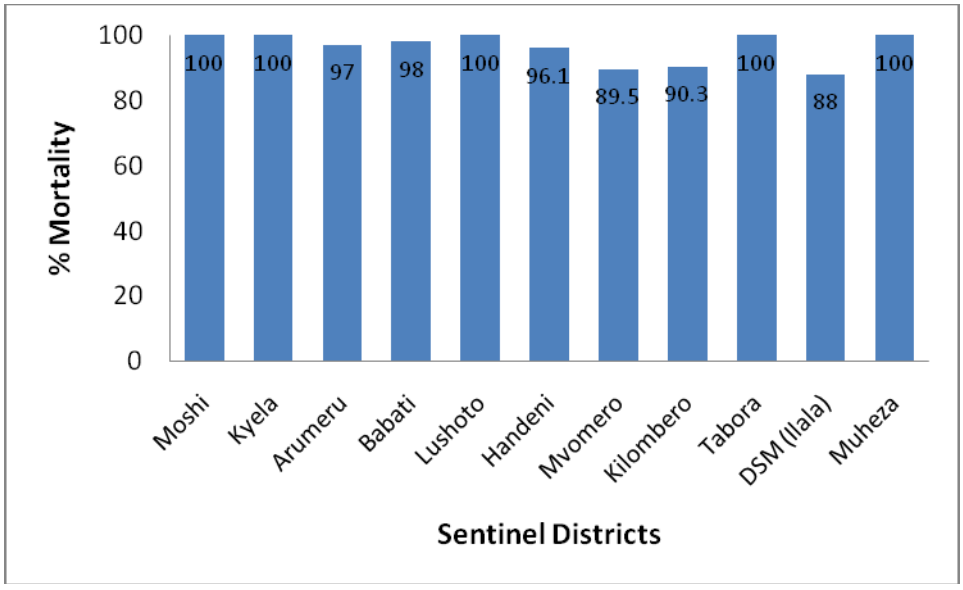

Figure 5: Susceptibility status of anopheles mosquitoes to 0.05% Deltamethrin

3.2. Insecticide usage

Responses from interviews with agriculture and public health officers in the districts revealed a long history of insecticide use. Crops for which insecticides are applied include maize, tomatoes, coffee, beans, rice and vegetables. Animal species sprayed with insecticide are cattle and poultry. In public health, insecticides are used for control of mosquitoes, houseflies, cockroaches, bedbugs and lice. Modes of application include spraying and fumigation in homes, guesthouses and hostels, restaurants, hospital wards and grain stores. The detailed list of insecticides in use from these sites is shown in the table 2 below. The history of these insecticides usage in agriculture and public health is important determinant of the development of insecticide resistance to malaria vectors.

Table 1: Inventory of Pesticide Usage

(a) Pesticide use in public health

1. Adulticides:

Pesticide	Steladone	Tixfix	Paranex 100 EC	Ecofleece	Akheri powder	Cistine
Latest Yr introduced	Mid 1980s	1990s	1990s	1990s	Late 1990s	1990s
Active ingredients and Formulation	Chlorphenviphos as EC	Amitraz 12.5% as EC	Alphacypemethrin 100 EC	Cypermethrin 10% w/v as EC	Lambdacyhalothrin 0.1% and carbaryl 5% (powder)	Deltamethrin 2.5% as EC
Dosage	35ml in each 20ltrs of water in spray pumps. 1:600 in cattle dip	1 litre in 500 litres of water	2.5ml in 5litres of water	1:1000 for cattle dip	Dusting the animal and its house	60ml in 5litres of water
Frequency	Once a week	Once a week	Twice per month	Once every 2 weeks	Once but may repeat when necessary	Once every 8 weeks
Total rounds	-	-	-	-	-	-

Adulticides (continued):

Pesticide	Icon 10 WP	Iconet	Rungu	X-Pel	Bigtox/Hatari	Super-Doom
Latest Yr introduced	Late 1990s	Around 2000	Late 1990s	1970s	Recently after 2000	Late 1990s
Active ingredients and Formulation	Lambda-cyhalothrin 100g/kg as wettable powder	Lambda-cyhalothrin 25g/litre as microcapsule suspension	Aerosol of fenitrothion, permethrin and tetramethrin	Aerosol of pyrethrum 1%, piperonyl butoxide 1.3%	Aerosol of Fenitrothion 0.8%(w/w), Tetramethrin 0.2%(w/w), piperonyl butoxide	Aerosol of tetramethrin 0.23% (w/w) and deltamethrin 0.015%(w/w)

					1.0% (w/w) and inert ingredients 98%(w/w).	
Dosage	62.5g in 8-10litres of water	10mg/m^3 of the mosquito netting	Space spray for ten seconds and then leave doors and windows closed for 10 minutes	Space spray for 3-5 seconds and then leave doors and windows closed for 10 minutes	Space spray for 3-5 seconds and then leave doors and windows closed for 10 minutes.	Space spray for ten seconds and then leave doors and windows closed for 10 minutes
Frequency	Every three months	Every six months	Once a day up to once a week	Once a day up to once a week	Once a day up to once a week	Once a day up to once a week
Total rounds	-	-	-	-	-	-

Adulticides (continued)

Pesticide	**RISASI**	**RAID-IT**	**RED CANS**	**NGAO**	**BAYGON**
Year introduced	1990s	Recently after 2000	Not sure	Around 2000	Late 1990s
Formulation	Aerosol of tetramethrin 0.2%, cypermethrin 0.12%, piperonyl butoxide 0.6%, perfume 0.08%, colourless kerosine 31%, butane 68%	Aerosol of tetramethrin 0.3%, cypermethrin 0.1% and propoxur 0.74%	Aerosol of pyrethrum pale extract 2.5%, piperonyl butoxide 2% and permethrin 0.105%	1.6g of K-O TAB containing 25% deltamethrin	Aerosol of propoxur
Dosage	Space spray for 3-5 seconds and then leave doors and windows closed for 10 minutes	Space spray for 10 seconds and then leave doors and windows closed for 10 minutes	Space spray for 10 seconds and then leave doors and windows closed for 10 minutes	25mg/m^3 of the mosquito netting	Space spray for 10 seconds and then leave doors and windows closed for 10-15 minutes
Frequency	Once a day up to once a week	Once a day up to once a week	Once a day up to once a week	Every six months	Once a day up to once a week
Total rounds	-	-	-	-	

(b) Agricultural Pesticides

Pesticide	Gramaxone	Actellic 50 EC	Actellic super Powder / Stocal Super Dust	Desis	Selecron	Fenizol
Year introduced	1980s	1990s	1990s	1990s	1990s	1990s
Method of application	Spraying	Spraying	Powdering the grains	Spraying grains for preservation	Spraying	Spraying
Crop protected	Coffee, beans	Vegetables	Grains eg. Maize, beans.	Grains eg. Maize, beans.	Cabbages, citrus, tomatoes, potatoes, coffee and onions	Cabbages, beans, tomatoes, potatoes, and coffee
Formulation	276g Paraquat dichloride	EC of Pyrimifos methyl 500g/L(50%w/v)	Powder of Pyrimifos methyl 16g/kg and permethrin 3g/kg	Tablet of Deltamethrin 25%w/w	EC of profenfos premium grade organophosphate 500g/l(50%w/v)	EC of fenvalerate 200g/l(20%w/v)
Dosage	100ml in 15litres of water	1-2litres per hectare	100g per 90kg bag of grain	Two tablets per 5 litres of water to preserve 90kg of grains	Varies from100ml to 1litre in 15-20 litres of water	Varies from100ml to 1litre in 15-20 litres of water
Frequency	Every three months for coffee	Once per month	Every 8 months	Once a year	Every three months for coffee	Every three months for coffee
Total rounds	-	-	-	-	-	-

Agricultural Pesticides (continued)

Pesticide	Pyrex 48EC	Thionex 35EC	2-4-D
Year introduced	1990s	1990s	1990s
Method of application	Spraying	Spraying	Spraying
Crop protected	Maize	Coffee, citrus and tea.	Rice

Formulation	EC of chloropyrifos 480g/l(48%w/v**)**	EC of endosulfan 350g/l(35%w/v)	Dimethylamine salts of 2,4-dichlorophenoxy acetic acid 86.4% as EC
Dosage	1.5-2 litres per hectare for 20-30ml in 20 litre of water	1.5-2 litres per hectare for 20-30ml in 20 litre of water	100ml in 15-20litres of water
Frequency	Twice per cropping season		Once-twice a year
Total rounds	-	-	-

(c) Some Herbicides used in agriculture

Herbicide	**Basagram**	**Stomp 500 EC**	**Round-up**
Year introduced	1990s	Not sure	1980s
Crop protected	Rice	Maize, sunflower, potatoes	Rice
Formulation	Bentozone (160g/L) and propanil (340g/L) as EC	N-(1-ethylpropyl) 3,4-dimethl -2, 6 dinitrobenzenenamine as EC	480g/L IPA salt of N-phosphono-methyl- glycine equivalent to 360g/L glyphosphate (w/s) as EC
Dosage	100ml in 20litres of water	3litres per hector	100ml in 20litres of water
Frequency	Once a year	Once every farming season	Once a year
Total rounds	-	-	-

3. ENABLING FACTORS

- Good collaboration between WHO, NRU, NMCP and other partners involved in malaria control e.g. PMI/RTI
- Commitment of the NRU in the project implementation
- Linkage with other projects at the NRU has made the implementation of some activities to be easy e.g. testing of the new insecticides
- Good flow of information between WCO and AFRO/HQ

4. MAJOR CONSTRAINT

No major constraint which raises alarm.

5. PLAN FOR NEXT QUARTER

The following are planned for the next quarter:

(a) To continue with monitoring for insecticide resistance in some sentinel districts/sites
(b) To carry out statistical analysis of the collected insecticide resistance data from all sentinel districts
(c) To set up the molecular laboratory at NRU and start the analysis of the samples from sentinel districts

6. REFERENCES

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Etang, J., Manga, L., Chandre, F., Guillet, P., Fondjo, E., Mimpfound, R., Toto, J., Fontenille, D (2003): Insecticide susceptibility status of *Anopheles gambiae s.l.* (Diptera:Culicidae) in the Republic of Cameroon. J. Med. Entomol. 40 (4): 491-497.

7. APPENDICES

APPENDIX 1: List of Equipments and supplies received

ITEM NO	DESCRIPTIONS	QTY	REMARKS
1	**MICROSCOPES AND OPTICAL EQUIPMENT**		
	Objective PLCN100XOB-PHI FOR CX21	1	Sent to NRU
	Biological Microscope standard set	1	Sent to NRU
	MM Mirror unit for CH20	1	Sent to NRU
	Halogen bulb 6V20 WHAL	1	Sent to NRU
	Wooden case	1	Sent to NRU
2	**MICROSCOPES AND OPTICAL EQUIPMENT**		
	ZOOM Microscope Model SZ61-1LST-SET STANDARD SET	1	Sent to NRU
3	**LABOARATORY EQUIPMENT S.T.C**		
	Sartorious Competence Electronic Analytic balance, Custom tarrif No. 90160010, S/NO. 22909764	1	Sent to NRU
4	**THERMOCYCLER**		
	Gold 96-w GeneAmp, PCR Syst 9700	1	Sent to NRU
5	**Oven/Incubator**	1	Sent to NRU
6	**Laboratory PH meter**	1	Sent to NRU
7	**Water Bath**	1	Sent to NRU
8	**Single Channel pipettor**		
	Cart no. 144974101	1	Sent to NRU
	Cart no. 144974104	1	Sent to NRU
	Cart no. 144974178	1	Sent to NRU
	Cart no. 144974180	1	Sent to NRU
	Single Channel pipettor	1	Sent to NRU
9	**Pipettor tips**		
	For volume 0.1-20µL, 2000pack	4 packs	Sent to NRU
	For volume 2- 200µL,1000pack	4 packs	Sent to NRU
	For volume 50 -1000µL, 1000pack	3 packs	Sent to NRU
10	**Centrifuge and Accessories**		
	Centrifuge, model rotina 38 R HETTICH, our cat, no. 555611707	1	Sent to NRU
	Suspensions, no.1741, 6/set fitting intorotor	1	Sent to NRU

	no. 1726		
	Suspensions, no.1741, 6/set fitting intorotor no. 1726	1	Sent to NRU
	Swing out rotor, no.2023, 30 sets	1	Sent to NRU
	Reducing adaptors no. 2023	1	Sent to NRU
	Reducing adaptors no. 2031	1	Sent to NRU
	Angle rotor, no. 1789, 30-place	1	Sent to NRU
11	**OTHER LABORATORY SUPPLIES RECEIVED**		
	Laboratory Catalogue	2	Sent to NRU
	Micro-titre Plate	3	Sent to NRU
	Wall Tray	2	Sent to NRU
	Micro AMP 8 Cap strip		Sent to NRU
	Full plate Conc.	1	Sent to NRU
	8 Tube strip		Sent to NRU
	Splash free 96 well base	1	Sent to NRU
12	**COLD CHAIN, REFRIGERATION, AIR CONDITION**		
	Revco Ultima 11 up 379 220v 50hz	1	Sent to NRU
13	**2 PACK LABORATORY EQUIPMENT**		
	No. 1708170	1	Sent to NRU
	Nettogewicht 50.40	1	Sent to NRU
	Nettogewicht 9.80	1	Sent to NRU
	Nettogewicht 0.65	1	Sent to NRU
	Nettogewicht 8.00	1	Sent to NRU
14	**OTHER LABORATORY EQUIPMENTS**		
	Deep freezer -70°C /	1	Sent to NRU
	Deep freezer -20 °C	1	Purchase locally
	Refrigerator	1	Purchase locally
	Electrophoresis equipment	1	Sent to NRU
	Gel recording system	1	Sent to NRU
	Stereo microscope	1	Sent to NRU
	Stereo microscope	1	Sent to NRU
	Laptop Computer Lesserjet Printer	1 1	Sent to NRU Sent to NRU

Appendix 2: WHO/IST mission itinerary and report for coordination and evaluation of the level of implementation of WHO/Gates project activities

WORLD HEALTH ORGANIZATION
TRAVEL REPORT SUMMARY/REPORT COVER PAGE

Submitted by			**Programme classification/Registry file number(s)**
Dr John Govere,	VBC/IST ESA	31	
August 2009			
Names	Unit/Division		
Date			

Visit to: Tanzania

Inclusive travel dates:		**Co-worker(s)**
(From)	**(To)**	
23 August 2009	29 August 2009	

Purpose/Objective of travel:
The main objective of the mission was to review progress on the implementation of the WHO/Gates project that aims to strengthen national capacities for an effective delivery of vector control interventions in Tanzania.

Specific objectives:

- To review the progress of implementation of the January – August 2009 project plan;
- To conduct a site visit to the NIMR Muheza Vector Control Training Institute to assess capacity and infrastructure and operations;

a) To make recommendations on the way forward

Background:
Tanzania is one of the four countries in ESA that is implementing the WHO/Gates project "Malaria vector control: Filling the gap between product development and effective delivery". The project started in February 2008 with the first fiscal year running from February 2008 to August 2008. The second fiscal year runs from January 2009 to August 2009. Tanzania implemented all but a few activities during the first year. Outstanding 2008 activities that included purchasing of equipment for the NIMR and NMCP have since been achieved. In January 2009 representatives of all participating countries met in Maputo to develop the January to August 2009 plans. The present mission was to assess progress in the implementation of the plan.

Terms of Reference

- To assess progress in the implementation of the January – August 2009 plan
- To make recommendations for the way forward

Methodology:
Meetings were held with the Project Officer, Dr Bilali Kabula, National Malaria Control Program Manager, Dr Alex Mwita, NRU Project Focal Point, Dr William Kisinza, and NMCP Project Focal Point, Miss Jubilate Minja. The Officers gave their views on the project implementation. The meetings and discussions were followed by field visit to Tanga on the following day to meet with Director of NRU Muheza Vector Control Training Institute and to assess laboratory activities which relate to the project

Findings:
The implementation of the project is going on smoothly. All implementing parties; NMCP, NRU and WHO are satisfied with the progress that has been achieved. All planned activities have been achieved and a detailed report by the Project Officer is available.

Recommendations:	**Cleared by:**
a) WHO HQ to speed up purchase and delivery of reagents and PCR primers to allow identification of mosquitoes that were collected from the sentinel sites	Dr O Walker, IST Coordinator ESA **Distribution list** PHE/AFRO, VBC IST staff, MAL IST Staff WR/Tanzania, Tanzania NMCP Manager, Director NIMR

Malaria Vector Control: Filling the Gap between Product Development and Effective Delivery

1 Introduction

Tanzania is one of the four countries in ESA that is implementing the WHO/Gates project "Malaria vector control: Filling the gap between product development and effective delivery". The project started in February 2008 with the first fiscal year running from February 2008 to August 2008. The second fiscal year runs from January 2009 to August 2009. Tanzania implemented all but a few activities during the first year. Outstanding 2008 activities that included purchasing of equipment for the NIMR and NMCP have since been achieved.

In January 2009 representatives of all participating countries met in Maputo to develop the January to August 2009 plans (see Tanzania plan of action Annex 1). The present mission was to assess progress in the implementation of the plan.

2 Terms of Reference

- To assess progress in the implementation of the January – August 2009 plan
- To make recommendations for the way forward

3 Expected outcome of the mission

- Implementation of the January – August 2009 WHO/Gates project plan assessed and recommendations made

4 Method of work

Meetings were held with the Project Officer, Dr Bilali Kabula, National Malaria Control Program Manager, Dr Alex Mwita, NRU Project Focal Point, Dr William Kisinza, and NMCP Project Focal Point, Miss Jubilate Minja. The Officers gave their views on the project implementation. The meetings and discussions were followed by field visit to Tanga on the following day to meet with Director of NRU Muheza Vector Control Training Institute and to assess laboratory activities which relate to the project. The mission action plan is shown below.

Program for WHO/IST mission to Tanzania 24-28 August 2009

Date	Activity	Time	Remarks/Responsible
23/08/09	Arrival	1925	Dr Govere
24/08/09	Meeting with Project Officer	0830 - 1000	Drs Kabula and Govere
	Meeting with NMCP Manager	1030-1100	Drs Kabula & Govere
	Meeting with NMCP and NRU Project Focal Points	1100-1330	Drs Kisinza, Kabula & Miss Minja
	Preparation for field visit to Muheza	1430-1600	Drs Kabula & Govere
25/08/09	Courtesy call to WR & briefing on mission objectives	0830-0900	Drs Govere, Kabula & Njau
	Travel to Tanga	1200-1800	Drs Kabula, Govere & Miss Minja
26/08/09	Meeting with Dr Magesa	0900-1100	Drs Kabula, Govere & Miss Minja
	Visiting laboratories in Tanga	1100-1330	Drs Kabula, Govere & Miss Minja
27/08/09	Visit to Muheza laboratory, insectary, experimental huts	0830-1600	Drs Kabula, Govere, Magesa & Miss Minja
28/08/09	Travel to Dar es Salaam	0900-1400	Drs Kabula, Govere & Miss Minja
29/08/09	Departure	0720	Dr Govere

5 Findings

The implementation of the project is going on smoothly. All implementing parties; NMCP, NRU and WHO are satisfied with the progress that has been achieved. The Table below shows that all planned activities have been achieved and a detailed report by the Project Officer is available.

Training of NMCP staff of insectary and vector surveillance: Four officers from the NMCP including the national NMCP project Focal Point underwent two-week training in insecticide management and vector surveillance. The participants were also introduced to the modified vector surveillance SOPs. Equipment for the NMCP insectary was purchased. However, the NMCP failed to obtain a room to convert to an insectary. It was therefore agreed that the equipment be given to NRU to strengthen its insectary capacity.

Standardization of SOPs: A three day stakeholders' workshop was held to review the WHO SOPs for vector surveillance. The SOPs received some modifications and then distributed to NIMR-Mwanza, NIMR-Amani, RTI, NMCP, Ifakara and other stakeholders. The tools are being used for vector surveillance activities in the country.

Training workshop on WHOPES guidelines and procedures: A one week-workshop was held to update stakeholders on WHOPES guidelines. The NRU Muheza Vector Control Training Institute which is the WHOPES collaborating institute organized the workshop. The guidelines are currently used to evaluate new insecticides and other malaria control products.

Monitoring of insecticide resistance from sentinel sites: All 13 sentinel sites are functional and generate useful data. During the just ended rain season useful insecticide resistance was obtained from the sentinel sites and the data show that the local malaria vectors are still fully susceptible to the WHOPES recommended insecticides for ITNs and IRS.

Training of national scientists: A curator trainee has been identified. In addition, two MSc. students who are sponsored by Welcome Trust and registered with Liverpool School of Tropical Medicine are also benefiting from the project. There is also a likelihood of one PhD student to benefit from the project as well.

Purchase of equipment: All the requested equipment were procured and delivered. However, the PCR reagents and primers for analysis of mosquito samples are yet to be delivered. The vehicle arrived at Da es Salaam and clearing process was underway at the time of the mission.

Project management: The Project Officer's contract ends by the end of August 2009. The WR and AO Tanzania have been informed and steps are underway to extend the contract.

Implementation of January-August 2009 Plan: Tanzania

Objective	Activity	Tasks	Timeline	Comments
To strengthen infrastructure, technical and institutional capacities for effective vector control in malaria endemic countries, with a particular emphasis on resistance management	**Develop entomological skills at the level of national malaria control programs**	Provide local training of NMCP staffs on insectary practices & vector surveillance activities	Mar-April	Four NMCP Officers were trained in insectary management and vector surveillance for two weeks
		Pre-testing the manual of SOP for vector surveillance and conducting malaria vector surveillance in the sentinel site	April-June	A workshop to held to review and modify SOPs for vector surveillance and final documents distributed stakeholders
		Provide equipment & supplies to NMCP	March-June	Equipment purchased and given to NMCP.
	Strengthen the capabilities of	Support training of national scientists	Mar-Aug	Two PhD NIMR students sponsored by Welcome Trust will benefit from

Objective	Activity	Tasks	Timeline	Comments
	local research institutions			the project
		Generating of country specific Entomological profile	Mar-Aug	Useful data is being generated from the 13 sentinel sites.
		Provide equipment & supplies to NRU	March-June	Reagents and primers for mosquito identification not yet delivered.
		Purshase equipments for NRU (Deep freezer -20, Microwave oven and Refrigerator)	Feb-March	All equipment purchased and delivered o NRU
	Project Management	National Project Officer's Salaries (8.5 months)	Jan-August	This ends in August 2009 and needs to be extended urgently
		Travel costs for NPO	Mar-Aug	Resources available
		NPO's Office running cost	March-August	Resources available
		Meeting costs for NPO & key stakeholders	Mar-Aug	Resources available
		Costs of freight & Customs clearance of equipment and supplies	Mar-Aug	Resources available
To develop up to date country databases on the status on malaria vector resistance to insecticides and facilitate	Monitoring for insecticide resistance in all sites	Collect insecticide resistance data from sentinel sites	Feb-June	Useful data on insecticide resistance is being generated from the 13 sentinel sites
To facilitate the development, harmonization and use of methodologies and decision support systems in malaria control	Harmonize procedures and protocols	Organise a standardisation workshops on SOP	May - Aug	A workshop to held to review and modify SOPs for vector surveillance
		Disseminate new and standardised SOP	May - Aug	Final documents distributed stakeholders
To develop country capacities to evaluate and introduce new tools in malaria vector control including new insecticides and application technologies	**Organise national training workshop on WHOPES guidelines and procedures**	Organise training workshop	March-April	Workshop held to train NMCP and NRU and other stakeholders on WHOPES guidelines
		Undertake a field project to test a newly developed insecticide	April-August	Two new insecticides were field tested using WHOPES guidelines
Coordination and evaluation				WHO/IST evaluation mission was provided

6 Conclusion

The progress of project implementation is satisfactory. All planned activities have been achieved. The 13 established sentinel sites are producing useful entomology data. The NRU laboratories are now fully equipped and well staffed with skilled personnel. However, reagents are still to be delivered to the NRU-NIMR Amani centre for mosquito analysis and the contract of the Project Officer has to be extended.

7 Recommendations

- WHO HQ to speed up purchase and delivery of reagents and PCR primers to allow identification of mosquitoes that were collected from the sentinel sites