Resilience Against Future Threats (RAFT) through Vector Control

Alphaxard Manjurano[1], Charles Wondji[2], Raphael NGuessan[3], Patchara Sriwichai[4], Tom Churcher[5], James Tibenderana[6], Louisa Messenger[7,8], Rosine Wolie[3], Basile Kamgang[2], Leo Braack[6], Jo Honeybone[8], Jo Lines[8] and Sian Clarke[8] - for the RAFT Research Consortium

Introduction

Resilience Against Future Threats (RAFT) through Vector Control's 6-year research programme comes at a critical time when the capacity of countries to effectively tackle malaria and other mosquito-borne diseases is under threat, particularly in Africa. Insecticide resistance in malaria mosquitoes is jeopardising the gains in malaria control made to date, whilst urban expansion in African cities provides ideal conditions for new threats, such *Aedes*-borne arboviruses and *Anopheles stephensi*. To face these challenges, RAFT aims to generate new research evidence to inform national and global vector control decision makers on the most appropriate strategies.

Goals

- To manage insecticide resistance by ensuring the targeted deployment of most cost-effective malaria vector control interventions in African countries
- To enhance strategic preparedness for emerging mosquito threats in sub-Saharan Africa and Southeast Asia, through increased awareness, technical understanding and operational know-how among national vector control programmes and donors

Who we are

Research partners:

- London School of Hygiene & Tropical Medicine (LSHTM)
- Imperial College, London
- Malaria Consortium

Sub-Saharan Africa

- **Institut Pierre Richet** (IPR), Cote d'Ivoire
- Centre for Research in Infectious Diseases (CRID), Cameroon
- National Institute for Medical Research (NIMR), Tanzania

Asia

- **Mahidol University**, Thailand

IMPERIAL · LONDON SCHOOL of HYGIENE &TROPICAL MEDICINE · CRID · INSTITUT PIERRE RICHET · Mahidol University International College · malaria consortium disease control, better health

Addressing insecticide resistance

Long-lasting insecticidal nets (LLINs) have been responsible for two-thirds of the reduction in malaria burden since 2000, however, these gains are threatened by insecticide resistance. New LLIN products offer a solution, but future net-buying decisions will be more complicated. Sub-national stratification needs to take account of differences in insecticide-resistance of local malaria vectors.

Our approach

RAFT will generate evidence to aid decision-making through combining data from:

Experimental hut trials to evaluate how different insecticidal nets perform according to resistance in local mosquitoes (genomics)

Genetic analysis to measure how each resistance gene affects vector longevity and feeding success

Mathematic modelling to predict the impact of each LLIN on malaria transmission given local resistance

Economic analysis to identify the most cost-effective LLINs to counter insecticide resistance in a given target area

Experimental hut studies in Mwanza, Tanzania. Other study sites include: Cote d'Ivoire, Cameroon (not shown)

For further information and research updates

Visit our website: globalvectorhub.lshtm.ac.uk/raft

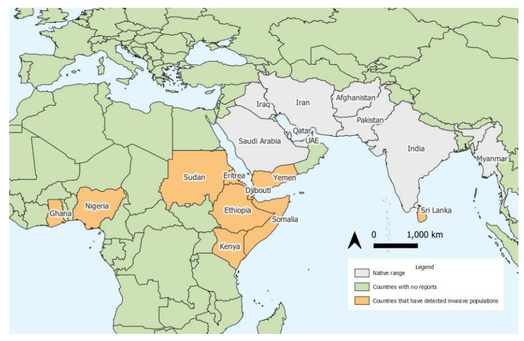
Contact us: RAFT@lshtm.ac.uk

1. National Institute for Medical Research, United Republic of Tanzania; 2. Centre for Infectious Diseases, Cameroon; 3. Institute Pierre Richet, Cote d'Ivoire; 4. Mahidol University, Thailand; 5. Imperial College, UK; 6. Malaria Consortium, UK and Thailand; 7. University of Nevada, US; 8. London School of Hygiene & Tropical Medicine, UK.

Addressing emerging mosquito-borne disease threats

We live in a rapidly changing world. The effects of anthropogenic change on our environment have the potential to change vector-borne disease risk. To manage these risks we need to document, monitor and plan for them. Currently, more than 40% of African citizens live in cities, a figure predicted to reach 60% by 2050. Two mosquito vectors that thrive in urban environments, already present a growing threat:

- ***Anopheles stephensi*** First reported in Djibouti in 2012, this malaria vector has since spread to several other countries. Unlike the principal malaria vectors in Africa, this mosquito readily breeds in man-made water containers. This raises the prospect of urban malaria in African towns and cities.



- ***Aedes* spp.** mosquitoes which transmit arboviruses such as chikungunya, dengue and yellow fever breed in used tyres and discarded containers - the detritus of urban life. Outbreaks of dengue are increasingly reported in Africa.

Our approach

To increase awareness, technical understanding and operational planning amongst vector control programmes to help counter emerging disease threats, RAFT's activities include:

Field studies to characterise the impact of agriculture and urbanisation on vector ecology and variation in mosquito-borne disease risks:

- Effect of rice cultivation on mosquito production and malaria
- Effect of urbanisation and housing on mosquito longevity and malaria transmission – in Cote d'Ivoire
- Surveillance for *An. stephensi* in highly-connected urban locations at most risk of importation – in Cameroon and Tanzania
- *Aedes*-borne disease transmission across urban, semi-urban and rural environments - in Cameroon, Tanzania and Thailand

New surveillance tools – Development of eDNA surveillance technique for rapid assessment surveys of *An. stephensi*

Knowledge exchange - South-South exchange visits and webinars to facilitate networking and experience sharing between African, Asian and Latin American country experts and control programmes to strengthen capacity in preparedness for arboviruses.

Funding

This project is funded by UK International Development from the UK government. Health Research Programme Consortia (RPCs): RAFT (Resilience Against Future Threats through Vector Control), PO8615.

This material has been funded by UK International Development from the UK government; however, the views expressed do not necessarily reflect the UK government's official policies

UK International Development
Partnership | Progress | Prosperity