Technical consultation on the spread of *Anopheles stephensi*

Malaria Policy Advisory Committee Meeting
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Anopheles stephensi

- three ecological variants; type, intermediate and mysorensis
- ‘type’ form is an efficient urban malaria vector in India due to its anthropophilic nature and adaptation to man-made breeding sites
- ‘type’ and ‘intermediate’ forms have also emerged as efficient vectors in rural areas of India as a result of changing agricultural and water storage practices
- quickly adapt to the local environment & withstands high temperatures
- an efficient urban malaria vector for both Plasmodium falciparum and P. vivax
- until 2011, the reported distribution was confined to certain countries in South-East Asia and large parts of the Arabian Peninsula
An. stephensi breeding sites (Ethiopia)
Why hold a technical consultation?

First record of the Asian malaria vector *Anopheles stephensi* and its possible role in the re-emergence of malaria in the Middle East.

Michael K. Faulde, A. Yasi, H. T. R. Kandasamy Aravindan, G. Gayan Dharmasiri

DOI: 10.1111/1223-3203.10772

CASE REPORT

First record of *Anopheles stephensi* in Sri Lanka: a potential role of malaria reinfection.

A. G. Gayan Dharmasiri, A. Yasi, H. T. R. Kandasamy Aravindan

First detection of *Anopheles stephensi* Liston, 1901 (Diptera: culicidae) in Ethiopia using molecular and morphological approaches.

Tamar E. Carter, Solomon Yared, Araya Gebreslassie, Victoria Bonnell, Lembodhar Damodaran, Karen Lopez, Mohammed Ibrahim, Seid Mohammed, Daniel Janies

Global Malaria Programme

World Health Organization
Technical Consultation Objectives (1)

• Review published and unpublished evidence on the presence of *An. stephensi* outside of its traditional geographic range;

• Review efforts to model potential areas at risk for *An. stephensi* introduction and assess – to the extent feasible – the potential risk for further spread beyond the vector’s previously reported geographic range;

• Review knowledge on *An. stephensi*’s bionomics and biology, and analyse differences between vector populations in Asia and Africa to identify suitable control practices for each area where the vector is present;
• Review countries’ experiences of controlling *An. stephensi* where it has been traditionally present, with the aim of identifying best practices and the main challenges in the control of this species;

• Review the status of *An. stephensi* resistance to different insecticide classes;

• Recommend surveillance and control strategies to address the threat posed by the spread of *An. stephensi* and surveillance indicators to assess the impact of control interventions.
# Broad Participation

**Chair**  
Kezia Malm  
NMCP  
Ghana

**Participants**  
Tamar Carter  
Baylor University  
USA

Mike Reddy  
Microsoft Research  
Seattle  
USA

Marianne Sinka  
University of Oxford  
United Kingdom

**Temporary Advisers**  
Jude Bigoga  
University of Yaoundé  
Cameroon

Ahmadali Enayati  
Mazandaran University of Medical Sciences Sari  
Iran

Marco Seyfarth  
Bundeswehr Medical Services  
Germany

Mohamed Abdi Ali  
NMCP  
Djibouti

Maureen COETZEE  
WITS Research Institute for Malaria  
South Africa

Michael Faulde  
University Clinics Bonn  
Germany

Fitsum Tadesse  
Armauer Hansen Research Institute, Ethiopia

Abdoul-ilah A. Abdi  
Counsellor to the President of Djibouti  
Djibouti

Nelson Cuamba  
Adviser for NMCP of Mozambique

Kevin Gorman  
Oxitec Limited  
UK

S. N. Surendran  
University of Jaffna  
Sri Lanka

Manonath Marasinghe  
Anti-Malaria Campaign  
Sri Lanka

Krijn Paaijmans  
Arizona State University  
USA

Courtney Murdock  
University of Georgia  
USA

S. Y. Gebremeskel  
Jigjiga University  
Ethiopia

Mebrabthom H. Zeweli  
Malaria focal point  
Ethiopia

Naveen Rai Tuli  
Municipal Corporation of Delhi  
India

Laura Norris  
BMGF  
USA

D. Y. Gebre  
Jimma University  
Ethiopia

Meshesha B. Managido  
PMI Vector Link  
Ethiopia

Global Malaria Programme

World Health Organization
Conclusions

- *An. stephensi* has been spreading over the last decades
- Djibouti, Sri Lanka and Ethiopia were only the most recently affected countries
- Sudan has since joined the list (Ayman Ahmed, per. Com.)
- Further spread must be anticipated (or has already occurred)

Figure from Surendran *et al.* (2019) Anthropogenic Factors Driving Recent Range Expansion of the Malaria Vector *Anopheles stephensi*. Front. Public Health 7:53.
Conclusions

- Evidence of actual or potential for transmission of both *P. falciparum* and *P. vivax* in Djibouti and Ethiopia
- Experiences of controlling *An. stephensi* in Africa is limited or absent. Surveillance and control approaches should thus be based on best-practices from India until context specific experience has been developed.
- *An. stephensi* mosquitoes that invaded new geographical areas generally have a genetic background that confers resistance to multiple insecticide classes, posing potential control challenges. However, no data on susceptibility to pyrroles or neonicotinoids were reviewed.
- New tools for surveillance and control need development and evaluation, including – once available – a self-limiting *An. stephensi* gene-drive construct that aims to produce non-biting male mosquitoes to suppress local wild populations
- Model-based assessments of mosquito threats need further development, incl. on key variables and how to collect/incorporate these
Recommendations to WHO

• Develop a ‘Vector Alert’ document and post it online to urge WHO Member States and their implementing partners in and around the Horn of Africa, Sudan and the surrounding geographical areas, and Sri Lanka to take immediate action

• Action in three areas:
  • Surveillance (including updates to mosquito identification keys)
  • Intervention
  • Monitoring & evaluation

• Develop data reporting sheet

• Update Malaria Threats Map to illustrate current and new reports of *An. stephensi* distribution / invasion (allowing potential expansion to report other invasive anopheline species)
English & French versions online. Arabic undergoing layout.

Accompanied by data reporting form and new email account for data reporting.
What has happened since?

Malaria Threats Map

Tracking biological challenges to malaria control and elimination

**VECTOR INSECTICIDE RESISTANCE**
Resistance of malaria mosquitoes to insecticides used in core prevention tools of treated bed nets and indoor residual sprays threatens vector control effectiveness

**PARASITE pfhrp2/3 GENE DELETIONS**
Gene deletions among some malaria parasites cause false negative diagnostic test results, complicating case management and control

**PARASITE DRUG EFFICACY AND RESISTANCE**
Resistance of malaria parasites to artemisinin – the core compound of the best available antimalarial medicines – threatens antimalarial drug efficacy

**INVASIVE VECTOR SPECIES**
The spread of anopheline mosquito vector species and their establishment in ecosystems to which they are not native poses a potential threat to the control and elimination of malaria.
What has happened since?

Reporting new detections:
Form: https://www.who.int/docs/default-source/documents/publications/gmp/whogmp-invasive-species-reporting-form.xlsm?sfvrsn=8c82af32_21
Send to: vectorsurveillance@who.int

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Further Information
