APMEN
Entomology and Vector Control for malaria Elimination
Regional meeting & Workshop
Bangkok, Thailand
7-10 November 2016
SURVEILLANCE AND VECTOR CONTROL TOOLS NEEDED TO SUPPORT THE SHIFT TO ELIMINATION
Sri Lankan Experience

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Entomology and Vector Control for Malaria Elimination
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Dr. M. R. S. S. BANDARA
REGIONAL OFFICER, ANTI-MALARIA CAMPAIGN
MINISTRY OF HEALTH, SRI LANKA
Sri Lanka – Island near India
SRI LANKA

Total Land Area – 65,610 km²
Populations - 21,324,791
No of Provinces – 09
No of districts – 22
Capital city – Sri Jayewardenepura
Commercial city - Colombo
CLIMATIC ZONES AND MAINLY ON ANNUAL RAINFALL

Sri Lanka Rainfall Map (mm)

[Map showing climatic zones in Sri Lanka with different colors for Wet Zone, Intermediate Zone, Arid Zone, Dry Zone, and Home areas.]

- Wet Zone
- Intermediate Zone
- Arid Zone
- Dry Zone
- Home
History of Malaria in Sri Lanka

- **1911**: Setting up of 1st Anti Malaria Centre
- **1921**: Appointment of first malarialogist
- **1934/35**: Largest ever epidemic
- **1946**: Introduction of DDT
- **1947**: Near Elimination status
- **1958**: Malaria eradication programme launched
- **1963**: Near Elimination status
- **1967/68**: Malaria resurgence causing a countrywide epidemic
- **1969**: DDT resistance in A.culicifacies first detected
- **1975**: Introduction of malathion
- **1984**: Chloroquine-resistant PF first detected
- **1992/93**: Widespread malathion resistance in A.culicifacies first detected
- **1994**: Introduction of Lambda-cyhalothrin
- **1997**: WB project commenced
- **2000**: Malaria elimination project launched
- **2003**: ACT introduced
- **2007**: Pre Elimination status
- **2009**: Malaria elimination project launched
- **2012**: Pre Elimination status
- **2007**: ACT introduced
- **2009**: Malaria elimination project launched
- **2012**: Pre Elimination status
Sri Lanka has reduced its malaria cases by 99.9% since 1999, and aims to eliminate malaria by 2014.

Includes indigenous and imported cases.
CHANGING OF MALARIA INTENSITY WITH THE TIME

Intensity of Malaria Transmission in Sri Lanka (Represented district-wise)

API
> 0.1
0.06 - 0.1
0.01 - 0.05
0

2009

2010

2011

2012 – No indigenous malaria
Entomology has been a Key discipline that has helped in malaria control in different phases in Sri Lanka

➢ To describe epidemiological trends

➢ The transmission patterns of malaria

In control - before 2009
pre-elimination - 2009-2014 (Intensified E&P surveillance)
With GFATM funds. – NGOs - selected district
Elimination and post elimination and even in prevention of re introduction & (PoR) phases.
Entomology Surveillance

It Included

- To determine changes in the geographical distribution of vector and their density

- To obtain relevant measurements of the vector population over time to facilitate appropriate and timely decisions regarding interventions and evaluate the control programes
Entomology Surveillance

The type of entomological surveillance used were depend on the phase as well as the situation of the risk:

- Sentinel surveys (Control / Elimination / PoR)
- Spot checks on selected receptive localities (Control/Elimination/PoR)
- Special surveys during outbreaks or epidemics (Control/Elimination)
- Case-based investigations (Elimination/PoR)
# Entomology Surveillance

**Techniques used in surveillance**

<table>
<thead>
<tr>
<th>Vector Prevalence</th>
<th>Cattle Baited Hut Collections</th>
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<tr>
<td></td>
<td>Cattle Baited Net Trap Collections</td>
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<td>Larval Surveys</td>
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<td>Resting Behavior</td>
<td>Indoor Resting Hand Catches</td>
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<td>Outdoor Resting Hand Catches</td>
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<td>Pyrethrum Spray Sheet Collections</td>
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<td>Window Trap Collections</td>
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<tr>
<td>Biting Behavior</td>
<td>Human Landing Collections (partial night)</td>
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<td></td>
<td>Human Landing Collections (Full night)</td>
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<tr>
<td>Breeding behavior</td>
<td>Larval Survey</td>
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<tr>
<td>Resistance Monitoring</td>
<td>Insecticide susceptibility Test</td>
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<tr>
<td>Efficacy of Insecticide</td>
<td>Bioassay Test (IRS / LLIN)</td>
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</tbody>
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Entomology Surveillance

Sentinel Site Monitoring
High risk transmission over a period

Potential areas for vector breeding
High receptivity

Potential areas transmission
High vulnerability + receptivity

Spot check
Not covered by SSM

Outbreak & epidemic

Case-based investigation
## Entomology Surveillance

### Spot check
- Not covered by SSM

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<th>Climate change</th>
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<td>Disasters</td>
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<td>Development projects</td>
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<td>Risk human activities</td>
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<td>Gem mining</td>
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<td>Quarry pits etc</td>
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<td>Special occasions (ODT)/Festival</td>
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</table>

### Case-based
- Indigenous case
- Imported case
- Introduced case

### Risk Due to vulnerability
Entomology Surveillance

- Use of GIS
- Vector mapping – breeding and high adults / special situations
- Stratification based on receptivity and vulnerability
- Strengthening policies - SOPs and SOWs
- Update legislation framework and administrative policies
- Re-organizing authority and responsibility of Anti-Malaria services
- Administrative circulars
- Notification, early and emergency response
- Insecticide shifting and Monitoring of insecticide resistance
- Quality assurance
- Updating the Data management system

(A Real time BCDE sibling / B and E)- ELISA

- Studies on Changes in biting behavior (ODT) – biting / resting
- Quality assurance / Supervisions
- Data on potential vectors
- Capacity building – In-service training (EAS/ SMOS/ Entomologists)
- Inersectorl coordination
- Awareness
- IVM
Larval density of *An.culicifacies* in MOH areas - 2012
Adult female density of *An. culicifacies* by MOH areas in 2012 (data restricted to the locations of cattle baited huts)
Schematic diagram depicting entomological surveillance and vector control – a malaria patient reported

ES – All areas patient stayed one night within the previous two weeks since onset of fever (with in 48 hrs)

Larval survey, with 1 km radius

Larvae available do HC, PSC, HLC (Full night)

If Primary or secondary vector detected

Detected at the airport on arrival from malarious country directly admitted to the Hospital in non respective area – No ES

If not found RMO can decided to carry out other surveys

Carry out salivary gland detection and send for PCR
Schematic diagram depicting entomological surveillance and vector control – a malaria patient reported

If vectors detected

Appropriate vector control interventions
Based on the evidence of vector bionomics

IRS (1-2 KM Radius)
Fogging (2 rounds)
LLIN Distribution (1-2 Km radius)
Larval control – chemical larviciding – 2 rounds
Larvivorous fish
Environmental measures

Review and further Action and follow-up
Current control strategies (2010-2014)

- Ensure 100% case detection (by microscopy/RDT)
- Notification and investigation of all cases to prevent secondary infections
- Strengthening malaria surveillance system
- Radical treatment policy for all *P. vivax* infections
- Continue ACT/PQ for *P. falciparum* malaria
- Quality control and quality assurance for diagnostic and treatment services
- Outbreak preparedness
- Prevention of malaria in travelers
- Re-orienting public and private health sector

NSP

HRD and capacity building
Operational research
Integrated vector management
Challengers……

- More research on vector biology
- Insecticide resistance and updating policies
- Human migration and awareness
- Impact of current interventions
- Quality assurance of vector control tools
- Updating and sharing new knowledge.
THANK YOU