MALERA REFRESH:
UPDATING THE MALARIA ELIMINATION & ERADICATION R&D AGENDA

VCWG, Feb 3\textsuperscript{rd} 2016
Janet Hemingway
Fredros Okumu
OUTLINE

1. MalERA Refresh process

2. Scientific progress & emerging research questions
   • Vector tools for malaria elimination
   • Insecticide resistance

3. Ongoing vector research in MESA Track
MALERA REFRESH

Overall objective: to update the multi-disciplinary R&D agenda for malaria elimination and eradication

1. To review progress made since malERA was published in 2011

2. To examine what hypothesis are currently being tested

3. To define priority areas for the next 5-10 years
MALERA REFRESH

- **Leadership Group:** Regina Rabinovich, Marcel Tanner, Dyann Wirth, Pedro Alonso
- **Coordinated** by Malaria Eradication Scientific Alliance (MESA)
- **6 expert panels** with more than 150 international experts from academia, PDPs, industry, funders, WHO, etc.
MALERA REFRESH

Panels

✓ Basic science & enabling technologies. Chairs: Dyann Wirth, Elizabeth Winzeler, Lee Hall
✓ Insecticide & drug resistance. Chairs: Janet Hemingway, Abdoulaye Djimdé
✓ Characterizing the reservoir & measuring transmission. Chairs: Chris Drakeley, Abdisalan Noor
✓ Tools for elimination. Chairs: David Kaslow, Fredros Okumu, Tim Wells
✓ Combination interventions and modeling. Chairs: Rick Steketee, Simon Hay
✓ Health systems & policy research. Chairs: Marcel Tanner, Maxine Whittaker

• Vector themes are cross-cutting !!
MalERA Refresh panels have promoted positive synergies between drug & vector experts, e.g. in the area of resistance.
KEY STEPS

1. Online surveys based on original gaps identified in 2011

2. Face to face meetings with various experts on drugs, diagnostics, vector control and vaccines.

3. Iterative follow-ups between groups of experts on drugs, vaccines, diagnostics and vector control.

4. Desk reviews including extensive literature searches.

5. Iteration with other maLERA refresh panels

6. Synthesis
MALERA REFRESH

- A **publication** is expected in 2016.
- Inclusive & transparent process

www.malariaeradication.org
VECTOR TOOLS FOR MALARIA ELIMINATION

Fredros Okumu
WHERE HAVE WE MADE PROGRESS IN LAST 5-6 YEARS?

- **New insecticides** in the pipeline to replace/supplement current ones. New insecticide and combination nets expected in 2-3 years.

- Longer lasting formulations of organophosphates available for IRS and longer-lasting re-treatment kit, now available for bed nets.

- New LLINs treated with the slow-acting chlorfenapyr, or PPF tested against insecticide resistant mosquitoes.

- New insecticide-synergist combination nets (PermaNet 3.0 and Olyset Plus) efficacious against pyrethroid resistant mosquitoes; interim WHO approval.
WHERE HAVE WE MADE PROGRESS IN LAST 5-6 YEARS?

- Improved understanding of contributions of LLINs to the reduction of malaria burden
- Improvements in Transgenesis and para-transgenesis
- Improved understanding of mosquito survival strategies during dry season.
- Improvements in high-throughput identification and bar-coding techniques
WHERE HAVE WE MADE PROGRESS IN LAST 5-6 YEARS?

• Various complementary vector control tools, which target malaria transmission outdoors and indoors are under development

• Spatial repellents have shown demonstrable protective evidence against *P. vivax* and *P. falciparum* malaria in Indonesia. Other spatial tests demonstrated entomological but not epidemiological impact. A large clinical trial is underway (results expected in 3 yrs)

• Other advances have been made on more complementary technologies like entomopathogenic fungi, eave tubes, attractive toxic sugar baits, mosquito attractants and housing improvements
WHAT ARE THE REMAINING GAPS?

• **Residual transmission** not adequately measured; no clear guidelines on how to define, quantify and monitor it
• Narrow **diversity and range of AIs** and unclear pathways to market
• No efficient **application technologies to effectively use new AIs**, while delaying insecticide resistance
• Gaps in our **understanding of behavioral resistance and resilience** among vector species
• Our understanding of **vector ecology** still limited
• Loss of taxonomy skills among vector biologists and malariologists
WHAT ARE THE REMAINING GAPS?

- Limited understanding of **epidemiological impact of insecticide resistance** and how should it be measured

- No sufficiently sensitive/scalable **tools for measuring malaria vector densities and transmission** across settings

- No **methods for evaluating new vector control tools** that are widely accepted as standard; No strategies to support implementation of innovative technologies e.g. MDA programs using ivermectin

- Poor **communication strategies to ensure** long-term support, during low-level transmission; **No decision tools or centralized data depositories** for stratification and introduction of new tools
WHAT QUESTIONS ARE EMERGING?

• Writing is currently ongoing
• Consultation with the Panel will generate a list of research questions, and priority areas.
  ▪ Insecticide formulation
  ▪ Scalable delivery methods
  ▪ Improved technologies
  ▪ Evaluation of new tools
INSECTICIDE RESISTANCE

Janet Hemingway
WHERE HAVE WE MADE PROGRESS IN LAST 5-6 YEARS?

- **Documented** multiple resistant populations
- **Database** on insecticide resistance in malaria vectors
- Improved understanding of **mechanisms** of insecticide resistance
- Characterised **collections of resistant mosquitos** at various research facilities
WHAT QUESTIONS ARE EMERGING?

• Writing is currently ongoing

• Consultation with the Panel will generate a list of research questions, and priority areas.
  ▪ Biology of resistance mechanisms
  ▪ Optimising surveillance systems
  ▪ Managing/mitigating resistance
  ▪ Knowledge translation (evidence-based policies and implementation)
ONGOING VECTOR RESEARCH

In the MESA Track database, there are currently 724 ongoing projects relevant to malaria elimination.

- Vector projects: 22% (162/724)
- Non-vector projects: 78% (562/724)
ONGOING VECTOR RESEARCH

162 projects relevant to vector research

*Projects on tool development do not include information on country
ONGOING VECTOR RESEARCH

A total of 162 projects relevant to vector themes

- 63 projects relevant to vector tools
- 44 projects relevant to management of resistance
ONGOING VECTOR RESEARCH

63 projects relevant to vector tools

Vector Tools (% of projects)

Development: 43%
Implementation: 57%

Vector Tools (% projects)

ITNs, LLINs or IRS: 24%
New Tools: 76%
ONGOING VECTOR RESEARCH

44 projects relevant to insecticide resistance

Projects investigating insecticide resistance (%)

- Mechanisms & Molecular basis: 35%
- Monitoring resistance: 30%
- Management of resistance: 25%
- Measuring impact on transmission: 15%

*Projects can be relevant to more than one category*
THANK YOU!

www. malariaeradication.org