West Africa Malaria Workshop
Addressing Resistance in Corporate Programs

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Content

- Why Resistance Matters
- Preventing Resistance
- Managing Resistance
- Bayer Role in Resistance Management
- A Case Study in resistance Management: Bioko Island
- Importance of Corporate IRS Programmes
Principles of resistance development and insecticide characteristics

Figure 12: Genetic heritability drives increased resistance in the face of continued pressure

Figure 5: Characteristics of the four classes of insecticide currently recommended for IRS and LLINs are summarized in Figure 5.
Currently there are only 4 classes of insecticides recommended for IRS:

- Pyrethroids
- Carbamates
- Organochlorides
- Organophosphates

We need new active ingredients

We need new delivery systems to augment the action of existing AIs

Need to create an environment that encourages innovation and the development of ‘ethical’ research based products (WHOPES recommended)

Innovation requires investment and a shared commitment to the costs and benefits of R&D- the corporate sector has a role to play here.

The corporate sector can play several roles to support innovation
Preventing Resistance

- Rational use of available tools
  - Choosing the correct insecticide
    - Knowing when to change
    - Science based decision making
  - Invest in training & quality control to ensure effective spray campaigns
- Monitoring and Evaluation
  - Invest in creating the infrastructure
  - Diligently implement program M&E
- Partnership/Collaboration with the National Programme
- Collaboration and support of local research institutions
Managing Resistance

• Taking steps to prevent the development of resistance increases the cost of IRS programs **BUT** addressing resistance after it has developed is even more expensive.

• Key causes of insecticide resistance: Tolerance, Evolution, Poor Management of available tools

• Strategies to address resistance:
  • Insecticide rotation
  • Mosaic spraying
  • Combining Insecticides
  • Improving the skills and knowledge of spray operators
  • Constant M&E and surveillance!!!
Bayer in The Malaria Vector Control Community
We deliver on our promise - Science for a Better Life

Leading Innovation
- (Historical) development K-Otab 1-2-3
- Partner in development of first LLINs*
- Defence of bendiocarb (Ficam)
- Development of K-Othrine WG
- LifeNet – addressing market needs
- IVCC Partnership – LLIRS 2013

Insecticide resistance management
- Taking early lead, with the push ‘Resistance matters’
- Taking early lead in proof of principle (Mexico trial, IRAC)
- Investment in bendiocarb production expansion
- Investment in local formulation in Africa

Key Contribution To IRM Through Active Involvement in various Forums
- Participant in several Vector Control Working Groups
- Roll Back Malaria Board Member
- The only manufacturer invited to present at launch of WHO GPIRM.
- Crop Life Public Health Group
- Innovative Vector Control Consortium (IVCC)
- Insecticide Resistance Action Committee (IRAC)

Footprint in 27 countries across Africa.
Over 70 Million people in Africa Protected by Bayer Products in 2012

Comprehensive portfolio of Vector Control products.
High levels of expertise, strong commitment to capacity building.

*LLIN : long lasting insecticidal net
A case Study in Resistance Management: Bioko Island 2003-2005

- A multiple stakeholder malaria control partnership
- Marathon Oil – Corporate Partner
- Insecticide rotation used to address the emergence of pyrethroid resistance
  - K-Othrine WG 250 (Deltamethrin)
  - Ficam WP80 (Bendiocarb)
- Resistant vector population responded to the change in insecticide
- M&E showed a reduction in the vector burden on the Island
Effect of rotation on Bioko Island

![Graph showing the impact on malaria vector count island-wide](image)

- **An. funestus**
- **An. gambiae**

Average number *An. gambiae* and *An. funestus* per trap per 100 nights (December 2003 – August 2005)

**Impact on malaria vector count island-wide**

- Round 1: Pyrethroid
- Round 2: Carbamate
- Round 3: Carbamate
Bayer Engaging the Corporate Sector

- We have a specific focus on encouraging corporates to develop and implement vector control strategies

- Engage companies that have existing policies and programs for malaria control or would like to develop them
  - Sharing information
  - Connections to the malaria community
  - Capacity building: Training of spray operators, technical support

- We have WHO recommended products- less risk for corporates

- We are present locally through our Representative Offices, Agents and Distributors across Africa
Importance of Corporate IRS Programs

• Long term investment in staff and community health. Proactive approach to Malaria Control.

• IRS is a key part of IVM so it results in better returns on corporate health investments overall.

• Opportunity for building strong relationships with government, NMCP, communities, NGOs and the academic community.

• Presents new opportunities for employee engagement. Much more engaging than annual net donations.

• Clear ways to measure investment and results

• Corporate sector can provide a sustainable source of alternative funding for local IRS programs
Investment Required

• Prepare for a long term commitment

• Develop infrastructure and expertise

• Set up M&E structures, record baselines

• Develop Partnerships with other members of the VC community and Collaborate with the National program

• Prioritise ongoing surveillance and scientific partnerships

• Support Innovation
Thank You!
IRS - Costs

2.5.2 Financial Cost of Managing Insecticide Resistance

Financial cost for geographical areas in which IRS is the primary tool for vector control.

What has been modelled?
- Pre-emptive rotations: The model compares the estimated cost of IRS with pyrethroids alone to pre-emptive rotations with three different insecticides: pyrethroids, carbamates and organophosphates.
- Rotations after failure of pyrethroids: The model compares the estimated cost of IRS with pyrethroids alone with that of rotations without pyrethroids (i.e. rotations of carbamates and organophosphates).

Implementing IRS rotations pre-emptively would increase the cost by 20–47%.

- Short transmission season. The model suggests that replacing IRS with pyrethroids alone by 3-year rotations of pyrethroids, carbamates and organophosphates would increase the cost in areas with short malaria transmission seasons by approximately 20%, corresponding to an increase in the cost per person from US$ 3.50 to US$ 3.90.

- Long transmission season. This same model suggests that in areas with long transmission seasons, IRS rotations would increase costs by approximately 47%, the corresponding costs per person increasing from US$ 4.60 to US$ 6.80.

See Figure 28.

Figure 28: Cost implications of implementing indoor residual spraying rotations pre-emptively

Implementing rotations after failure of pyrethroids would increase the cost of IRS by 30–71%. If pre-emptive IRS approaches are not implemented, the efficacy of the current insecticides might be lost. Implementing rotations after failure would be significantly more expensive than implementing it pre-emptively because pyrethroids would likely be excluded from the rotations (Figure 28):
- Short transmission season. The model suggests that the approximate 30% increase in cost for IRS rotations would increase to 50% if implementation was delayed until pyrethroids were no longer usable.
- Long transmission season. In areas with long malaria transmission seasons, the cost of IRS would increase by approximately 71%, instead of 47% with pre-emptive rotations.

See Annex 11 for more details on the hypothesis and sources used for this model of the financial impact of insecticide resistance.