insecticide Resistance Status of *Anopheles gambiae* s.l. in 2018 in Burkina Faso

Hien S.A[1]; Maiga S[1]; Namountougou M[1,2]; Soma D.D[1], Hien D.F[1]; Coulibaly S[1]; Kaboré D[1]; Kientega M[1]; Meda GB[1]; Koné K[3]; Dotson E[4]; Belemvire A[5]; Armistead J[5]; Jacob D[6]; Oxborough R[6]; Dabiré KR[1]

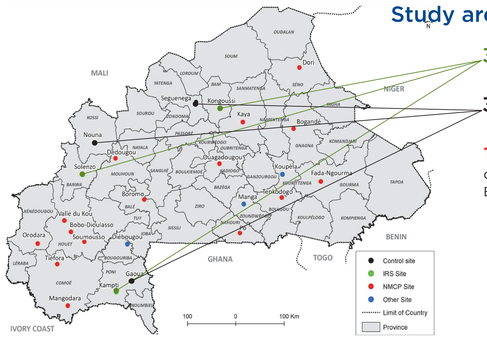
[1]IRSS/Centre Muraz, Malaria and Tropical Neglected Research Unit, Burkina Faso; [2]Université Nazi Boni, Burkina Faso; [3]U.S. President's Malaria Initiative, US Agency for International Development, Burkina Faso; [4]U.S. Centers for Disease Control and Prevention, Division of Parasitic Diseases, USA; [5]U.S. President's Malaria Initiative, US Agency for International Development, USA; [6]U.S. PMI AIRS Project, Abt Associates, USA

Background

- The current methods used to control malaria vectors are based on the reduction of human-vector contact and reduced longevity of malaria vectors (WHO, 2012) through the use of long-lasting insecticidal nets (LLINs) and by indoor residual spraying.
- However, the spread of pyrethroid resistance within malaria vector populations across Africa is jeopardising the effectiveness of LLINs.
- This study aims to:
  - Update the nationwide susceptibility status of *An. gambiae* s.l. to pyrethroid, carbamate, organophosphate, pyrrole and neonicotinoid insecticides in Burkina Faso.
  - Deterermine whether PBO pre-exposure followed by deltamethrin restores efficacy against pyrethroid resistant *An. gambiae* s.l.

Methods

Study area



3 IRS SITES

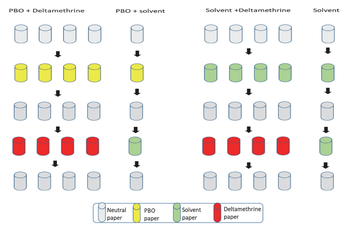
3 ADJACENT UNSPRAYED SITES

15 NMCP MONITORING SITES
distributed in three eco-climatic areas in Burkina Faso

Larval collections

- Mosquito larval collections in monitoring sites.
- Larvae reared to adult stage and female adults 2-5 days old were used in bioassays.

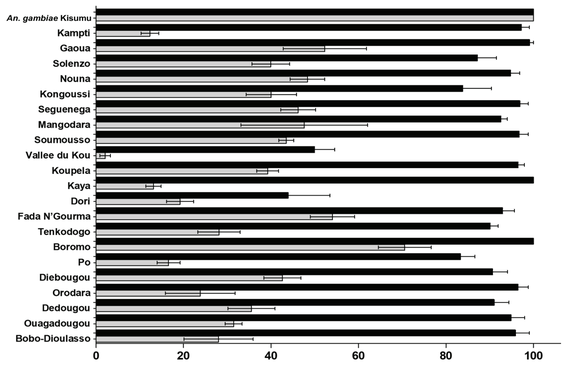
WHO bioassays with wild *An. gambiae* s.l.



- WHO tube assays with PBO synergist + deltamethrin
- WHO tube assays with 0.1% bendiocarb, 0.75% permethrin, 2% clothianidin, and 0.25% pirimiphos-methyl.
- CDC bottle assays performed with 100µg/bottle chlorfenapyr.

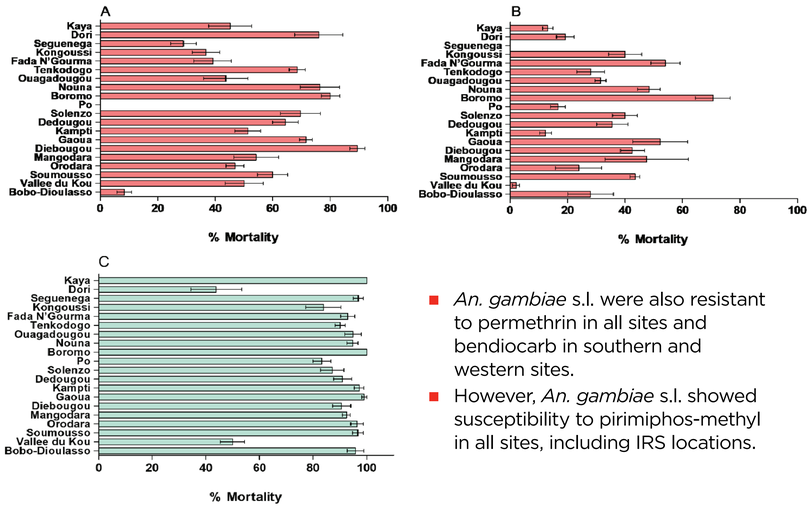
Results

% Mortality of wild *An. gambiae* s.l. in WHO tube tests with deltamethrin after pre-exposure to PBO



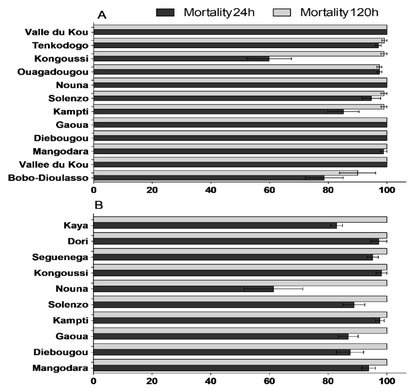
An. gambiae s.l. were resistant to deltamethrin in all sites nationwide. Pre-exposure to PBO followed by deltamethrin resulted in much greater mortality rates. The increase in mortality was substantial, with mortality rates reaching >80% in most sites.

Susceptibility of *An. gambiae* s.l. to carbamate, organophosphate and pyrethroid insecticides



- *An. gambiae* s.l. were also resistant to permethrin in all sites and bendiocarb in southern and western sites.
- However, *An. gambiae* s.l. showed susceptibility to pirimiphos-methyl in all sites, including IRS locations.

Susceptibility of *An. gambiae* s.l. to new classes of insecticide; A) chlorfenapyr and B) clothianidin



- There was high mortality (98-100%) 72 hours after exposure with chlorfenapyr 100µg/bottle in all sites, except in one site (Bobo-Dioulasso).
- Mortality rates obtained 24 hours after exposure with 2% (w/v) clothianidin varied between 60% (the lowest) and 98% (the highest). After 120 hours, all sites reached 100% mortality.

Discussion and Conclusions

- *An. gambiae* s.l. were resistant to all pyrethroids tested, but pre-exposure to PBO increased mortality with deltamethrin in nearly all sites.
- *An. gambiae* s.l. were susceptible to chlorfenapyr at all sites (except 1).
- PBO or chlorfenapyr LLINs may provide greater control of malaria vectors in Burkina Faso than conventional pyrethroid LLINs.
- Full susceptibility to pirimiphos-methyl and clothianidin was observed, indicating that pirimiphos-methyl and clothianidin formulations can be used for IRS in rotation for insecticide resistance management.

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