Mosquitoes which survived the DD and RT were considered as resistant and the resistance status of each field strain was categorized based on the WHO criteria with mortality <80% indicative of resistance. Biochemical assays were conducted to determine the activities of α and β esterases, mixed function oxidases (MFO) and glutathione-S-transferases (GST) enzymes which are involved in resistance of mosquitoes to DDT and PYs. Enzymatic activity levels in each strain were compared with those obtained for the CAREC susceptible strain and significant differences were determined by Kruskal-Wallis and Tukey's non-parametric tests ($p<0.05$). The established DDs were 1µg/100ml, 20µg/100ml and 100µg/100ml for deltamethrin, permethrin and DDT, respectively; and the RTs for deltamethrin, permethrin and DDT were 30, 75 and 120 mins, respectively. All field strains were resistant to DDT (<80% mortality), two strains were incipiently resistant to deltamethrin and three to permethrin (80-98% mortality). Biochemical assays revealed elevated levels of α-esterase and MFO enzymes in all strains. All, except three strains, showed increased levels of β-esterases and all strains, except Curepe, demonstrated elevated GST levels. Metabolic detoxification of enzymes is correlated with the manifestation of DDT and PY resistance in Trinidad and Tobago strains of *Ae. aegypti*. The presence of this resistance also suggests that knock down (kdr)-type resistance may be involved, hence the need for further investigations. This information can contribute to the development of an insecticide resistance surveillance program and improvement of resistance management strategies in Trinidad and Tobago.

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COMMUNITY USE OF LONG-LASTING INSECTICIDAL NET IN COMBINATION WITH CARBAMATE TREATED PLASTIC SHEETING FOR INSECTICIDE RESISTANCE MANAGEMENT IN MALARIA VECTORS

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Due to the spread of insecticide resistance in African malaria vectors, there is an urgent need to develop alternative tools and strategies for the control and management of resistant mosquito populations. In this context, a new Insecticide Resistance Management (IRM) strategy based on the community use of Long Lasting insecticidal Net (LLIN) and Carbamate-Treated Plastic Sheeting (CTPS) was evaluated in southern Benin. A randomized controlled trial (phase III) was carried out in 21 villages in the district of Tori-Bossito. The impact of a full coverage of LLIN, alone or in combination with CTPS, was investigated in terms of malaria transmission and insecticide resistance management in comparison with a control group (i.e. selective coverage of LLIN to children < 5 following the National Malaria Control Program policy). 55,405 mosquitoes of which 1,713 *Anopheles gambiae* and 1,091 *Anopheles* funestus were collected from July 2008 to December 2009. *Anopheles* funestus density was significantly reduced (about 80%) with LLIN and LLIN+CTPS groups compared to the NMCP group ($P<0.001$). No significant reduction of *Anopheles gambiae* density was however observed with a full coverage of LLIN compared to the control ($P=0.061$), whereas combination of LLIN+CTPS significantly reduced the population size of *An. gambiae* (49% reduction, $P<0.001$). The Entomological Inoculation Rate was reduced by 40% ($P=0.010$) and 70% (P0.05). After 18 months intervention, this frequency increased in all treated arms but the frequency evolved faster with a full coverage of LLIN compared to the combination of LLIN+CTPS ($P=0.005$). Regarding carbamate resistance, the frequency of the ace 1R allele was low in the study site (<10%) but did not increase regardless the treatments ($P>0.05$). This study confirmed previous findings in experimental huts showing that a combination of LLIN and CTPS in a same dwelling is promising for the control and management of pyrethroid-resistant malaria vectors in Africa.

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EFFICACY OF A MOSAIC LONG-LASTING INSECTICIDE NET (PERMANET3.0) AGAINST WILD POPULATIONS OF RESISTANT *CULEX QUINQUEFASCIATUS* IN EXPERIMENTAL HUTS IN TOGO (WEST AFRICA)

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The efficacy of new Long Lasting Insecticide Net; PermaNet3.0, against *Culex quinquefasciatus* was evaluated in six experimental huts (February-March, 2008) in Lomé (Togo). Endpoints of evaluation were deterrence, exophily, blood feeding inhibition and mortality. Also, wash resistance of the net and its efficacy on vectors was compared with commercially marketed PermaNet2.0 net. In parallel, field susceptibility and resistant status of *Cx. quinquefasciatus* and *Anopheles gambiae* local populations were assessed by testing to Permethrin (1%), DDT (4%), Bendiocarb (0.1%), Deltamethrin (0.5%, 0.05%), Carbosulfan (0.4%) and Chlorpyrifos Methyl (0.4%) using WHO test tubes and protocol. Subsequent evaluation of Kdr status was done in *An. gambiae* s.s. 1,223 *Cx. quinquefasciatus* females were collected in six week evaluation period (one Latin square rotation). The unwashed PermaNet3.0 deterred 16.84% of total *Culex* mosquitoes caught. After 20 washes, the net deterred 5.79% mosquitoes compared to 6.84% by unwashed PermaNet2.0 net. Also, the net induced mosquitoes to exit huts by 50.48% and inhibited blood feeding 70.97% in unwashed state. After 20 washes, the net induced 42.91% mosquitoes to exit and inhibited 67.06% of mosquitoes from blood feeding. The new PermaNet3.0 gave 76% personal protection at zero wash and 69% protection after 20 washes. More so, the net retained almost equal its insecticidal effect at zero wash (7.1%) and after 20 washes (6.5%). In susceptibility test, *An. gambiae* populations showed resistance to DDT, Permethrin and Carbosulfan (12%, 61% and 77% respectively) but susceptible to CM (100% mortality) and Deltamethrin (100% mortality). *Culex quinquefasciatus* species however were resistant to all insecticides tested. M molecular form of *An. gambiae* s.s was predominant (97%) with no S form detected. One hybrid form was detected (3%). The kdr resistant genotype frequency F(R) was 0.84 with 70% homozygotes kdrRR. The evaluation depicts the success of vector control innovations using pyrethriods and non-pyrethriods in combination on nets.

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MULTIPLEX ASSAY DEVELOPMENT FOR SPECIES IDENTIFICATION AND MONITORING OF KNOCK DOWN RESISTANCE IN *ANOPHELES* MOSQUITO VECTOR POPULATIONS OF PAPUA NEW GUINEA

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Extensive distribution of indoor residual spraying of insecticides and long lasting insecticide treated bednets for prevention of malaria have created selective pressures resulting in the development of insecticide resistant mosquitoes in malaria-endemic regions of the world. A point mutation in the voltage-gated sodium channel gene (*VGSC), kdr,* is the most common variation associated with resistance to DDT and pyrethroid insecticides used in vector control. In the Papua New Guinean *Anopheles punctulatus* (Ap) species complex (>10 species), species-specific insecticide resistance has not been characterized. As morphological species identification has proved challenging within the Ap complex, we undertook DNA sequence-based strategies to evaluate species-specific differences and *kdr* associated polymorphisms. We observed consistent differentiation among Ap, *A. koliensis*, *A. farauti* 1 &4, revealing species-specific ITS2 and VGSC polymorphisms from DNA sequences of 90 mosquitoes in 7 provinces