of multilane roads near the villages, industrial activities, and land surface temperature and altitude.

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Malaria vector control

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Background: Since 2011, the NMCP of Benin has implemented a large IRS campaign using bendiocarb in the department of Atacora in Bénin. The aim of this study was to evaluate the susceptibility of *An. gambiae* mosquitoes to bendiocarb, before (2010) and after (2012) the implementation of IRS interventions and to report the evolution of *Ace-1*^{R} mutation frequency in this region.

Methods & Materials: Mosquitoes resting in the house (indoor collection) were collected through Morning Spray Catch (MSC) from 7 a.m. to 9 a.m in five treated districts (Kouandé, Natitingou, Matéri, Péhunco, Tanguiéta) and in the Control (Copargo, an untreated district) before and after IRS. Anopheles larvae were also reared in each district before and after IRS and emerging adults were exposed to WHO impregnated papersdiscriminating dosages with bendiocarb, 0.1%. PCR assays were run to determine the members of the *An. gambiae* complex, as well as phenotypes for insensitive acetylcholinesterase (AChE1) due to *Ace-1*^{R} mutation.

Results: This study showed that the mean *Ace-1* mutation frequency have significantly increased from 2010 to 2012 after two years of IRS campaign. Mortality data indicated that mosquitoes were susceptible in 2010 to bendiocarb 0.1%. From 2010 to 2012, after two years of IRS campaign, there is a drastic decline in the *An. gambiae* susceptibility to bendiocarb in treated districts. The *Ace-1*^{R} mutation was found in *An. gambiae s.s.* and *An. coluzzi* with frequency of7.33% and 7.35%.The high proportion of homozygous susceptible specimens survived from the WHO bioassays may suggest the implication of the other mechanisms of resistance such as biochemical resistance mechanisms.

Conclusion: These results are of prime importance in the effort to document multiple impacts of operational control program on mosquito vectors. It showed a significant increase of *Ace-1* allele frequency and resistance to bendiocarb in *Anophele gambiae* population after IRS implementation that can be a threat for malaria vector control based on the IRS which is in progress in Benin.

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Studies of reservoirs and vectors of plague in Northeastern, Tanzania

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Background: *Yersinia pestis*, the etiologic agent of plague, is transmitted to animals by infective flea-bites. Fleas associated with rodents, cats, dogs and other small mammals are considered important for the maintenance and transmission of bacterium. Therefore, a study was undertaken to investigate factors associatted with flea infestation among rodents species, and to investigate the presence of Y.pestis in fleas of North-Eastern Tanzania during a quiescent period.

Methods & Materials: Fleas were collected from rodents and domestic animals by brushing the animal. House dwelling fleas were trapped with light traps. All collected fleas were identified to genus level and subjected to PCR test for *Y.pestis* DNA

Results: Among the captured rodents, *Rattus rattus*(26.5%), *Lophuromys flavopunctatus* (16.5%), *Praomys delectorum* (16.2%) and *Mastomys natalensis* (32.3%) were most abundant rodent species. Altogether, 805 fleas were collected from 61% of captured rodents. The most common fleas were *Xenopsylla spp*, *Dinopsyllus spp* and *Ctenophthalmus spp*. Fleas were found to be highly abundant in *M. natalensis, R.rattus, P.delectorum* and *L.flavopunctatus*. These flea species probably play an important role in the transmission of plague in these two districts. Fleas from domestic animals were mostly *Ctenocephalides spp* (>90%). *Pulex irritans* was dominant in human dwellings. Fea indices were high among rodents, house and other small animals indicating that there is high risk of plague outbreak. *Y.pestis* was not detected in all fleas, suggesting that during quiscent period fleas do not harbour the plague pathogens and also, rodent hosts may not have enough *Y.pestis* cells to infect the fleas.

Conclusion: We concluded that rodent species was the most important risk factor associated with flea infestation among the rodent population. Therefore, measures for control and prevention of plague in this area shuold particlarly target rodents associated with high intensity of flea infestation. The findings of present study further suggest that fleas should be tested for *Y.pestis* DNA during the active phase of plague outbreacks for confirmation of infection and during inter-epidermic periods to confirm disease quiescence or detect infection activity.

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