Prevention and Control of Dengue: A Webliography of Resources
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Introduction
Below are links to information resources on the prevention and control of dengue. Click on the underlined text to view the report, website, etc. Unless specified otherwise, the reports are in pdf format.

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**Websites**
- [CDC Dengue](#) – Fact sheets and other dengue publications in English and Spanish.
- [WHO Dengue](#) – Fact sheets and other WHO dengue publications.
- [WHO DengueNet](#) - DengueNet, built on the Global Health Atlas platform, is the World Health Organization's central data management system for the global epidemiological and virological surveillance of dengue fever (DF) and dengue haemorrhagic fever (DHF).
- [WHO Tropical Diseases Research-Dengue](#) – This section of the TDR website has links to reports and audiovisuals on Dengue and DHF.

**Outbreaks**
- May 13, 2008 – [Dengue outbreaks in Peru, Brazil and Indonesia - PROMED-mail](#)
- May 5, 2008 - [Dengue outbreaks in Brazil and Indonesia-PROMED-mail](#)

**Selected Reports/Fact Sheets**
- [PAHO](#) – 2008 reports on dengue cases in Latin America and other information
- [WHO](#) - Dengue publications by WHO

**Abstracts of 12 Recently Published Journal Articles**


A serological survey of primary school children from six schools in Chachoengsao Province, Thailand, was performed at the end of the peak of dengue transmission. GIS analysis of sero-positive cases was carried out to determine transmission foci. Vector control implementation was conducted in the foci and also within 100 meters around the foci in the treated areas by community participation in collaboration with the local government. Vector control strategies included source reduction together with the use of screen covers, a combination of Bacillus thuringiensis subsp. israelensis and Mesocyclops thermocyclopoides, and lethal ovitraps. Implementation of vector control strategies in the foci was continued until the end of the rainy season. Vector control effectiveness was monitored using entomological, serological, and clinical parameters. Results showed a significant reduction of dengue vectors as well as a decrease in sero-positive children and clinical cases in treated areas when compared with untreated areas.

In the countries where the disease is endemic, control of dengue is mainly based on the elimination or treatment of the water-filled containers where the main vector, Aedes aegypti, breeds, in interventions usually reliant on community participation. Although such control activities must be continuous, since vector eradication appears impossible, it should be possible to reduce the incidence of dengue significantly, in a cost-effective manner, by targeting only those types of containers in which large numbers of Ae. aegypti are produced. This strategy is now recommended by the World Health Organization, although it depends on the most productive types of container being carefully identified, in each endemic region. In Thailand, exhaustive surveys of 3125 wet containers in 240 houses in either an urban area (100-120 houses) or a rural area (120 houses) were conducted during a rainy and a dry season in 2004-2005. Indices based on the numbers of Ae. aegypti pupae observed were found to correlate with the 'classical' entomological indices that are based on all of the immature stages of the vector. Overall, 2.3 and 0.8 Ae. aegypti pupae were observed per person in the rural and urban areas, respectively. Although adult female Ae. aegypti laid eggs in all 10 types of wet container that were identified, large water-storage containers produced the majority of the pupae, especially at the end of the dry season (when such containers accounted for 90% of the pupae detected in the rural area and 60% of those in the urban area). Since these containers are large, easy to reach and account for, <50% of all wet containers, it should be relatively easy and quick to treat them with larvicide or to cover them. If even such targeted treatment is to be sustainable, however, it will have to be integrated, as one of several activities in which the at-risk communities are encouraged to participate.


BACKGROUND: Vector control is facing a threat due to the emergence of resistance to synthetic insecticides. Insecticides of botanical origin may serve as suitable alternative biocontrol techniques in the future. Although several plants have been reported for mosquitocidal activity, only a few botanicals have moved from the laboratory to field use, because they are poorly characterized, in most cases active principals are not determined and most of the works are restricted to preliminary screening. Solanum villosum is a common weed distributed in many parts of India with medicinal properties, but the larvicidal activity of this plant has not been reported so far. METHODS: Aqueous and polar/non-polar solvent extract of fresh, mature, green berries of S. villosum was tested against Stegomyia aegypti, a common vector of dengue fever. A phytochemical analysis of chloroform:methanol extract was performed to search for the active toxic ingredient. The lethal concentration was determined (log probit analysis) and compared with Malathion. The chemical nature of the active substance was also evaluated following ultraviolet-visual (UV-Vis) and infrared (IR) analysis. RESULTS: In a 72 hour bioassay experiment with the aqueous extract, the highest mortality was recorded in 0.5% extract. When the mortality of different solvent extracts was compared, the maximum (p < 0.05) mortality was recorded at a concentration of 50 ppm of chloroform:methanol extract (1:1, v/v). The larvicidal activity was lower when compared with the chemical insecticide, Malathion (p < 0.05). Results of regression analysis revealed that the mortality rate (Y) was positively correlated with the period of exposure (X) and the log probit analysis (95% confidence level) recorded lowest value (5.97 ppm) at 72 hours of exposure. Phytochemical analysis of the chloroform:methanol extract reported the presence of many bioactive phytochemicals. Two toxic compounds were detected having Rf = 0.82 (70% and 73.33% mortality in 24 and 48 hours, respectively) and Rf = 0.95 (40% and 50% mortality in 24 and 48 hours, respectively). IR analysis provided preliminary information about the steroidal nature of the active ingredient. CONCLUSION: S. villosum offers promise as potential bio control agent against S. aegypti particularly in its markedly larvicidal effect. The extract or isolated bioactive phytochemical could be used in stagnant water bodies for the control of
mosquitoes acting as vector for many communicable diseases.


This study discusses the use of geoprocessing to identify key areas for Aedes aegypti control, based on the infestation index obtained in the Aedes aegypti Infestation Index Rapid Survey (LIRAa). The study was conducted in November 2004 in Nova Iguaçu, Rio de Janeiro State, Brazil. The results were analyzed on two scales, neighborhoods and blocks, with the building infestation index assigned to the neighborhood polygons and the Breteau index to the blocks. Kernel estimation was used in the spatial pattern analysis. The Breteau index spatial distribution showed five areas with high and medium density of positive Ae. aegypti breeding sites, highlighting small block clusters with high larval density, strategic for vector control. Based on the results, we recommend this method for dengue vector surveillance.


The fecundity and survival of 6 copepod species were assessed under laboratory conditions in order to choose the best candidates to control the aquatic stages of dengue mosquitoes in the field. Females of all the 6 species (Mesocyclops aspericornis, Mesocyclops pehpeiensis, Mesocyclops woutersi, Mesocyclops thermocyclopoides, Mesocyclops ogunnus, and Megacyclops viridis) mated more than once. Multiple mating resulted in increased egg production. The reproductive ability and longevity varied among the species, and M. aspericornis had the highest values. The lowest values were observed in M. thermocyclopoides. Multiple mating of males of M. aspericornis was also observed. The paternal fecundity decreased with each additional mating. There was no difference in the paternal fecundity between the males that mated at low and high female frequencies. The sperm stored in the M. aspericornis females remained viable for 30 days after storage under moist conditions at 25 degrees C or 15 degrees C. This feature in M. aspericornis represents an additional positive factor indicating that this species is a good biological agent for controlling mosquito larvae, especially in domestic water containers that may dry intermittently.


Productivity of defective rainwater harvesting structures (RWHS) and other peridomestic habitats for dengue vector was assessed in a coastal town in Tamil Nadu, southern India, where dengue cases were reported. Of 31,709 houses, 792, 790, and 759 were surveyed during southwest monsoon, northeast monsoon, and summer season, and RWHS were found in 651, 638, and 544 houses, respectively. Of these RWHS, 23.3, 34.6 and 14.2% had defects; 20.7, 30.9, and 11.8% were holding water; and 6.5, 11.9, and 5.7% supported dengue vectors. Six types of RWHS, namely, open percolation pit, covered percolation pit, sealed percolation pit, rechargeable trench with bore, and structures connected to well in use or disuse were found. Number of female pupae of Aedes, i.e., pupal productivity obtained from RWHS ranged from 114 in summer to 1,174 in northeast monsoon, and open percolation pit contributed maximum (11.5%). The productivity of habitats other than RWHS varied from 635 in summer to 1,754 in northeast monsoon. Overall, the pupal productivity recorded from RWHS was 30.1% and in other habitats was 69.9%. A hierarchical cluster analysis showed three clusters of 23 types of habitats, which differed significantly in pupal production (F = 426.4, P < 0.05). Cluster I consists of 15 habitats, namely, disused well, RWHS-disused well, RWHS-used well, metal container, coconut shell, glass bottle, sealed percolation pit, used well, ornamental container, tree stump, defrost water collection tray, disposable cup, flower pot, broken toilet ware, and sun shade. Cluster II includes seven
habitats, i.e., grinding stone, open percolation pit, covered percolation pit, cement tank, mud pot, plastic container, and rechargeable trench with bore, and cluster III includes automobile tire alone. Cluster II and III contributed to 80.1% of the total pupal production, whereas the remaining 19.9% by cluster I. The study showed that the defective RWHS, particularly open and covered percolation pits were found to be among the key containers, propagating Aedes population. The pupae per person obtained during northeast monsoon in different houses varied between 0.077 and 2.839 (average 0.864). House and Breteau Indices were relatively higher during northeast monsoon, whereas the Container Index was higher in southwest monsoon. In view of risk of dengue vectors propagation, the need for source reduction involving community and prioritizing control measures toward the highly productive water-holdings is discussed.


BACKGROUND & OBJECTIVES: Dengue fever (DF), dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS) are the re-emerging infectious diseases caused by the four serotypes of dengue (DEN) virus, type 1 to 4, belonging to the family Flaviviridae and genus Flavivirus. In the absence of a safe and effective mass immunisation, the prevention and control of dengue outbreaks depend upon the surveillance of cases and mosquito vector. The aim of this work is to test enzyme-linked immunosorbent assay (ELISA) tool for the virological surveillance of dengue. METHODS: Virus-infected Aedes mosquitoes were collected from the field in order to serve as an early warning monitoring tool for dengue outbreaks. In a prospective field study conducted from April to September 2000, female adult Aedes mosquitoes were caught from selected dengue-sensitive area in Chombung district, Ratchaburi province and assayed by ELISA. RESULT: Approximately 18.3% were found positive for dengue virus. CONCLUSION: This can imply that ELISA can be an alternative tool for epidemiological surveillance for dengue in mosquitoes.


Increased DEN-2 virus transmission in Puerto Rico during 2005 prompted the implementation of a rapid intervention programme to suppress Aedes aegypti (L.) (Diptera: Culicidae) emergence, which in turn lead to the discovery of previously unknown breeding sites underground. Initially, the following control measures were applied in Playa/Playita (PP), a town of 1,400 households, to all areas where the number of pupae per person exceeded the expected threshold for dengue transmission; all containers likely to be aquatic habitats were turned over and containers too large to turn were treated with 1 p.p.m. methoprene. The impact of these interventions was evaluated by comparing the number of resting adult mosquitoes (by backpack aspiration and sweepnetting in bedrooms) pre-intervention, with numbers at 3 and 5 weeks post-intervention, and by evaluating pupal density at 4 weeks post-intervention in PP and in a nearby town, Coqui (CO; 1500 households), which was not treated. The pre-intervention and post-intervention densities of resting Ae. aegypti adults were significantly larger in the intervention town, although the density of pupae in surface containers was low and similar in both towns at 4 weeks post-intervention. At 3 weeks post-intervention, the density of resting adults decreased by only 18% of pre-intervention levels, but returned to pre-intervention levels 5 weeks after treatment. By contrast, the density of resting adults in CO steadily decreased to 48% and 61%, at 3 and 5 weeks after the initial surveys, respectively. Geographical Information Systems identified significant clustering of adult mosquitoes, which led to the discovery of underground aquatic habitats (septic tanks) that were producing large numbers of Ae. aegypti and Culex quinquefasciatus (Say) in the treated town. We calculated that septic tanks could produce > 18 000 Ae. aegypti and approximately 170 000 Cx quinquefasciatus adults per day. Septic tanks are likely to be common and widespread in suburban and rural Puerto Rico, where, apparently, they can contribute significantly to the maintenance of island-wide dengue virus endemicity.

A new approach to dengue vector surveillance based on permanent egg-collection using a modified ovitrap and Bacillus thuringiensiis israelensis(Bti) was evaluated in different urban landscapes in Recife, Northeast Brazil. From April 2004 to April 2005, 13 egg-collection cycles of four weeks were carried out. Geo-referenced ovitraps containing grass infusion, Bti and three paddles were placed at fixed sampling stations distributed over five selected sites. Continuous egg-collections yielded more than four million eggs laid into 464 sentinel-ovitraps over one year. The overall positive ovitrap index was 98.5% (over 5,616 trap observations). The egg density index ranged from 100 to 2,500 eggs per trap-cycle, indicating a wide spread and high density of Aedes aegypti (Diptera: Culicidae) breeding populations in all sites. Fluctuations in population density over time were observed, particularly a marked increase from January on, or later, according to site. Massive egg-collection carried out at one of the sites prevented such a population outbreak. At intra-site level, egg counts made it possible to identify spots where the vector population is consistently concentrated over the time, pinpointing areas that should be considered high priority for control activities. The results indicate that these could be promising strategies for detecting and preventing Ae. aegypti population outbreaks.


The acetone, chloroform, ethyl acetate, hexane and methanol leaf extracts of Acalypha indica, Achyranthes aspera, Leucas aspera, Morinda tinctoria and Ocimum sanctum were studied against the early fourth-instar larvae of Aedes aegypti L and Culex quinquefasciatus Say. The larval mortality was observed after 24 h exposure. All extracts showed moderate larvicidal effects; however, the highest larval mortality was found in the ethyl acetate extract of A. aspera. In the present study, bioassay-guided fractionation of A. aspera led to the separation and identification of a saponin as a potential mosquito larvicidal compound, with LC(50) value of 18.20 and 27.24 ppm against A. aegypti and C. quinquefasciatus, respectively. (1)H NMR, (13)C NMR and mass spectral data confirmed the identification of the active compound. This is the first report on the mosquito larvicidal activity of the saponin from the ethyl acetate extract of A. aspera. This study investigates the potential of crude extracts from commonly used medical herbs in India as an environmentally safe measure to control the vector of dengue and lymphatic filariasis.


OBJECTIVE: To identify key elements that should provide an added value and assure sustainable effects of the deployment of technical tools for Aedes aegypti control. METHODS: An observational study was conducted between April 2001 and March 2002 in 30 blocks (1574 houses) in the central zone of Guantanamo city. A trial that combined two complementary technical interventions, the distribution of new ground level water tanks and the intensive use of insecticide, was nested in May 2001. Another 30 blocks (1535 houses) were selected as control area. We assessed community perceptions and household risk behaviour at baseline and after 9 months, and measured the trial's impact through entomological indices. RESULTS: Perceived self efficacy to solve A. aegypti infestation and prevent dengue was not modified. We found no changes in behaviour. In the study area the container indices decreased significantly from 0.7% before to 0.1% 1 month after the intervention. Six months later, they had increased to 2.7% and uncovered new water tanks constituted 75.9% of all breeding sites. Over the 9 months after the trial the average monthly house indices were similar in the study and control areas. A technical approach and lack of community involvement in the trial's implementation were the main causes of these short-lived results. CONCLUSIONS: Top-down deployment of technical tools without active involvement of the community has a temporary effect and does not lead to the behavioural changes necessary for sustainable A. aegypti control.
OBJECTIVES: Insecticide-treated bednets (ITNs) are effective in preventing nocturnally transmitted vector-borne diseases, but their effect on diurnally active dengue vectors has never been studied. We investigated the efficacy of ITNs in reducing Aedes aegypti populations and dengue transmission. METHODS: A cluster-randomized trial was carried out in Leogane, Haiti between July 2003 and July 2004. The study area (1017 houses) was divided into 18 sectors (clusters): nine received ITNs (Olyset(R) long-lasting insecticidal bednets) and nine were untreated controls. Entomological surveys [measuring Breteau (BI), house (HI), container (CI) and pupae per person (PPI) indices and oviposition activity] were undertaken at baseline and at 1 and 5 months post-intervention. All houses were georeferenced to enable spatial analysis. Control sectors received ITNs at 6 months, and a final entomological and attitudinal survey was undertaken at 12 months after baseline. Anti-dengue IgM seropositivity rates were measured at baseline and after 12 months. Efficacy of ITNs was assessed by WHO cone bioassays.

RESULTS: At 1-month post-intervention, entomological indices fell in all sectors, with HI and BI in the bednet sectors reduced by 6.7 (95% CI -10.6, -2.7; P < 0.01) and 8.4 (95% CI -14.1, -2.6; P < 0.01) respectively. Moreover at 1 month, ovitraps in control sectors were significantly more likely to be positive than in bednet sectors (P < 0.01). By 5 months, all indices remained low and HI, CI and BI were also significantly lower than that of baseline in the control arm. Curiously, at 5 months, HI, CI and BI were lower in the control arm than that in the bednet arm. A final survey, 12 months after the initial baseline study (5 months after bednets had been given to all households) indicated that all indices were significantly lower than that at baseline (P < 0.001). Control houses located within 50 m of a bednet house had significantly lower CI (Z = -2.67, P = 0.008) and PPI (Z = -2.19, P = 0.028) at 1 month, an effect that extended to 100 m by 5 months (Z = -2.03, P = 0.042 and Z = -2.37, P = 0.018 respectively), suggesting a spill-over effect of the bednets. An IgM serosurvey showed a 15.3% decrease (95% CI 5.0-25.5%, P < 0.01) in the number of IgM-positive individuals from baseline to 12 months later. CONCLUSIONS: Insecticide-treated bednets had an immediate effect on dengue vector populations after their introduction, and over the next 5-12 months, the presence of ITNs may have continued to affect vector populations and dengue transmission.