



Integrated Vector Management for Malaria Control in Africa

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Background

Vector control is a critical element of malaria control programs in Africa. To reduce human exposure to infective *Anopheles* mosquitoes, most programs rely on methods that kill adult mosquitoes. These include promoting the use of insecticide-treated bednets (ITNs) or spraying long-lasting insecticides on the interior walls of houses (“indoor residual spraying,” or IRS). IRS became popular in the 1950s, when effective and inexpensive insecticides such as DDT first became available. Before then, many malaria control programs relied on methods for killing mosquito larvae, before they mature to the adult stage. These methods are more labor-intensive and include “source reduction” (draining and filling, or avoiding the creation of, mosquito breeding sites) and “larval control” (killing larvae with oil or insecticides applied to the water surface).

Each of these methods is cost-effective in some settings but may be ineffective, or too costly, in others. IRS does not work on thatch walls and may be too costly where mosquitoes are resistant to the less expensive insecticides. Larval control can be effective in arid areas and cities, where there are relatively few breeding sites, but is impractical in the rural areas of many African countries, where mosquito breeding sites are small and ubiquitous. ITNs have proven effective in many settings, but they may be less so where *An. arabiensis* is the principal vector, since mosquitoes of this species frequently bite outdoors and in the early evening, before people are in bed.

One of EHP’s core missions is to *determine the effectiveness of selected vector control methods and identify the appropriate settings for each.*

Under the program on Integrated Vector Management, EHP is working with several partners to help malaria control programs identify the most cost-effective combination of vector control methods for the particular settings they must address.



A small stream created by spillage at a water well in Gash Barka. Such man-made breeding sites are an important source of anopheline mosquitoes during the dry season in arid zones of Eritrea.

Highlights

Larval Control Trials in Eritrea

Eritrea’s national malaria control program (NMCP) has long used source reduction and chemical larvicides. EHP is helping introduce the use of biological larvicides and refine protocols that maximize the effectiveness of larval control methods.

The NMCP has performed field trials to validate the efficacy of two bacterial larvicides, *Bacillus thuringiensis* var. *israelensis* (Bti) and *Bacillus*

sphaericus (Bs), and is implementing a pilot program for routine larval control operations in four villages. Local staff map mosquito breeding sites, check sites weekly, and apply one of the bacterial larvicides or the chemical larvicide temephos® whenever mosquito larvae are present.

Larval Control Trials in Uganda

EHP is working with the Uganda MOH to determine whether eliminating mosquito breeding sites will reduce malaria transmission in urban settings. In two cities, neighborhoods have been identified close to significant mosquito breeding sites — flooded brick pits in Kampala and flooded fields adjacent to housing estates in Jinja. After completing baseline surveys, the team will work with area residents and local officials to devise and carry out a plan for eliminating the sites. Follow-up surveys will estimate the impact on local malaria transmission rates.

Malaria and Urban Agriculture

EHP is supporting work by the International Water Management Institute (IWMI) as part of the CGIAR System-wide Initiative on Malaria and Agriculture. IWMI is preparing to study the relationship between urban agriculture and malaria transmission in six West African cities. Before starting the larger study, IWMI is working in Kumasi, Ghana, to characterize the water quality parameters of urban breeding sites that are productive for *Anopheles* larvae. Results from this effort will be used to design interventions for controlling larvae in urban agricultural sites.

Collaboration with WHO/AFRO to Strengthen Vector Control in Africa

EHP is supporting several initiatives led by WHO's Regional Office for Africa (AFRO). Beginning with a Regional Consultation in February 2001 to examine "The Future of Vector Control Programmes in Africa," AFRO has embarked on a thoughtful series of activities that includes training field technicians to test for

vector resistance to insecticides, developing guidance on IVM and training control program managers on IVM principles, and helping countries that still use DDT for indoor spraying identify and use alternative vector control methods.

International Symposium on Larval Control for African Malaria Vectors

In collaboration with WHO/AFRO, the International Centre for Insect Physiology and Ecology (ICIPE), and several research institutes, EHP held the symposium in Kampala in April 2002. Participants shared information on uses of larval control in malaria programs and charted a path for future research and collaboration. To follow on this meeting, EHP is partnering with the University of Durham to review data from African countries using larval control methods, initiate several new field trials and organize a second symposium in April 2004.

EHP Partners

- Ministries of Health and USAID Missions in Eritrea and Uganda
- WHO Regional Office for Africa
- International Centre for Insect Physiology and Ecology
- University of Durham
- Danish Bilharziasis Laboratory
- Swiss Tropical Institute (STI)
- Institute de Recherche pour le Développement (IRD)
- International Water Management Institute

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