

# Malaria

## Vector Control

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Malaria vector control through three different larviciding strategies

Oman  
Wilayat Barka, South Batinah Region

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### Abstract

A field study was carried out in South Batinah Region to evaluate the impact of 3 larviciding-based strategies of vector control. The evaluation covered 2000 breeding sites in this region and continued over 27 weeks.

The first strategy was to use half the amount of Abate (0.5 ppm) weekly, instead of the conventional weekly dose of 1 ppm currently used in the National Malaria Eradication Programme. The second approach was to apply the full dose (1 ppm), but fortnightly. The third method was to search for vector larvae and treat only the breeding places of anopheline larvae. The first method was found to be as effective as the full dose and the second approach was the least effective larvicidal method.

**Conclusion** Compared to the full dose of Abate currently used in the control programme of the Ministry of Health, the half dose of Abate (0.5 ppm) was proved to be a more cost-effective and environmentally friendly larvicidal-based vector control method. It is much more effective than applying a full dose fortnightly or treating only larval-positive breeding sites. This vector control method could be adopted in malaria endemic countries

### Background

The National Malaria Eradication Programme in Oman has achieved

excellent malaria control through case management and vector control, including larval control, using chemicals. This study reports the results of comparing different larvicidal strategies for vector control in the field.

### Materials and Methods

Oman consists of 10 administrative regions, each divided into wilayats. At the wilayat level, malaria units are responsible for malaria eradication activities. The area under each unit is demarcated into daraks for all operations. Centrally, the Directorate of Environmental Health and Malaria Eradication supervises the national programme.

The study was carried out in 5 coastal daraks of the malaria-free wilayat of Barka in the South Batinah region.

Geographic reconnaissance was updated for the vector breeding locations by physical verification. Final maps indicating details of the work were then prepared. Meteorological data were collected from Seeb Weather Station. The pH value in each darak was also recorded.

The intervention The intervention consisted of using several different strategies for applying Temephos insecticide. Some daraks were treated using the existing standard method, but applying only half the standard weekly dose of Temephos; others were treated with the normal 1 ppm dose of Temephos, fortnightly; and in the third group, only positive larval breeding sites were treated. One darak was left without intervention to observe the natural conditions and as a control for comparison to the above-mentioned strategies.

Supervisory teams closely directed the sprayers and regularly delivered the daily programmes for spraying. All daraks were visited weekly to assess the impact of the treatment strategy on larva control.

### Conclusions and implications of the study

- A half dose of Abate (0.5 ppm) is more cost-effective compared to a full dose, with less harmful effect to the environment. Hence this method could be applied on a wide scale in endemic countries.
- In countries targeting elimination, it is recommended to stratify the country according to receptivity and vulnerability to malaria, and apply the tested larvicide wherever there is a risk of resuming malaria.
- The frequency of positive breeding sites for the vector in this region ranged from 4% to 6.6% in June and increased during the months of August to December.
- *Anopheles culicifacies* and *An. stephensi* are the only species identified in this region.

Vector susceptibility to Temephos A pre-intervention baseline evaluation of the vector susceptibility to Temephos was performed using WHO standard methods for susceptibility testing. Larval density tests were also conducted.

## ■ Main study findings

**Baseline pre-intervention survey: June 2001**  
There was no significant difference between the tanks regarding the presence of the vector during this period (ranging from 4 to 6.6%). The only species identified were *An. culicifacies* and *An. stephensi*, and the former was much more prevalent (vector density: 10-25/100 dips for *An. culicifacies* compared to 0-7/100 dips for *An. stephensi*). Vector susceptibility tests to Temephos were also conducted in each darak.

**Intervention period: 30 June-December 2001**

**Control daraks** Vector breeding in this area markedly increased during the period August-December, reaching 20-50 larvae/dip without application of any vector control measure.

**Weekly half-dose treatment with Temephos**  
In this intervention, there was a significant decrease in vector density in the treated daraks, with vector numbers declining from an initial 30 larvae/dip to none after 4 cycles, and this was maintained till the end of the study.

**Fortnightly normal dose of 1 ppm** Although there was a significant decrease in vector density with this intervention, it was not 100% effective.

**Weekly breeding checking and treating of positive sites** While this intervention was more effective in reducing vector density compared to the fortnightly normal dose of 1 ppm, it was less effective compared to the weekly half-dose treatment with Temephos.

**Vector breeding sites** Twenty percent of potential breeding sites were positive for the vector during the study period. However, there was a significant difference between sites regarding the presence of the vector. Interestingly, repeated identification of larvae was reported up to 10 times, indicating a tendency of the vector to use the same breeding site or "habitat" in this situation.

**Larvicidal strategy** Multivariate logistic regression analysis showed that weekly half-dose treatment with Temephos provided the most protective effect against positivity of breeding sites. This was adjusted for the effect of temperature and pH value of the daraks.

**Vector susceptibility tests** There was no significant difference before and after intervention regarding vector susceptibility to Temephos.

**Cost-benefit analysis of different strategies**  
The cost for larvicide was reduced by 50% using weekly half-dose applications of Temephos, which was proved to be as effective as using the full dose, and was the most effective tested strategy. The fortnightly cycle was the most economic method, but was the least effective.

## ■ Conclusions and recommendations

A half dose of Abate is a cost-effective larvicidal-based vector control that could be applied on a wider scale in endemic countries. However, in countries targeting elimination, it is recommended to stratify the country according to receptivity and vulnerability to malaria, and apply the tested larvicide where there is a risk of resuming malaria. Testing the half dose of Abate for a two-week cycle is also recommended to provide a further reduction in cost and harm to the environment.