MALARIA CONTROL IN EAST TIMOR

Due to the breakdown of surveillance, vector control activities and treatment facilities, malaria showed a three-fold increase in East Timor following the 1999 crisis. WHO, in an effort to address the problem, was involved with the implementation of numerous activities aimed at decreasing malaria morbidity and mortality. Most recently, in July 2001, WHO adapted malaria treatment guidelines for East Timor.

WHO, through subcontracts with two international non-governmental organizations (Merlin and IRC), actively sought to control malaria by:

- establishing a Vector Borne Control Working Group in the Division of Health Services to help coordinate the activities of and provide technical back-up to the NGOs involved in vector control activities;
- establishing malaria diagnostic facilities, including re-training microscopists and equipping 13 district laboratories in the country;
- arranging anti-malarial drug supplies;
- promoting and distributing be nets, especially for protection of pregnant women and children under 5 years; and
- conducting social research into community knowledge, attitudes and practices related to malaria.

Attached is a report from Merlin covering malaria control activities implemented by it under the supervision of WHO. Activities described in this report were undertaken with the financial assistance of the Governments of Australia and the United States of America.
Merlin/WHO Emergency Control of Malaria and other Vector Borne Diseases in East Timor

Final Report

January 2001
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1. EXECUTIVE SUMMARY

1.1 PROGRAMME DATA SHEET

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Jane Moore Medical Advisor (jane.moore@merlin.org.uk)

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Ana Maria Miranda Finance Controller

Country: East Timor

Disaster: Conflict affected communities with widespread destruction of homes and infrastructure leading to massive displacement of populations in East Timor, making host and returning population highly vulnerable to life-threatening communicable diseases.

Beneficiaries: The population of East Timor (approximately 800,000) including approximately 160,000 returnees from West Timor, other parts of Indonesia, Australia, Mozambique and Macau.

Period of Activity: 8/10 months from January/ March 2000 respectively to October2000

Objective: To reduce avoidable morbidity and mortality due to malaria and other life-threatening insect-borne diseases through establishment of integrated disease surveillance, diagnostic, treatment and vector control support to East Timorese health staff and supporting health agencies.

Implementing Partners: Merlin, as a key implementing agency within the WHO Roll Back Malaria (RBM) initiative, working in co-ordination with WHO representatives in the region, the United Nations Transitional Administration in East Timor (UNTAET), the Division of Health Services (DHS) of the Ministry of Social Affairs, International Rescue Committee (IRC) and other international NGOs implementing complementary and related activities.

Contracts: Obligation HQ/00/494373 Combined report
Obligation HQ/00/170954
2. PROGRAMME CONTEXT

2.1 BACKGROUND

The majority of East Timorese people were displaced by fighting, widespread looting and property destruction following a vote for independence from Indonesia in August 1999. Some 200,000 people became refugees in West Timor and other Indonesian islands. Infrastructure, including health service infrastructure, was significantly damaged. Security was re-established by international peacekeeping forces in September 1999. International NGOs began to arrive in September 1999 to offer humanitarian assistance, in particular re-establishment of district health care services. The United Nations installed a transitional administration (the United Nations transitional Administration in East Timor, UNTAET) in October 1999. By June 30, some 160,000 East Timorese had returned to East Timor from Indonesia and other parts of the world.

2.2 KEY HEALTH PLAYERS

In February 2000, the Interim Health Authority (IHA) of UNTAET was established, made up of national and international health and administrative workers. In August 2000, with the formation of the Ministry of Social Affairs, the IHA was renamed into Division of Health Services (DHS). The DHS has the responsibility for establishing health strategies, policies and programmes, and works closely with the NGOs in charge of health care at district and national level. At present, all national health workers working for NGOs are paid UNTAET stipends as public employees, but this will change with the UNTAET recruitment process during January 2001, when all positions will be opened to East Timorese applicants. Health services are also presently provided by church groups, which are operational in the majority of districts.

2.3 MALARIA DATA SEPTEMBER 1999-NOVEMBER 2000

WHO’s Department of Emergency and Humanitarian Action (EHA) established an office in East Timor in September 2000 and commenced passive communicable disease surveillance activities. Since September 26, 1999, there have been more than 150,000 cases of suspected malaria reported from health facilities to WHO. There are two reporting peaks: one in late November and one in late May to June (Annex 1, chart 1). These peaks persist when reported malaria cases are analysed as a proportion of total reported consultations to minimise bias from reporting variation from different health facilities, (Annex 1, chart 2). The greatest number of suspected malaria cases was reported from Dili district, with Lautem second and Viqueque third (Annex 1, chart 3). The greatest number of suspected malaria cases per 100,000 population was reported from Lautem district, with Viqueque district second, Liquica district third, and Oecussi district fourth (Annex 1, chart 4). When suspected malaria cases are analysed as a proportion of total consultations per district, Oecussi shows the highest percentage followed by Viqueque and Lautem (Annex 1, chart 5). Without confirmatory diagnostic data it is unclear what proportion of suspected malaria cases is due to malaria and what proportion is due to any other febrile illness such as dengue fever. With country standardised reporting mechanisms and laboratory diagnostic systems now in place more information will become available.

2.4 MERLIN’S ACTIVITIES

WHO/EHA initiated Malaria Control Programme in line with the RBM strategy in East Timor in September. Merlin and IRC (US based International Rescue Committee) were nominated as implementing partners. IRC has been responsible for bednet distribution and community education, whereas Merlin covers most activities related to diagnosis, treatment, surveillance and epidemic response. Merlin commenced activities in all districts of East Timor on January 4.
3. PROJECT DESCRIPTION

3.1 PROGRAM GOALS AND OBJECTIVES

3.1.1 PROJECT AIM
Reduced avoidable morbidity and mortality due to malaria and other life-threatening insect-borne diseases.

3.1.2 OBJECTIVE 1
To re-establish national capacity to identify communities and individuals at high risk of, or infected with, life threatening vector borne diseases in all 13 districts of East Timor.

Sub-objective 1
To mobilise and return skilled laboratory technicians from local communities and Dili reference laboratory to their health facilities of origin around the country.

Sub-objective 2
To work with national laboratory officials to re-establish supervision, technical support, WHO standardised disease surveillance reporting and information dissemination systems for district laboratories

Sub-objective 3
To co-ordinate and provide material, technical and training support to national staff, international and national NGOs, to re-establish a network of basic diagnostic laboratories to support key health facilities in each district. Presently all medical supplies including drugs and pharmacy supplies are provided on a relief basis.

Sub-objective 4
To carry out incidence and prevalence malaria surveys to identify communities in high-risk areas

3.1.3 OBJECTIVE 2
To improve capacity of national and international health staff to treat malaria and other life-threatening vector borne diseases in all 13 districts of East Timor

Sub-objective 1
To supply and promote the use of effective national case definitions and standard WHO treatment protocols for malaria, dengue and Japanese encephalitis through NGOs and local health authorities

Sub Objective 2
To establish and maintain a contingency stock of WHO recommended anti-malarial drugs

Sub Objective 3
To supply essential anti-malarial drugs to national health facilities through supporting agencies to minimise stock ruptures and ensure standard treatment protocols can be implemented.

Sub-objective 4
To provide clinical training workshops in management of severe and non-severe malaria for nurses and doctors in partnership with health agencies supporting each district.
3.1.4 OBJECTIVE 3
To establish emergency response capacity to vector borne disease outbreaks and disease prevention amongst high risk communities.

Sub-objective 1
To re-establish and support national outbreak response teams.

Sub-objective 2
Conduct targeted campaigns for residual spraying of buildings and health education in communities identified as high risk for outbreaks.

Sub-objective 3
Maintain an emergency medical stock of essential drugs and materials to provide additional support to partner NGOs and health authorities in the event of malaria/dengue outbreaks.

3.1.5 OBJECTIVE 4
To improve countrywide insect-borne disease control through provision of technical support and co-ordination among implementing agencies.

Sub-objective 1
To establish a task force of implementing agencies that provide various components essential for the control of major insect-borne diseases to promote a co-ordinated response by national and international NGOs and agencies in this emergency setting plus the dissemination of relevant information, including regular updated disease surveillance data.

Sub-objective 2
In collaboration with WHO, to provide technical support and advice to implementing partners implementing complementary cross-sectoral vector control programmes.

Sub-objective 3
To assess the efficacy of appropriate insecticides for residual spraying, bed net and curtain impregnation and to recommend standard use of the most effective and safe insecticide protocols.

4. STATE OF IMPLEMENTATION COMPARED TO OBJECTIVES

4.1 OBJECTIVE 1

4.1.1 SUB-OBJECTIVE 1
Re-establishment of Dili Central Laboratory as the central reference laboratory:
Merlin has worked closely with UNTAET and the Dili Central Laboratory (DCL) to re-establish the laboratory as the central reference laboratory with quality control, supervisory, co-ordinating and reporting responsibilities. Merlin has also facilitated the process of re-establishing one malaria microscopist per district, linked to the central health facility, and paid on UNTAET stipends. All district and central technicians are UNTAET (government) employees under the direct responsibility of the district health services and accountable to the Central Laboratory. The Central Laboratory itself is government property and reports directly to the Division of Health Services.

4.1.2 SUB-OBJECTIVE 2
Re-establish supervision, technical support and malaria surveillance reporting for district laboratories:
Merlin’s expatriate parasitologist, in collaboration with the Dili Central Laboratory, has conducted supervisory visits to establish quality control and standard WHO reporting procedures in Aileu, Ainaro, Dili, Ermera, Liquica, Oecussi, Manatuto, Same, and Viqueque. Merlin has trained one quality controller and supervisor from Dili Central Laboratory to ensure sustainability of quality control and reporting procedures. Strengthening of quality assurance and monitoring of reporting procedures are ongoing.

Merlin’s country manager has accompanied WHO’s epidemiologist on field visits to all field laboratories, to reinforce surveillance procedures, stress the need for rapid and regular reporting and discuss means to facilitate communication between Dili and the districts.

4.1.3 SUB-OBJECTIVE 3

Material Support:
Microscopes, reagents, slides and consumables, for the laboratory diagnosis of malaria have been procured and distributed to the districts where required on a relief basis and further supplies are to come from the DCL. Districts that were supplied are: Aileu, Ainaro, Dili (AMI-Portugal Clinic, Atauro Island, and Dili Central Laboratory), Ermera, Liquica, Maliana, Manatuto, Oecussi, Los Palos, Same, and Suai. The remaining districts were supplied by the NGO providing district health care.

Orders for supplies are placed by lab technicians from the district in writing to the DCL or through the NGO in charge of district health care. Recent assessment of the stock keeping and supply system has, however, shown that materials were stored inadequately and carelessly, and not in the cabinets originally donated for this purpose. In addition, the supply of microscopists in the district has been far from satisfying, with NGOs directly approaching Merlin for further supplies, due to difficulties in obtaining materials from DCL. The issue has been raised with DHS and it has been agreed to facilitate further distribution of laboratory supplies to the district by temporarily housing them at the Central Pharmacy, from where they can be ordered using the same procedures as those used for drug orders.

Technical support:
Merlin’s expatriate parasitologist, in collaboration with the Dili Central Laboratory, has conducted supervisory visits to provide additional teaching and support to laboratory technicians. Merlin has also provided on-going technical support and additional cross-checking.

Training:
WHO, in collaboration with Merlin, produced a training course for laboratory technicians on the microscopic diagnosis of malaria. Training materials were prepared in Bahasa Indonesian based on Basic Malaria Microscopy (WHO, 1991). An 8-day course was conducted by Merlin in collaboration with DCL from March 2nd to 11th, with significant technical contribution from WHO. A total of thirteen technicians, one from each of the districts, were retrained. A refresher course for staff at DCL was carried out for 5 days (September 4th – 8th) to further improve standards at this central facility.

Visits to laboratory technicians in the districts have shown that they will require further training and supervision, but DHS has requested that all training is suspended until the end of the UNTAET recruitment process (anticipated to be end of January 2001). To be prepared for the end of this process and be able to provide training to laboratory technician immediately afterwards, Merlin decided to enter into discussion with DHS and WHO on essential requirements for further training and, collaboratively with AMI-France, produce a competency based training course for parasitology. DHS has stated that it will be necessary to make technicians multi-skilled, because laboratory staff levels in the districts will be reduced to one person. Each person will be required to perform a wide range of tests, not only malaria diagnosis. The course is now near completion and in accordance with WHO and DHS regulations. It will provide students with the knowledge required to identify a wide range of parasitic diseases. Laboratory items and consumables for the course are presently on order, to ensure that Merlin and AMI are ready to commence training immediately after the recruitment process.
Functioning laboratories:
Laboratories with trained microscopists are now functioning in all thirteen districts in line with the DHS plan to establish laboratory facilities in each district and are located in the main hospitals, working in collaboration with the NGO’s that provide health care in these districts.

4.1.4 SUB-OBJECTIVE 4
Clinic surveys:
MERLIN conducted three brief surveys in clinics across East Timor in January. The surveys were performed on a systematic sample of patients attending the clinics, irrespective of presence of fever (i.e. one patient in every five). Quorum® rapid antigen detection dip-stick tests were used to test for *P. falciparum* and thick and thin blood films were made for confirmatory testing plus examination for *P. vivax* and *P. malariae*. The dipsticks were read within 15 minutes and the doctor/health worker was notified of a positive result for a patient. Slides were read at a later stage to determine the prevalence of *P. vivax* and *P. malariae*.

Results are shown in Tables 1a – 1c below.

**Table 1: Clinic based malaria survey results:**

<table>
<thead>
<tr>
<th>Location</th>
<th>Date</th>
<th>n</th>
<th>Fever reported previous 72 hours</th>
<th>Axillary temp &gt;37.5 °C</th>
<th>Av Age (Range)</th>
<th>Sex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dili</td>
<td>14/01/00</td>
<td>54</td>
<td>98.1%</td>
<td>51.0%</td>
<td>12.6y (9m-60y)</td>
<td>54%F 46%M</td>
</tr>
<tr>
<td>Baucau - Quelica</td>
<td>17/01/00</td>
<td>22</td>
<td>53.3%</td>
<td>4.5%</td>
<td>31.7y (12m-75y)</td>
<td>90%F 10%M</td>
</tr>
<tr>
<td>Manatuto</td>
<td>21/01/00</td>
<td>24</td>
<td>70%</td>
<td>23.8%</td>
<td>9.1y (3mo-26y)</td>
<td>57%F 43%M</td>
</tr>
</tbody>
</table>

**Table 1b:**

<table>
<thead>
<tr>
<th>Location</th>
<th>% P falciparum</th>
<th>% P vivax</th>
<th>% mixed</th>
<th>% unconfirmed</th>
<th>% P species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dili</td>
<td>4.2% (95% CI 6.0-41.0%)</td>
<td>10.6% (95% CI 4.6-23.3%)</td>
<td>0%</td>
<td>1.1% (95% CI 0.1-9.9%)</td>
<td>15.9% (95% CI 7.9-29.3%)</td>
</tr>
<tr>
<td>Baucau - Quelica</td>
<td>6.6% (95% CI 0.3-29.0%)</td>
<td>6.6% (95% CI 0.3-29.0%)</td>
<td>6.6% (95% CI 0.3-29.0%)</td>
<td>0%</td>
<td>19.8% (95% CI 6.3-43.0%)</td>
</tr>
<tr>
<td>Manatuto</td>
<td>18.1% (95% CI 6.3 - 42.6)</td>
<td>15.8% (95% CI 3.5-36.0%)</td>
<td>5.3% (95% CI 0.3-26.9%)</td>
<td>10.5% (95% CI 11.0-29.1%)</td>
<td>49.7% (95% CI 24.3-67.3%)</td>
</tr>
</tbody>
</table>

**Table 1c:**

<table>
<thead>
<tr>
<th>Location</th>
<th>% axillary temperature ≥ 37.5°C and slide positive for <em>Plasmodium</em> sp</th>
<th>% history of fever in the past 72 hours and slide positive for <em>Plasmodium</em> species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dili</td>
<td>16.6% (95%CI 5.5-38.1%)</td>
<td>17.0% (95%CI 8.1-31.3%)</td>
</tr>
<tr>
<td>Baucau</td>
<td>n/a</td>
<td>12.5% (95%CI 0.7-53.3%)</td>
</tr>
<tr>
<td>Manatuto</td>
<td>20% (95%CI 1.0-70.1%)</td>
<td>50.0% (95%CI 24.0-80.0%)</td>
</tr>
<tr>
<td>Overall</td>
<td>17.2% (95% CI 6.5-36.5 %)</td>
<td>23.1% (95% CI 14.2-35.1 %)</td>
</tr>
</tbody>
</table>

A significant interaction was found between location and malaria ($\chi^2$=8.22, df=2, p=0.016), with Manatuto showing the highest prevalence of malaria overall. No relationship was found between temperature recorded, reported fever, age group, or gender and malaria. The lack of relationship between fever or reported fever is interesting to note clinically.
Results were distributed to international and national agencies active in the health sector at the Malaria Task Force Meeting.

**Cross-sectional surveys:**
Merlin has conducted three random household cross-sectional wet season prevalence surveys, one in Dili in the north (S8°34’, E125°35’, altitude 0m), one in Same in the south (S9°00’, E125°40’, altitude 500m) and two in the east in Lautem district.

For full report please refer to annex 2.

### 4.2 OBJECTIVE 2

#### 4.2.1 SUB-OBJECTIVE 1

Prior to the conflict, chloroquine was the standard first-line treatment for falciparum malaria in East Timor, with sulphadoxine-pyrimethamine (SP) as second-line therapy and quinine as third line therapy and for complicated and severe malaria. Primaquine was also inconsistently used in single dose as a gametocidal drug for falciparum malaria.

In December 1999, WHO produced protocols for the management of uncomplicated malaria in the emergency period, recommending the use of SP as first-line therapy for falciparum malaria, chloroquine as first-line therapy for vivax malaria, and SP combined with chloroquine as first-line therapy of malaria diagnosed clinically. WHO in collaboration with Merlin developed these protocols for wide dissemination. These protocols have recently been revised, distributed and promoted to all NGOs operational in the health sector (Annex 3).

The WHO protocols for the management of malaria in the emergency setting were based on the limited information available at the time, including chloroquine efficacy studies from nearby islands and information on the history of anti-malarial use in East Timor. No recent anti-malarial drug efficacy data were available for East Timor. A chloroquine efficacy study following the WHO anti-malarial efficacy format for areas with low to medium transmission was deemed necessary for the development of protocols for the use in the medium term in East Timor.

Merlin therefore received additional funding from AusAID to conduct an anti-malarial efficacy study. This study commenced on May 10 2000 and was conducted in Los Palos, eastern East Timor. Results show overall treatment failure of 67.7% for malaria infections due to *P. falciparum* treated with chloroquine (Annex 4). Results have been disseminated through the health sector meeting and through the Division of Health Services in a formal report in August.

#### 4.2.2 SUB-OBJECTIVE 2

Merlin has procured emergency drug supplies for the treatment of 70,000 cases of malaria in the emergency setting. The contingency stock of recommended anti-malarial drugs consists of:

- Chloroquine; 150mg tablets
- Sulphadoxine/pyrimethamine; 500/25 mg tablets
- Quinine sulphate; 300 mg tablets
- Quinine for injection; 600 mg/2ml ampoules
- Paracetamol; 500 mg tablets

#### 4.2.3 SUB-OBJECTIVE 3

Merlin has made anti-malaria drugs available to international and national medical agencies to cover drug supply ruptures. Drugs have been distributed to most districts of East Timor (table 2), and distribution is ongoing. With the establishment of a central pharmacy the need for drug supply by Merlin has been reduced significantly and is limited to situations where drugs are needed urgently, for example at times where the pharmacy is closed. The majority of quinine tablets and ampoules have therefore been donated to the Central Pharmacy, to ensure storage below 30°C, and only a limited stock is kept at the Merlin store-room.
Table 2: Distribution of emergency anti-malarial drugs to cover supply ruptures to 18/11/2000

<table>
<thead>
<tr>
<th>Drug</th>
<th>Formulation</th>
<th>Quantity distributed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chloroquine</td>
<td>Tablet 150mg</td>
<td>120,000</td>
</tr>
<tr>
<td>Quinine</td>
<td>Tablet 300mg</td>
<td>51,000</td>
</tr>
<tr>
<td>Quinine Ampoule</td>
<td>600mg</td>
<td>15,490</td>
</tr>
<tr>
<td>Paracetamol</td>
<td>Tablet 500mg</td>
<td>177,000</td>
</tr>
<tr>
<td>Sulphadoxine-pyrimethamine</td>
<td>Tablet 500-25mg</td>
<td>143,000</td>
</tr>
</tbody>
</table>

NGOs
AFMET, AMI – Portugal, Bairo Pite Clinic, CAM, Christian
Childrens Fund, Clinic Cafe, Clinic Maria Auxiliadora, Dare
Polyclinic, HealthNet International, IMC, MDM-Portugal,
MDM-France, OIKOS, Share, Timor Aid, Uma Ita Nian,
World Vision

Districts
Aileu, Ainaro, Bobonaro, Covalima, Dili, Ermera, Lautem,
Manatuto, Oecussi, Manufahi, Same

4.2.4 **SUB-OBJECTIVE 4**
WHO in collaboration with MERLIN, conducted a training workshop (Dili, February 12, 2000) for
approximately 40 Timorese and expatriate doctors and nurses on the management of malaria and
dengue haemorrhagic fever, including the use of standard WHO treatment protocols.

MERLIN has conducted workshops (March 20-April 8, 2000) with approximately 120 Timorese and
expatriate doctors and nurses on the management of uncomplicated and severe malaria, the use of
WHO protocols, and standardised WHO disease surveillance and reporting procedures. Workshops
were conducted in collaboration with the NGOs providing health care in six districts: Baucau, Los
Palos, Manatuto, Oecussi, Suai, and Viqueque.

MERLIN has collaborated with AMI France and the Nursing Academy of East Timor (Academia de
Enfermagem Timor Lorosa’e) to develop a three day series of training modules on the management of
malaria and other febrile illnesses adapted from *Integrated Management of Childhood Illness (IMCI)*
materials (WHO, Geneva, 1997), promoting the use of standard WHO treatment protocols. These
modules are designed for the training of sub-district level nurses.

The training modules consist of:
Module 0: Pre-test
Module 1: Background
Module 2: Clinical features of uncomplicated malaria
Module 3: Assessing the child with fever
Module 4: Clinical session
Module 5: Treatment of uncomplicated malaria
Module 6: Complicated and severe malaria
Module 7: Treatment of uncomplicated malaria
Module 8: Post-test and evaluation

There is a facilitator’s guide and a course participant’s guide in Bahasa Indonesia, and a course
facilitator’s guide in English.

The malaria training modules are used by nurse trainers under the supervision of AMI France in a
comprehensive country-wide training programme for two nurses from each sub-district of East Timor.
46 nurses are at present enrolled in the first phase of this training programme being conducted in three
districts, with workshops being conducted at district level in groups of 10-12.

Training of 4 Timorese nurse trainers and piloting of training materials was conducted by Merlin, in
collaboration with AMI-France and the Nursing Academy of Timor Lorosa’e (April 10-13 2000,
Dili). Topics covered were:
Results of the evaluation of the train the trainer activities are listed in Table 1 below:

<table>
<thead>
<tr>
<th>Results</th>
<th>Average Percent</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-test</td>
<td>58%</td>
<td>48% - 70%</td>
</tr>
<tr>
<td>Post-test</td>
<td>73%</td>
<td>66% - 78%</td>
</tr>
<tr>
<td>Improvement</td>
<td>15%</td>
<td>8% - 18%</td>
</tr>
</tbody>
</table>

Training of 52 tertiary level nursing students using amended training materials was conducted by nurse trainers under the supervision of AMI France (May 8-10 2000, Dili). Materials and curriculum were further adapted following this training.

4.3 OBJECTIVE 3

4.3.1 SUB-OBJECTIVE 1

Pending the establishment of national vector borne diseases control programme, EHS requested WHO to co-ordinate vector control activities in East Timor. As such WHO initiated fortnightly meetings of a vector borne disease working group in March 2000, of which Merlin has been an active member. This helped develop an emergency response capacity for outbreaks of vector borne diseases. Based on ongoing monitoring of weekly surveillance data reported from each district, a team of experts can be deployed to visit representatives of NGOs in charge of district health care, establish the validity of results and provide assistance in deciding on the appropriate response. Merlin and WHO have prepared the malaria outbreak response protocols which will need to be updated on a regular basis and should be handed over to the DHS in the near future. Merlin has established a stock of laboratory supplies for emergency diagnosis, drugs to prevent rupture in the drug supply and ensure effective treatment (see above), and insecticides and equipment for residual house spraying, outdoor and indoor insecticide mist-blowing and bednet re-impregnation.

Merlin’s country manager accompanied WHO’s Dili-based epidemiologist on visits to all districts of East Timor. The epidemiologist’s role was to collect epidemiological data as well as to provide technical inputs for diseases prevention and control activities. The purpose of the visits was to reinforce standard WHO reporting procedure, to ensure rapid and accurate clinical and laboratory reporting of malaria and other diseases on a weekly basis. Surveillance reports are the main mechanism by which to detect malaria and other vector borne-disease outbreaks and reinforcement of the procedures has been recognised as a high priority.

District visits are also useful to inform health providers and District Health Administrators of the existence of a Dili based outbreak response capacity. Contact phone numbers have been exchanged to ensure rapid communication between representatives at district level and the emergency response team in Dili, and thus enable rapid deployment of required resources in case of outbreaks. Stock levels of essential malarial drugs were also checked and further supplies provided if this was necessary.

To establish capacity for residual spraying, the East Timorese District Health Administrator was asked to identify a minimum of four volunteers, who would be willing to be trained in the application of insecticides, until the end of August. It was clarified that Merlin would not be creating permanent
jobs for them, but that the spraymen would work on a voluntary basis, being paid an incentive for the duration of vector control interventions in their district. Once a minimum of 4 volunteers were identified, Merlin’s vector biologist went to the districts to provide training on the basis of the WHO manual for indoor residual spraying (Application of residual sprays for vector control; WHO/CDS/WHOPES/GCDPP/2000.3). As part of the training exercise the district hospital was sprayed and in districts where high risk areas had been identified this was followed by targeted spraying (see table 4).

Table 4: Districts and areas where training and spraying was carried out

<table>
<thead>
<tr>
<th>Village</th>
<th>District</th>
<th>Purpose</th>
<th>No. of Houses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baucau</td>
<td>Baucau</td>
<td>Training Hospital</td>
<td></td>
</tr>
<tr>
<td>Viqueque</td>
<td>Viqueque</td>
<td>Training Hospital</td>
<td></td>
</tr>
<tr>
<td>Leisasa-Riheu</td>
<td>Gleno – Ermera</td>
<td>Training + Targeted Spraying</td>
<td>53</td>
</tr>
<tr>
<td>Los Palos</td>
<td>Lautem</td>
<td>Training Hospital</td>
<td></td>
</tr>
<tr>
<td>Seloikraik</td>
<td>Aileu</td>
<td>Training + Targeted Spraying</td>
<td>127</td>
</tr>
<tr>
<td>Weidaubarak</td>
<td>Same</td>
<td>Training + Targeted Spraying</td>
<td>116</td>
</tr>
<tr>
<td>Ainaro</td>
<td>Ainaro</td>
<td>Training Hospital</td>
<td></td>
</tr>
<tr>
<td>Suai</td>
<td>Kovalima</td>
<td>Training Hospital</td>
<td></td>
</tr>
<tr>
<td>Kailako</td>
<td>Bobonaro</td>
<td>Training + Targeted Spraying</td>
<td>Hospital + 220</td>
</tr>
<tr>
<td>Oecussi</td>
<td>Oecussi</td>
<td>Training Hospital</td>
<td></td>
</tr>
</tbody>
</table>

4.3.2 SUB-OBJECTIVE 2

Areas suitable for targeted campaigns of residual spraying (see table 4) were identified in collaboration with WHO and the NGOs in charge of district health care. Identification was based on reported malaria cases during the last rainy season and suggestions from staff of health facilities. Sub-objective 3

Merlin maintains a stock of essential anti-malaria drugs for outbreak response at the store room in Dili. In the event of an outbreak the drugs can be rapidly distributed by Merlin and/or other NGOs involved in outbreak response activities.

4.4 OBJECTIVE 4

4.4.1 SUB-OBJECTIVE 1

Establishment of task force

Merlin and WHO established and co-ordinated malaria and dengue task force meetings with international and national agencies. These meetings were held weekly in January and February 2000 to present survey and surveillance data, and to co-ordinate activities between different agencies involved in health service provision and vector control. In response to reports of dengue haemorrhagic fever in late February and early March, meetings to plan and co-ordinate response and develop community education materials between operational NGOs in the health and water/sanitation sector, WHO and UNTAET occurred more frequently.

Pending the establishment of national vector borne diseases control programme, EHS requested WHO to co-ordinate the vector control activities in East Timor. Thereafter, WHO presented surveillance data at the weekly health meetings and malaria/dengue specific meetings have been arranged on an ad hoc basis. Since June 2000, a regular Vector Borne Disease Control Working group meeting has been held on a fortnightly basis at WHO, to co-ordinate activities between NGOs and assist DHS with advice when presented with a new proposal. All of the NGOs actively involved in vector control (Merlin, Oxfam, IRC), as well as the Australian Army, the PKF health cell and other concerned NGOs regularly attend the meeting.
SUB-OBJECTIVE 2
Provide technical support and advice to implementing partners

Merlin has been involved in community mobilisation programmes in collaboration with WHO and UNTAET. Together, technical support for dengue haemorrhagic fever outbreak response has been given. This collaboration enabled the production of a pamphlet / Aedes mosquito control for use in community mobilisation programmes, and has advised UNTAET on co-ordinated dengue haemorrhagic fever outbreak response and produced a response plan for use by UNTAET. WHO and Merlin have worked with Oxfam, an NGO operational in the water-sanitation sector, on dengue haemorrhagic fever control in the emergency setting in Dili. The Dengue educational leaflet was redesigned in November 2000 in collaboration with WHO and DHS. DHS has decided to launch a dengue prevention campaign, including a calendar with fundamental preventative messages.

Merlin has participated in a health services review of East Timor conducted in January and February by UNTAET, the East Timorese Health Professional Workgroup, Oxfam and MSF. At the ensuing workshop attended by all international and national NGOs operational in the health sector, as well as donors and UN bodies, the Interim Health Authority was established. This authority consisted of members of the East Timor Health Professional Workgroup and expatriate staff from UNTAET, and has been established to co-ordinate and control the national health services of East Timor. Merlin’s participation in this review and workshop was important to ensure that insect-borne disease control programmes can be integrated into the future health services system of East Timor.

Merlin participated in, and provided parasitological expertise to, a Japanese Encephalitis outbreak investigation led by WHO in Viqueque April 2000.

SUB-OBJECTIVE 4
Assessment of efficacy of insecticides, bed net and curtain impregnation.

Merlin assessed insecticide efficacy against mosquito vectors during July 2000 in Lautem district, using the standard WHO insecticide resistance test kit for adult mosquitoes. Mosquito larvae were collected from a number of sites in the surroundings of Los Palos and brought back to the laboratory, where they were reared in plastic bowls until emergence into adults. Adults were tested with a range of insecticides belonging to the synthetic pyrethroids and organophosphates. Susceptibility results are summarised below:

**Permethrin:**
- 100% susceptibility for *Culex sitiens* and *Anopheles subpictus*.
- 13% combined mortality for *Aedes aegypti* (1 hour exposure).
- 38% mortality for *Aedes aegypti* (2 hour exposure).

**Lambdacyhalothrin:**
- 100% susceptibility for *Culex sitiens* and *Anopheles subpictus*.
- 26% combined mortality for *Aedes aegypti* (1 hour exposure).
- 17% mortality for *Aedes aegypti* (2 hour exposure).

**Fenitrothion:**
- 100% susceptibility for *Anopheles subpictus* and *Aedes aegypti*.
- 95% combined mortality for *Culex sitiens*.

Of importance for malaria control is the insecticide susceptibility of *Anopheles* mosquitoes. No resistance of the species tested was found for pyrethroids or organophosphates, indicated that either
class can be used for their control. Due to the high efficacy against insects but low mammalian toxicity the pyrethroid insecticides are certainly favourable and are recommended by Merlin for the control of mosquitoes in East Timor. The compound chosen for house spraying in Lambda-cyhalothrin, an alphacyanopyrethroid, which has been shown to be highly effective for house spraying and bednet impregnation in other parts of the world. To increase acceptance by household owners, Merlin has chosen to use a microencapsulated formulation, which has reduced odour but prolonged activity due to the slow release activity of the capsules.

Control of the container breeding Aedes mosquitoes with pyrethroids presents a problem due to the high level of resistance observed. As no records for insecticidal application exist it is unclear how this resistance has arisen, but extensive fogging during Indonesian times may have contributed to it. Control with fenitrothion may present a possible solution, but it is generally agreed that Aedes mosquitoes should be controlled by environmental sanitation, i.e. clearing-up and screening of any water containers around peoples houses to eliminate breeding sites.

5.0 BARRIERS TO IMPLEMENTATION

5.1 OBJECTIVE 1
Mobilisation of laboratory technicians and establishment of diagnostic and surveillance system

To facilitate sustainability of the laboratory system, Merlin ensured that laboratory technicians were paid stipends through the transitional administration, UNTAET. This system was only newly established, and political negotiations were required to ensure that stipends were made available for the district-level technicians. In addition, positioning the Central Laboratory as the co-ordinating body required negotiations between laboratory workers, the Central Laboratory and the laboratory worker’s union. This delayed the commencement of training and the allocation of technicians to the districts.

Delays in establishment of operational health facilities in some districts (Ermera, Ainaro and Aileu) delayed the commencement of laboratory operations in those districts.

In Liquica, political and industrial negotiations were needed between the international NGO operational in the district, local authorities and the Catholic Church before the technician could be placed at the health facility.

In Manatuto, repairs to the health facility were required before the technician could be placed there.

5.2 OBJECTIVE 2
Lack of uniform adoption of the WHO malaria treatment protocols

Many international and national NGOs were initially not convinced of the validity of the new malaria treatment protocol, particularly as they were developed without efficacy data from East Timor. This prevented many NGOs from adopting the new protocol during the early phase and resulted in a lack of uniform management of malaria across the country. Joint visits of WHO’s epidemiologist and Merlin’s country manager to all districts of East Timor have contributed to solving this problem. All major health facilities are now aware of the protocol and actively implementing it.

Training

The UNTAET recruitment process, which will open up the majority of position in the existing health system, has been postponed from June 2000 until January 2001. The Division of Health Services (DHS) is therefore reluctant to allow further training to commence before it has been clearly established what positions will remain after the recruitment process and who will be employed. At present the DHS feels that training of clinicians and other health workers will lead to the majority of staff expecting future employment in the position they have been trained for. To avoid this, the majority of further training activities has been put on hold.
5.3 OBJECTIVE 3  
Re-establishment and support of national outbreak response teams

For reasons of national recruitment, stated under constraints to objective 2, re-establishment of emergency response capacity to vector borne disease outbreaks has also been affected. As it is unclear who will be in what health position within the next few months, and as Merlin does not want to create jobs that may not be supported by the government/Ministry of Health, it was decided to identify volunteers, at district level, willing to carry-out residual spraying in return for the payment of an incentive. Volunteers were identified with the help of East Timorese District Health Administrators.

Increased militia activity has limited communication and made certain areas inaccessible during September/October 2000. As a result the recruitment of volunteers and their training has taken longer than anticipated.

Targeted spraying of high risk areas

Identification of high-risk areas and targeted spraying relies on good surveillance data, provided from each of the districts. Reinforcement of the surveillance system relies on district visits of WHO representatives and Merlin staff. This process has also been slowed down by the security situation.

Materials

Establishment of a reliable supply system for the district laboratories has been hampered by insufficient management at DCL. The stock keeping and supply system is not reinforced sufficiently and the laboratory does not take the required responsibility. DHS is aware of this and other problems at DCL and will address these in the near future. WHO has just completed an assessment of the needs required to establish a fully functioning laboratory system for East Timor and preliminary discussions have indicated that this will require some changes of the existing system, to be addressed by the DHS. To ensure continued supplies of the districts Merlin and DHS have come to the agreement to temporarily house supplies at the Central Pharmacy.

Training

East Timorese health staff are generally keen to receive training and improve their skills. The difficulty presently faced is the urgent need to provide further training to lab technicians, when in reality all training has been suspended until the end of the UNTAET recruitment process. This process has been delayed considerably due to unanticipated complexity, effectively preventing further training for approximately 6 months.

Supervision

Communication within East Timor is difficult due to the absence of a postal and telecommunications system. Supervision thus required direct visits to the district labs, which is time consuming and limits supervision to one lab at a time. With the uncertainty that the UNTAET recruitment process brings with it, some lab technicians are reluctant to work with the supervisor, as they perceive a visit as a potential threat to their position. Merlin has therefore been very careful to ensure that the purely supervisory nature of the visit is made clear from the start.

Lack of uniform adoption of the WHO malaria treatment protocol

Many international and national NGOs were initially not convinced of the validity of the new malaria treatment protocol, particularly as they have been developed without efficacy data from East Timor. This prevented many NGOs from adopting the new protocol during the early phase and resulted in a lack of uniform management of malaria across the country. Joint visits of WHO’s epidemiologist and Merlin’s country manager to all districts of East Timor have contributed to solving this problem. All major health facilities are now aware of the protocol and actively implementing it.
5.4 OBJECTIVE 4

Co-ordination of activities
Co-ordination relies on good will between NGOs, authorities and co-ordination bodies, and assumes a reasonable capacity for response by these bodies. Several factors limit co-ordination activities. First, not all agencies are committed to co-ordination, preferring to maintain independence. Second, some agencies have limited capacity to respond despite good will for co-ordination. Third, health and other sectoral services are patchy, so that not all areas are covered. Finally, the administration in East Timor is transitional and in a phase of building new structures. The health authority in particular is in its early stages of being established. For this reason, it has, as yet, limited capacity to function in a consistent and reliable manner.

Insecticide resistance study
Delays in completion of the chloroquine efficacy study due to floods has delayed the commencement of the insecticide resistance study.

6.0 PROGRAMME IMPLEMENTATION STRATEGY

- Training of laboratory technicians was conducted at the Dili Central Laboratory by Merlin’s expatriate parasitologist in collaboration with experienced national technicians from the Dili Central Laboratory.
- Protocols for the management of malaria were devised by WHO, developed by WHO and Merlin and disseminated by Merlin.
- Standard disease surveillance protocols for malaria and dengue fever were devised and disseminated by WHO and promoted by Merlin.
- Clinical training materials were developed by Merlin’s expatriate doctors in collaboration with a Timorese nurse trainer using WHO materials and professionally translated into Bahasa Indonesia.
- Clinical training was conducted in co-ordination with operational health NGOs by Merlin’s experienced clinician.
- Prevalence studies were conducted by Merlin’s expatriate doctors and technicians, in association with Timorese technicians and nurses, in collaboration with the Dili Central Laboratory and with OIKOS, a Portuguese NGO, in Same.
- Training of spraymen in the districts was carried out in collaboration with the relevant health NGO in the district and the district health administration
- With the technical support of WHO, the malaria task force was co-ordinated by Merlin’s malaria expert.

7.0 MANAGEMENT, ADMINISTRATION AND SECURITY

7.1 MANAGEMENT
Local management is provided by the programme co-ordinator responsible to Merlin headquarters in London. Skilled expatriate staff implement and supervise the programme in the field. Technical advice and support provided by WHO in Dili.

7.2 ADMINISTRATION
The programme is administered locally by Merlin’s experienced administrator reporting to Merlin’s desk and finance officers in London headquarters.
7.3 **HUMAN RESOURCES**

Merlin’s team in the field consists of well trained and experienced technical and support staff. See Annex 5 for brief outlines of expatriate team members.

7.4 **SECURITY**

East Timor poses minimal security risks, as the country is now under control of UN Peace Keeping Forces (PKF). Merlin liases with other international NGOs, PKF, Civilian Police (CivPol) and local authorities to keep up to date with the security situation. Merlin has standard operational and security guidelines in place and uses HF and satellite communication equipment to remain in contact with the Merlin base in Dili during field visits.

8.0 **MONITORING AND PERFORMANCE**

- Weekly situation reports are provided to Merlin headquarters in London.
- Comprehensive reports for Merlin HQ are drafted on a monthly basis.
- Standard stock control procedures are followed for drugs and laboratory supplies.
- One field visit was conducted by Dr Kaldra, WHO consultant entomologist, April 2000.
- One supervisory visit was conducted by Jane Moore, Medical Adviser, Merlin HQ June 20-29 2000.
- One supervisory visit was conducted by Jane Moore, Medical Adviser, Merlin HQ June 20th – 29th 2000.
- One supervisory visit was conducted by Paul Foreman, Operations Manager, Merlin HQ, October 12th - October 21st 2000.

9.0 **CONCLUSION**

Merlin’s contribution to WHO’s Malaria activities during the emergency phase in East Timor has provided some of the foundations on which to base an integrated program over the next years. The wide variety of Merlin’s implementations has addressed the majority of factors important in the control of malaria and provided other players in the health sector with valuable assistance in the diagnosis, treatment and prevention of the disease. During the current transition from emergency to development, the challenge will be to facilitate full integration of malaria control activities in the emerging overall health structure, thus allowing sustainability in the future.
ANNEX 1: MALARIA DATA FOR EAST TIMOR

Chart 1: Number of reported suspected malaria cases by week, 26/9/1999 - 11/11/2000
Chart 2: Percentage of reported suspected malaria cases out of reported total consultations by week, 26/9/99 - 11/11/2000
Chart 3: Reported suspected malaria cases by district 26/9/99 - 11/11/00
Chart 4: Reported suspected malaria cases per 100,000 population by district 26/9/99 - 11/11/2000
Chart 5: Percentage suspected malaria cases out of reported total consultations by district, 26/9/99 - 11/11/2000

- Aileu
- Ainaro
- Baucau
- Bobonaro
- Cova Lima
- Dili
- Ermera
- Liquica
- Manatuto
- Manufahi
- Oecussi
- Viqueque

District

Percentage of reported suspected malaria cases
ANNEX 2: PREVALENCE STUDY RESULTS FROM THREE DIFFERENT CLIMATIC ZONES OF EAST TIMOR

Malaria surveys: Examination of a random sample of the population to measure the prevalence of malaria at a given moment.

Rationale for malariometric surveys in East Timor

Vector control in East Timor was disrupted from 1998 until the present time. It has been reported that even before this time there was limited vector control and concentration was mainly on other areas of public health such as education campaigns. Laboratory reports from 1998 have shown there to be a slide positivity rate varying between 10% and 73% in East Timor. Parasite rates were reported by WHO to be 12.25, and it is thought that these will have risen. Vector species for transmission of malaria both inland and on the coast are present in East Timor, and the general epidemiological characteristics (i.e. rainfall, temperature etc.) indicate that this country is one where high transmission of malaria is to be expected, especially after the destruction that has occurred. Previous malariometric surveys have covered only certain areas of the country.

The main objective in carrying out the survey was to:

- Determine malaria prevalence in each of the three climatic zones of East Timor. Those being
  I. Dili – the capital city with a long dry season, as well as different mosquito habitats from the other two zones.
  II. The mountainous zone up to and slightly beyond 650M.
  III. The lowland coastal zones towards the south of the Island which receive the largest amount of rainfall and which also has extended rainy seasons.

Sub-objectives are to:

- Determine which age groups are most at risk in areas where malaria is most prevalent.
- Determine whether the population is familiar with and accepting of impregnated bednets for their protection.

Description of survey area

Lautem is located 4 hours from Dili by road. It is the most easterly district of East Timor, which is divided into five sub districts, two of which - Lautem and Los Palos - were chosen for this survey. The district falls into the southern climatic zone, which stretches from the coast to the 600M mark. This zone has the most rainfall with over 1500mm annually. The average temperature is above 24°C and a dry period starting in June/July and lasting for 3 months. This year’s rainy season extended until the end of July.

The two survey sites are Lautem and Los Palos. Lautem sub district consists of 12 smaller villages (desas). The desas of the Lautem sub district are situated on the northerly side of the Island. The Lautem sub districts are situated between the coast and the mountainous area (mount Laleno), which runs through the centre of the island. There are three main rivers (R. Laivai, R. Raumoco and R. Malailada) flow from the mountainous areas, through the subdistrict, running into the sea on the northern coast.

The desas of Los Palos are situated more inland than Lautem. The subdistrict has no main rivers, but an intermittent lake and some intermittent rivers. The main part of the subdistrict consists of rice paddy fields and swampland.

Measuring the amount of malaria parasites, signs and symptoms
Parasitaemia: Parasites are usually detectable in the blood from the end of the incubation period in patients who have fever due to malaria. The proportion of people having parasitaemia may vary if the transmission of malaria is not stable. Therefore, the systematic measurement of this proportion may give an idea of the dynamics of malaria.

Parasite survey: The number of parasites in a single blood film varies greatly. If parasitaemia is scanty, the probability of detecting parasite decreases sharply as the time spent in examining the slide diminishes. So the proportion of parasite carriers detected during the survey may depend on the amount of time spent examining the blood film. Therefore, it is necessary to standardise the examination technique in such a way as to ensure detection of malaria in all but very scanty infections and to ensure comparability of the results.

The following procedure was used for slide examination:

a. Only the thick film
b. 100 microscopic fields were examined (taking approx. 3-5 minutes)
c. The examination of the slide was continued till one hundred fields were completed, even after the detection of one species in order not to miss mixed infections. (In mixed infections *P.f.* usually dominates, and scanty parasites of other species are easily missed).

Parasitaemia data was used to calculate:

1. Parasitaemia per µl blood per sample and general parasite positive count (table 1)
2. Infection rates (i.e. species IR - proportion of subjects harbouring parasites of a given species)
3. Parasite density Index (table 3)

Besides the species the parasite count will also be taken - following the table below:

<table>
<thead>
<tr>
<th>Class</th>
<th>Code</th>
<th>No. of parasites per microscopic field</th>
<th>Approximate parasite count (number of parasites per 1 ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+</td>
<td>1-10</td>
<td>5-50</td>
</tr>
<tr>
<td>2</td>
<td>++</td>
<td>11-100</td>
<td>51-500</td>
</tr>
<tr>
<td>3</td>
<td>+++</td>
<td>1-10</td>
<td>501-5000</td>
</tr>
<tr>
<td>4</td>
<td>++++</td>
<td>more than 10</td>
<td>more than 5000</td>
</tr>
</tbody>
</table>

The field must be of average thickness (10-20 WBC per field)

<table>
<thead>
<tr>
<th>Parasite per µl = 8000 X Parasites counted against 100WBC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class</td>
</tr>
<tr>
<td>-------</td>
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<tr>
<td>1</td>
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<td>6</td>
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<td>8</td>
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<tr>
<td>9</td>
</tr>
<tr>
<td>10</td>
</tr>
</tbody>
</table>

Table 2: Parasite density index

**Parasite Density Index** = \( \frac{\text{Frequency total}}{\text{Positives}} \)

**Spleen survey:** In a single infection and clinical attack of malaria the spleen becomes enlarged and palpable within the first days or weeks of the disease, but with effective treatment it recedes rapidly. Persisting and repeatedly untreated infections result in a more pronounced and longer-lasting enlargement.

Spleen examination for this survey will be performed with the subject in a standing position. Usual spleen index to be used (Hacketts)

**Temperature:** Axillary temperature was measured (under the armpit) using an electronic thermometer. Subjects with a temperature \( \geq 37.5^\circ \text{C} \) were considered febrile.

**Subject reporting of signs and symptoms:** Any signs and symptoms (malarial or not), from the previous two weeks were noted down from the subjects.

**Methodology**

*Systems used*
- Epi Info V.6
- Global Positioning System

Determining sample sizes

Information on population and family sizes of the two sub-districts was averaged from UN CIVPOL and UNICEF records. These were records that had been updated by CNRT and other Timorese political groups after the August troubles.

Statcalc (Epi Info. V.6) was used to determine sample sizes for both sub-districts. These sample sizes were divided by the average number of family members thought to be in each household in that area. This gave the figure on how many houses should be sampled to reach the subject sample target. The number of families in each area was calculated from the general area information- and our number needed divided into that to give the Nth house to be sampled.
Sample Routes
The team for the survey consisted of a driver, one interviewer, one nurse and one the investigator. A detailed map of the district was consulted, which showed that all of the villages and most of the houses in the sub-districts were situated adjacent to main roads of the area.

Sampling was initiated from the outermost part of the sub-district, continuing inwards along the main road. A note was made when a sub-road was passed (WP on GPS), and the team returned to that road after completing the main route. The first house in any new area was decided by randomly picking a number between one and the Nth house number for that sub-district, and then counting houses until that number house was found. Each house sampled was recorded using GPS.

Sampling Subjects
Each subject present in the household was sampled. Details on those who were not present were taken, with regards to age and sex.

Each person present in the household was then examined for temperature and spleen, a finger-prick blood sample of blood was also taken from which a malaria slide was made (thick and thin films). The head of household was asked the KAP questionnaire and details were also taken about any signs and symptoms that any of the household members had had in the previous two weeks, as well as any tablets/drugs taken.

Slide Examination
All slides were stained with 10% Giemsa for 10 minutes. Slides went through routine examination. QA was undertaken by a re-examining a small number of slides from the previous day’s examination without prior knowledge of the previous result. The Dili Central Laboratory examined a certain amount of slides. These were also re-examined for parasitaemia.

Ethical Issues
Neither the East Timorese Interim Health Authority, nor Merlin HQ had any regulations at that time with regards to applying for ethical clearance for such a study. The head of household was asked for their consent in every case, and in each case signed a consent form, which was in both English and Bahasa Indonesian.

All subjects who were found parasite positive for malaria were treated according to the standard treatment protocol within one week of being laboratory diagnosed positive.
Results

A total of 88 families (473 people) were surveyed in the Lautem district. 39 of these families (219 people) were from Lautem subdistrict, while 45 families (254 people) were from Los Palos subdistrict (for total age and sex breakdowns see figure 1 below).

Figure 1. Demography of sample population for malaria survey undertaken in Lautem district (n=473)

East Timor, July 2000

473 subjects were sampled in total from the district of Lautem. The mean age of the sample population was 21 years with a standard deviation of 19.85 years and a median of 13 years. Age and sex frequencies for all age groups are described in figure 1. Of the sample population, 52.9% of subjects sampled were male while, 47.1% were female. 11 (4.9%) of the women sampled were pregnant.
SLIDE POSITIVE RATES

Total malaria prevalence from the 473 samples for the Lautem district was 37.8%, by sub-districts - Lautem 49.7%, Los Palos 50.3%. There was no significant difference in malaria prevalence between the two sub-districts. Of the 179 positive subjects, 60.9% were positive for \textit{P. falciparum}, 31.8% for \textit{P. vivax} and 4.5% Mixed (\textit{P. falciparum} and \textit{P. vivax}) infection (figure 2). Of those subjects that were positive for malaria (n=179) 46.9% were female while 53.1% were male.

\textit{Figure 2} Prevalence of Malaria in different age groups (n=473), Lautem district, July 2000

There was a significant difference for prevalence of positive slides for malaria between age groups (P-value 0.0012).

As Figure 2 show children between the age of 1-9 years had the highest prevalence of malaria from the sample population, this group having a significantly higher prevalence of malaria than all other age categories (there were no significant differences between any other age groups). The prevalence of malaria lowered through the age groups, with only a slight peak in the 26-30 year old age group.

The species most prevalent in the Lautem district was \textit{P. falciparum} (60.9%), \textit{P. vivax} was present at 31.8%, followed by mixed infections of both the former 4.5%. The amount of \textit{P. vivax} in the 1-9 year old age group was high compared to other age groups, this was tested and found to be significant against all other groups (p-value 0.4320)
**Figure 3. Prevalence of malaria species among age groups, Lautem, July 2000**

**SPLEEN RATES**

The overall spleen rate for the whole sample population was 51.2%. Table 2 below describes the frequency of spleen grades 1-5 according to Hackett’s index. The Average Enlarged Spleen derived from these frequencies is 0.93.

**Table 2: Frequency of spleen sizes in Lautem sample population July 2000**

<table>
<thead>
<tr>
<th>Spleen size</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>224</td>
</tr>
<tr>
<td>1</td>
<td>82</td>
</tr>
<tr>
<td>2</td>
<td>123</td>
</tr>
<tr>
<td>3</td>
<td>31</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>462</strong></td>
</tr>
</tbody>
</table>

*Spleens were not examined in the 11 pregnant women

The Spleen Rate for children between in the 2-9 year old group was 54.2%. The Adult Spleen Rate was 45.4%. The Average Enlarged Spleen for the children’s group was 1, and for the adult group was 0.65. Spleens were not measured in the 11 pregnant women in the sample. Spleen size two was most often seen (26.6%, n=462) (after spleen size 0).

There was no significant difference between age groups with regards to enlarged spleens nor was there any correlation between slide positivity and spleen size.
RELATIONSHIPS BETWEEN SYMPTOMS AND SLIDE POSITIVITY

As already mentioned there was no relationship found between slide positive (measured generally and against Parasite Density Index) and spleen rate. However, some symptoms recorded from the patients were found to have a relationship with slide being positive. These were:
Measured fever and reported fever (over 37.5°C and within the previous 2 weeks) (p=0.0000). One-third of patients with either measured or reported fever were slide positive.
Chills (p=0.0000); out of the 58 people who reported chills, 70.7% were slide positive.

COMPARISON BETWEEN DISTRICTS

Figure 4. Prevalence for Malaria species in each District (sub-districts for Lautem), July 2000

From figure 4 alone, large differences for prevalence can be seen between districts. All figures are described in detail in Table 3. Significance tests were not done between districts.
Table 3 Prevalence of Malaria by species in each district.

<table>
<thead>
<tr>
<th>Location</th>
<th>Date</th>
<th>Sample Size</th>
<th>% P.f.</th>
<th>% P.v.</th>
<th>% Mixed</th>
<th>Malaria species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dili</td>
<td>March 9-16</td>
<td>204</td>
<td>2.9 (CI 0.8-9)</td>
<td>0</td>
<td>4.4 (CI 1.5-11)</td>
<td></td>
</tr>
<tr>
<td>Same</td>
<td>March 22-25</td>
<td>188</td>
<td>4.3 (CI 1.4-11.2)</td>
<td>3.2 (CI 0.8-9.7)</td>
<td>0</td>
<td>7.4 (CI 3.3-15.2)</td>
</tr>
<tr>
<td>Lautem</td>
<td>July 8-15</td>
<td>254</td>
<td>55.1 (CI 44.1-65.6)</td>
<td>37.1 (CI 27.1-48)</td>
<td>3.4 (CI 0.7-9.5)</td>
<td>4.5 (CI 1.2-11.1)</td>
</tr>
<tr>
<td>Los Palos</td>
<td>July 9-20</td>
<td>219</td>
<td>66.7 (CI 55.9-76.3)</td>
<td>26.7 (CI 17.9-37)</td>
<td>5.6 (CI 1.8-12.5)</td>
<td>1.1 (CI 0.0-6.0)</td>
</tr>
</tbody>
</table>

MALARIA BEDNET SURVEY
87 Families answered the questionnaire.
Malaria symptoms were recognised firstly by fever (85.1% 75.8-91.8), then by chills (69% 58.1-78.5), followed by muscle pain (35.6% 25.6-46.6). Although there was an ‘other’ section on this question, no one suggested anorexia as a sign or symptom of malaria.

Eighteen families had bednets at the time of the survey. 34 other families said that they had used bednets in the past. Of those that had nets most had been given to them by MDM-Portugal, the NGO working in the area (Figure 5)

Of those that had not got bednets, 100% said that they could not afford to buy the nets at the suggested price of 14,000Rp. Others (8% of family heads) said that they would not know where to get the nets, nor would they know where to go for re-treatment of the nets.
CONCLUSIONS

The overall conclusion from the prevalence survey is that the Lautem district is hyperendemic for malaria, based on spleen rates from the 2-9 years old and adult age groups. Splenomegaly through malaria can occur as either a short-term reaction to a current infection with the parasite, or long-term chronic or repeated infections. There is no correlation between the parasitaemia and enlarged spleens in the infected population. The conclusion from this lack of correlation and the high prevalence of splenomegaly throughout all age groups can be that the population in this area has been exposed to repeated infections with Plasmodia.

An observation that was made throughout the survey and also in the local hospital was that the people in this area were familiar with having large spleens, so much so that there is a traditional ‘cure’ for the condition (branding across the spleen three times). They were also aware that a large spleen was related to malaria and was often a reason that a patient sought attention in the clinic.

The age group in which Malaria is the most prevalent is the 1-9 year old age group. This is also the age group in which there was a significantly higher amount of *P. vivax* seen. An explanation for the high amount of *P. vivax* in this group may be related to the Chesson strain theory – although high rates of *P. vivax* might also be expected in the adult population if this were the case.

With regards to symptoms seen in people who had a positive slide, although certain risk factors were shown as significant (i.e. fevers, chills and anorexia), there were too few people seen with these symptoms to say conclusively that they could be related to a person having malaria. Fevers and chills were described in the malaria bednet questionnaire as being two of the signs most related to malaria. However, neither anorexia, nor large spleens were mentioned.

The questionnaire, as a whole indicated that people knew about malaria, the symptoms and that bednets helped to prevent it. Families also seemed to use bednets that were given to them, however they would not go out and look for them. This may be that in most cases the family could not afford them. As a general observation, families who did have bed nets did not know about their upkeep. Many nets that were seen had large holes in them, and families sometimes said that they washed the net up to three times a month (this may have been because of the group visiting the area). Most families when asked what could be done in the community to stop malaria said that they would wait for spray teams to come.

Finally, the large difference between the amounts of malaria seen in the districts in a good indicator as to where adequate and well thought out control measures should be taken. Districts with a long rainy season such as Viqueque and Suai, are likely to have similar rates of malaria. Those districts such as Ainaro and Aileu with climates similar to Same are likely to have lower rates of malaria. However, it should be borne in mind that within Timor many microclimates exist within 100km of each other.

While these prevalence surveys can give an overview of the general areas likely to be worst hit with malaria during the rainy season, they are not conclusive.
ANNEX 3: WHO GUIDELINES FOR TREATMENT OF UNCOMPPLICATED MALARIA IN EAST TIMOR

Clinical features of malaria vary from mild to severe disease. Most patients with malaria will have fever (>37.5°C) or a history of fever. Common symptoms are headache; back pains; chills; sweats; myalgia; nausea; vomiting; and diarrhoea. Children often present with febrile convulsions, fast breathing and cough. Adults often present with fever, anaemia and splenomegaly.

Uncomplicated falciparum malaria can progress rapidly into severe malaria. Malaria tends to be particularly severe in infants, children, pregnant women, and non-immune adults. It is better to over treat than to under treat if malaria is suspected. Patients should be encouraged to seek early treatment. Health workers should provide early treatment for all suspected malaria cases.

**Treatment of uncomplicated malaria**

<table>
<thead>
<tr>
<th>First line treatment:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Patients with laboratory confirmed malaria by microscopy:</strong></td>
</tr>
<tr>
<td><em>P. falciparum</em>: sulfadoxine-pyrimethamine (SP) one dose, 25 mg/kg sulfadoxine component</td>
</tr>
<tr>
<td><em>P. vivax</em>: chloroquine base total 25 mg/kg over three days</td>
</tr>
<tr>
<td><strong>Patients diagnosed on clinical grounds only:</strong></td>
</tr>
<tr>
<td>sulfadoxine-pyrimethamine (SP) one dose PLUS chloroquine 3 days</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Second line treatment:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quinine sulphate 10 mg/kg three times a day for 7 days</td>
</tr>
</tbody>
</table>

Weigh the patient and give dose by weight, wherever possible. Suggested dosage tables are given below.

### 1. First line treatment of uncomplicated malaria

#### Oral sulfadoxine/pyrimethamine

Treat *P. falciparum* infections with sulfadoxine-pyrimethamine (SP) combinations (25 mg/kg of the sulfadoxine component) as a single dose. Clinically defined malaria without laboratory confirmation should be treated with a combination of chloroquine and SP. This combination is easy to use, cost effective, and efficacious against *P. falciparum* and *P. vivax* infections. Due to high levels of resistance, chloroquine should no longer be used as first-line therapy for *P. falciparum* infections. Resistance of *P. falciparum* to SP and *P. vivax* to chloroquine should be kept in mind by health workers. Suspected treatment failures should be sent for microscopic diagnosis and follow up at a referral health facility.

| Oral Treatment with Sulfadoxine 500mg-Pyrimethamine 25mg (Fansidar, SP) |
|-----------------------------|------------------|-----------------|-----------------|
| Age (tablets) 3-6 mo        | Functional Age   | Weight (kg)     | Oral Dose       |
| 7 - 11mo                   | not yet sitting  | 5-6             | 1/4             |
| 1 - 8 yr                   | sitting, not walking | 7-9           | 1/2             |
| 9 - 11yr                   | walking, early primary school | 10-21 | 1 |
| 12-14 yr                   | late primary school | 22-30        | 1 1/2           |
| 15+ yr                     | junior high school | 31-39         | 2               |
|                            | senior high school or adult | 40+          | 3               |

Adverse reactions: Mild headache, nausea, and occasional vomiting; mucocutaneous reactions ranging from mild to severe Stevens-Johnson syndrome and toxic epidermal necrolysis.

Contraindications: History of sulfonamide allergy; first two months of life; first trimester of pregnancy; renal insufficiency, marked liver damage or blood dyscrasias.

Precautions: DO NOT combine with sulfanilamide antibiotics such as cotrimoxazole or give within a week of sulfonamide drugs. If skin reactions are observed, stop the medication immediately and seek further advice. Do not repeat treatment with SP for at least 1 month. SP has no anti-pyretic activity. If vomiting occurs within half an hour dose should be repeated.
Oral chloroquine

For malaria due to *P. vivax* use oral chloroquine, a total dose of 25 mg base/kg body weight given over three days. Where diagnosis is on clinical grounds without laboratory confirmation treat combine chloroquine with single dose SP.

### Oral Treatment with Chloroquine (150 mg base tablets)

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Functional Age</th>
<th>Weight (kg)</th>
<th>Day 1</th>
<th>Day 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;6 mo.</td>
<td>not yet sitting</td>
<td>3 - 6</td>
<td>1/4</td>
<td></td>
</tr>
<tr>
<td>7 - 12 mo.</td>
<td>sitting, not standing.</td>
<td>7 - 9</td>
<td>1/2</td>
<td>1/2</td>
</tr>
<tr>
<td>1 - 5 yr</td>
<td>standing, preschool</td>
<td>10-15</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>6 - 8 yr</td>
<td>early primary school</td>
<td>16-21</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>9 - 11 yr</td>
<td>late primary school</td>
<td>22-30</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>12-14 yr</td>
<td>junior high school</td>
<td>31-39</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>15+</td>
<td>senior high school., adult</td>
<td>40+</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

Adverse reactions: Mild nausea; vomiting; dizziness; gastrointestinal disturbances; purities; blurred vision (after prolonged use). NOTE: Can be used in pregnancy.

### 2. Second line treatment of uncomplicated malaria

Where symptoms of malaria persist despite three days’ treatment as above, oral quinine should be used as second-line therapy. If chloroquine has been used alone as first-line treatment, then SP should be used as second-line treatment, with quinine reserved for third-line treatment and for the treatment of severe malaria.

The dose of oral quinine is 10 mg salt/kg body weight three times a day for 7 days.

### Oral Treatment with Quinine Sulphate (300mg Tablets)

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Weight (kg)</th>
<th>Tablets</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;6 mo.</td>
<td>3-6</td>
<td>1/4</td>
</tr>
<tr>
<td>7-11 mo</td>
<td>7-9</td>
<td>1/4</td>
</tr>
<tr>
<td>1-5 years</td>
<td>10-15</td>
<td>1/2</td>
</tr>
<tr>
<td>6-8 years</td>
<td>16-21</td>
<td>3/4</td>
</tr>
<tr>
<td>9-11 years</td>
<td>22-30</td>
<td>1</td>
</tr>
<tr>
<td>12-14 years</td>
<td>31-39</td>
<td>1 1/2</td>
</tr>
<tr>
<td>15+</td>
<td>40+</td>
<td>2</td>
</tr>
</tbody>
</table>

Oral quinine is also available in East Timor in 200mg salt tablets. Adjust the dose accordingly.

**Adverse Reactions:** Syndrome of ‘cinchonism’ (giddiness, light-headedness, transient hearing loss, tinnitus, and blurred vision, even at therapeutic levels); anorexia, nausea and vomiting; potentiates postural hypotension of malaria; bradycardia. Less commonly (can follow one dose): urticaria; asthma; thrombocytopenia; haemolysis; and oedema of eyelids, mucous membranes, and lungs.

**Precautions:** In patients with heart disease and people on digoxin. Hypoglycaemia is common. Blood glucose should be monitored if possible, prevented by giving food or sugar, and treated presumptively if suspected.

### 3. Malaria in pregnancy

Malaria is more likely to become complicated and severe in pregnancy, associated with high maternal mortality. Low birth weight, anaemia and premature labour are common consequences of malaria in pregnancy.

During the first trimester and the last week of pregnancy, chloroquine may be used as first-line therapy (if chloroquine has not been used for prophylaxis). In the second and third trimester, SP treatment may be used cautiously as first line therapy. Quinine should be used as second line therapy.

Weekly chloroquine treatment is recommended for malaria prophylaxis. The dose is 5 mg/kg (two tablets of 150 mg chloroquine base in a 60 kg woman).
4. Supportive Treatment
Treatment for relief of fever and hydration of all suspected malaria patients is important. Treat fever with paracetamol and tepid (lukewarm) sponging. A child with fever requires more than normal amount of fluids. Extra breast feeding should be encouraged. Reduce fever in children and take food before the administration of antimalarials to prevent vomiting.

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Weight Kg</th>
<th>Paracetamol Tablets (500mg)</th>
<th>Paracetamol Tablets</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;6 mo</td>
<td>3-6</td>
<td>1/4</td>
<td>1</td>
</tr>
<tr>
<td>7-11mo</td>
<td>7-9</td>
<td>1/2</td>
<td>2</td>
</tr>
<tr>
<td>1-5 yr</td>
<td>10-15</td>
<td>1/2</td>
<td>3</td>
</tr>
<tr>
<td>6-8 yr</td>
<td>16-21</td>
<td>3/4</td>
<td>4</td>
</tr>
<tr>
<td>9-11 yr</td>
<td>22-30</td>
<td>3/4</td>
<td>4</td>
</tr>
<tr>
<td>12-14 yr</td>
<td>31-39</td>
<td>1/2</td>
<td>2</td>
</tr>
<tr>
<td>15+</td>
<td>40+</td>
<td>1/2</td>
<td>2</td>
</tr>
</tbody>
</table>

Paracetamol dose of 15 mg/kg can be repeated every 4-6 hours, with a maximum of 4 doses in 24 hours.
ANNEX 4 - EFFICACY OF CHLOROQUINE IN THE TREATMENT OF UNCOMPLICATED *PLASMODIUM FALCIPARUM* INFECTION IN LOS PALOS, EAST TIMOR, 2000

**Summary**
Chloroquine is the current first-line therapy for uncomplicated *falciparum* malaria in East Timor. A study of the clinical and parasitological efficacy of chloroquine in the treatment of uncomplicated *Plasmodium falciparum* infection was conducted in Los Palos subdistrict, a hyperendemic area in eastern East Timor (May 10 2000 – August 11 2000) using modified WHO 1997 guidelines for areas of low or moderate malaria transmission. Overall treatment failure was 67.7%, with 64.6% (31/48) categorised as Late Treatment Failure, 2.1% (1/48) categorised as Early Treatment Failure and 33.3% (16/48) categorised as Adequate Clinical Response. The median day of treatment failure was day 16. Genotyping is pending. Treatment failures were treated with the current second-line drug sulphadoxine-pyrimethamine (SP) and followed for a further 14 days to observe any indicators of *P. falciparum* resistance to SP. 100% of those followed had adequate clinical and parasitological response. The results of this study suggest that the first-line treatment for uncomplicated *falciparum* malaria should not be chloroquine in East Timor.

**Introduction**
At present, chloroquine is used as first line therapy for uncomplicated *falciparum* malaria in most home and clinic settings in East Timor. Merlin, a British-based medical NGO, in association with the Los Palos Hospital, conducted a chloroquine efficacy trial in the Los Palos Hospital outpatient department from May 10- August 11 2000. Los Palos Hospital functions as a district level health service with outpatient and a 50 bed in-patient facility. The hospital is currently being operated by the hospital administration and the United Nations Transitional Administration in East Timor (UNTAET) with assistance from an international NGO, MDM-Portugal. Los Palos (S08°30’ E127°00’, 393 m altitude) is located 5 hours by road from the capital and is the major town in the district of Lautem, the eastern-most of the 13 districts of East Timor. The outpatient facility serves as one of the three primary health care facilities in the town and a fixed primary health care facility for the subdistrict of Los Palos (population 20924), also served by once-weekly mobile clinics and less frequently for other subdistricts of Lautem. The inpatient facility serves the whole of Lautem district.

A systematic household cross-sectional prevalence study (n=243) conducted 10-20 July 2000 indicated a 40% prevalence of parasitaemia (64% *P falciparum*, 30% *P vivax*, 6% mixed) and a prevalence of 72% splenomegaly in children 2-9 years of age and 43% adults over 15 years. These data suggest that Los Palos subdistrict is an area of hyperendemicity.

**Methods**
A 28 day *in vivo* efficacy study was conducted using modified guidelines for the treatment of uncomplicated *falciparum* malaria in areas of low or moderate transmission (*Assessment Of The Therapeutic Efficacy Of Antimalarial Drugs For Uncomplicated Falciparum Malaria*, Draft 28.2.1997 WHO Division of Control of Tropical Diseases).

All persons presenting to the outpatient department of Los Palos hospital from 10 May 2000 to 7 July 2000 with history of febrile illness living in the study catchment area over 6 months were screened with Quorum® rapid antigen detection kits. Those testing positive on immunodiagnosis were then examined clinically and a Giemsa stained capillary blood thick and thin film was examined parasitologically. Inclusion criteria were; history of fever in the past 12 hours; over 6 months of age; with Giemsa stained slide positive *P. falciparum* mono-infection with parasite density of 1000-30,000 parasites/μl; axillary temperature <39.5 °C; live within one hours’ car journey from the hospital and able to attend for the stipulated follow-up visits; informed consent by the patient or by the
parent/guardian if the patient was less than 18 years of age. Exclusion criteria were; one or more of the general danger signs or any sign of severe malaria, including haemoglobin<5g/dl; presence of a severe disease; pregnancy; currently in treatment for malaria; and febrile disease other than malaria. Patients were weighed and given a supervised dose of chloroquine (25mg/kg in 3 doses at 24 hour intervals). Patients remained in the clinic under observation for 30 minutes following each dose. Parasitological and clinical follow-up occurred at days 3, 7, 14, 21, 28 and any other day the patient complained of symptoms.

Blood samples were taken for haemoglobin analysis using the electronic HemoCue® photometer and for genotype analysis at a later on days 0, 14 and 28 or day of treatment failure. Patients with treatment failure determined parasitologically (presence of parasitaemia greater than or equal to 25% of D0 on D3 in the case of early treatment failure, or greater than 1.0% of D0 on days 7-28 in the case of late treatment failure) were treated with a single dose of sulphadoxine-pyrimethamine (SP, 25mg/kg of the sulphadoxine component).

Patients treated with SP were asked to represent if they experienced illness or fever in the next 28 days, and were reviewed at 14 days for clinical and parasitological assessment. Patients with clinically severe disease were treated appropriately and withdrawn from the study. Patients with mild intercurrent illness treated with drugs that would not interfere with the study were treated as appropriate and remained in the study. Patients with no clinical or parasitological treatment failure were classified as having adequate treatment response.

Results
490 people were screened 201 tested positive on immunodiagnosis and 53 people meeting all the inclusion criteria and none of the exclusion criteria were enrolled in the study. 4 subjects were subsequently excluded from the study (3 new infections with \textit{P} \textit{vivax} on scheduled follow-up visits and 1 other severe intercurrent illness) and 1 was lost to follow-up due to movement away from follow-up area for work.

There was no significant interaction between age group and gender and withdrawal or exclusion from the study. The study sample was representative of the population of patients usually presenting to Los Palos hospital with uncomplicated \textit{falciparum} malaria.

Results of the 28 day follow-up period for the 48 remaining in the study are summarised in Table 1.
Table 1. Results of a 28 day chloroquine clinical efficacy study, Los Palos, May 10 – August 11 2000

<table>
<thead>
<tr>
<th>Number tested</th>
<th>Frequency</th>
<th>Percent (95%CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outcome</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adequate clinical response</td>
<td>16</td>
<td>33.3% (95%CI 20.8-48.5%)</td>
</tr>
<tr>
<td>Early treatment failure (day 3)</td>
<td>1</td>
<td>2.1% (95%CI 0.1-12.5%)</td>
</tr>
<tr>
<td>Late treatment failure (day 4-28)</td>
<td>31</td>
<td>64.6% (95%CI 49.4-77.5%)</td>
</tr>
<tr>
<td>Total treatment failures</td>
<td>32</td>
<td>66.7% (95%CI 51.5-79.2)</td>
</tr>
<tr>
<td>Total</td>
<td>48</td>
<td>100%</td>
</tr>
<tr>
<td>Follow-up success rate</td>
<td>52</td>
<td>98.1%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age</th>
<th>Frequency</th>
<th>Percent (95%CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-11 months</td>
<td>2</td>
<td>4.2%</td>
</tr>
<tr>
<td>2-9 years</td>
<td>21</td>
<td>43.8%</td>
</tr>
<tr>
<td>10-14 years</td>
<td>15</td>
<td>31.3%</td>
</tr>
<tr>
<td>15+ years</td>
<td>10</td>
<td>20.8%</td>
</tr>
<tr>
<td>mean range</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 m -29y</td>
<td>2</td>
<td>4.2%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sex</th>
<th>Frequency</th>
<th>Percent (95%CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>female</td>
<td>27</td>
<td>56.3%</td>
</tr>
<tr>
<td>male</td>
<td>21</td>
<td>43.8%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parasitaemia day 0</th>
<th>Frequency</th>
<th>Percent (95%CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>mean</td>
<td>12181 /µl</td>
<td></td>
</tr>
<tr>
<td>range</td>
<td>1222-29440 /µl</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parasite clearance by day 3</th>
<th>Frequency</th>
<th>Percent (95%CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>62.5%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cumulative incidence of therapeutic failure (parasitological evidence)</th>
<th>day of scheduled follow-up</th>
<th>frequency of failure</th>
<th>percentage of failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>1</td>
<td>2.1%</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>5</td>
<td>12.5%</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>13</td>
<td>39.6%</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>12</td>
<td>64.6%</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>1</td>
<td>66.7%</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Axillary temperature ≥37.5°C D0</th>
<th>Frequency</th>
<th>Percent (95%CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>50%</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fever resolution by day 3</th>
<th>Frequency</th>
<th>Percent (95%CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>95.8%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹ Those patients who were enrolled and were categorised as a treatment failure on a non-scheduled visit to the hospital were classed to the nearest scheduled follow-up.

There was no significant interaction between sex, age-group, reported antimalarial use in the previous two months, paracetamol treatment, splenomegaly on day 0, or anaemia (Hb<10) on day 0 and outcome.

Patients with treatment failure were significantly more likely to have lower haemoglobin on day of exit from the trial than those with adequate clinical response ($\chi^2=11.15 \text{ df}=1 \ p=0.00084$). 6.9% of patients with adequate clinical response had haemoglobin lower on D28 than on D0; 56.3% of patients with treatment failure had haemoglobin lower on day of treatment failure than on enrolment. Patients with treatment failure were more likely to have haemoglobin<10g/dl on day of exit from the trial than patients with adequate clinical response ($\chi^2 = 4.36 \text{ df}=1 \ p=0.03688$). (Table 2).
Table 2. Hb<10 g/dl on days 0 and 28 (adequate clinical response group) or day of treatment failure (treatment failure group).

<table>
<thead>
<tr>
<th></th>
<th>frequency (%) Hb&lt;10g/dl</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>D0 D28 or day of treatment failure</td>
</tr>
<tr>
<td>All subjects</td>
<td>25/48 (52.1%) 19/48 (41.7%)</td>
</tr>
<tr>
<td>Adequate clinical response</td>
<td>8/16 (50.0%) 3/16 (18.8%)</td>
</tr>
<tr>
<td>Treatment failure</td>
<td>17/32 (53.1%) 16/32 (50.0%)</td>
</tr>
</tbody>
</table>

No indicators of treatment failure with SP were noted (Table 3).

Table 3. Results of 14 day follow-up of patients with chloroquine treatment failure subsequently treated with SP.

<table>
<thead>
<tr>
<th></th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment with SP</td>
<td>32</td>
</tr>
<tr>
<td>Loss to follow-up</td>
<td>1</td>
</tr>
<tr>
<td>Withdrawal due to new vivax infection</td>
<td>2</td>
</tr>
<tr>
<td>Total included</td>
<td>29</td>
</tr>
<tr>
<td>Parasite clearance at day 14</td>
<td>29 (100%)</td>
</tr>
</tbody>
</table>

Discussion

Although most patients showed resolution of clinical symptoms by day three and only one patient had early treatment failure, two thirds of patients went on to demonstrate return of parasitaemia within 28 days of commencing treatment. This is an unacceptably high level of failure, exposing the majority of patients with uncomplicated malaria to further illness and the risk of severe and complicated malaria and death, particularly in children and pregnant women. Failure in improvement of anaemia in the majority of patients treated unsuccessfully with chloroquine is also an important contribution to morbidity.

It is likely that the majority of treatment failure is due to recrudescence. To distinguish between recrudescence and re-infection with *P falciparum* genotype studies will be conducted.

Conclusion

We observed 67.7% treatment failure for uncomplicated *falciparum* malaria treated with chloroquine in our study sample. Chloroquine is inappropriate for first-line therapy of uncomplicated *falciparum* malaria in a setting of such high resistance. It is reasonable to assume high levels of resistance to chloroquine exist in other parts of East Timor. This study supports the recommendations of the WHO that the first line treatment of uncomplicated *falciparum* malaria in East Timor should be with sulphadoxine-pyrimethamine (attached).

_Nadine Ezard, Matthew Burns (Merlin)_
_Edmundo Vieira, Joãzinho da Cruz (RSUD Los Palos)_
ANNEX 5 - HUMAN RESOURCES, MERLIN EAST TIMOR TEAM

Richard Allen
Medical Desk, London (January - March 2000)
Programme start-up East Timor (January 2000)
Merlin’s former in house malaria advisor, a permanent technical advisor to the Roll Back Malaria (RBM) - Expert Group on Malaria in Complex Emergencies, who has worked with the RBM campaign developing guidelines for the management of malaria in complex emergencies.

Dr Sandra Clark
Technical advisor (January - February 2000)
Experienced malaria clinician, having conducted malaria studies in Irian Jaya and Kenya and worked clinically in Irian Jaya for 10 years.

Caroline Lynch
Parasitologist (January 2000 - August 2000)
Graduate of the Liverpool School of Tropical Medicine, with experience in clinical malaria parasitology in Ghana.

Stuart Shepherd
Programme co-ordinator (January - March 2000)
Experienced programme co-ordinator, which has worked for MERLIN for 5 years in several countries, with an academic background in political science and a special interest in security.

Hanifa Rebbani
Finance/administration/logistics (Jan 2000 - May 2000)
Experienced administrator, finance controller and logistician with a background in pharmacy and five years field experience, who has worked most recently for MERLIN in Jakarta as country representative for one year.

Dr Nadine Ezard
Medical Programme Co-ordinator (Jan 2000 - August 2000)
Public health physician with clinical, training, research, programme design and implementation experience in Australia and internationally. Worked on Merlin’s malaria control programme in Honduras.

Dr John Phillips
Consultant clinical trainer (March - April 2000)
Consultant paediatrician with more than 20 years experience working in malaria in Africa and expertise in clinical training and education.

Matthew Burns
Parasitologist (March - September 2000)
Graduate of the Liverpool School of Tropical Medicine, with experience in vector biology in Cameroon.

Dr Yilma Robelle
Medical officer (March - May 2000)
Tropical medicine doctor, graduate of the London School of Hygiene and Tropical Medicine, with extensive experience in tropical medicine and public health in Ethiopia.

Mary Tennent
Logistician (April - August 2000)
Experienced logistician, with several years of experience working in five different countries, and a Masters of Political Science.

Birgit Spiewok
Finance controller (June 2000 –November 2000)
Experienced finance controller with a Masters in Development Studies, who has worked most recently for Merlin headquarters, London, for one year.

Dr Jan Kolaczinski
Program Co-ordinator (July 2000 - )
Medical entomologist, graduate of the London School of Hygiene and Tropical Medicine, with experience in vector control in the Ivory Coast.

**Cheryl Cooper**  
**Medical Entomologist (September 2000 – October 2000)**  
Experienced medical entomologist from the London School of Hygiene and Tropical Medicine with many years of teaching experience. Primary function on the East Timor program was the design of training materials for spraymen and the teaching of residual house spraying to volunteers.

**Helen Counihan**  
**Medical Parasitologist (September 2000 – October 2000)**  
Experienced parasitologist from the London School of Hygiene and Tropical Medicine with strong background in malaria microscopy and more than 10 years experience in laboratory diagnosis of parasitic diseases. Primary function on the East Timor program was assessment of microscopic skill of laboratory technicians followed by re-fresher training.