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THIRD INDEPENDENT ASSESSMENT
OF THE
INTENSIVE MALARIA CONTROL PROGRAMME
ANTI-MALARIA CAMPAIGN
SRI LANKA

10TH JUNE - 30TH JUNE

1985

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3rd Independent Assessment of the Intensive
Malaria Control Programme, 10-30 June, 1985

INTRODUCTION

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ii) Terms of Reference

Terms of Reference for the Third Independent
Assessment of the Intensive Malaria Control
Programme, MIC, Sri Lanka, 10-30 June, 1985

01. To review the implementation of the recommendations made by the 2nd Independent Assessment team and to identify constraints responsible for incomplete implementation, if any.
02. To review the progress of the programme during 1984 and the present status of malaria in the country.
03. To review the nature and extent of administrative, operational and technical problems affecting the programme.
04. To review in depth measures taken to delimit and contain the chloroquine resistant P.falciparum focus in Wewala in the Matale Region and identify additional measures, if any, required in containing new foci, in the future.
05. To review the research activities undertaken by MIC and its relevance to the needs of the programme.
06. To review staff training programme and facilities.
07. To review chemotherapy in the light of the appearance of chloroquine resistant P.falciparum.
08. To review the present epidemiological reporting system and response mechanisms in the MIC.
09. To review the potential role of TIC workers in areas with low malaria incidence where MIC is unable to provide surveillance owing to manpower constraints.

10. To consider the desirability for the AMC to function as an autonomous body with minimal external constraints so that the B/AMC will be able to take independent decisions regarding financial and administrative matters.

11. To formulate recommendations, relating to each of the above, for removal of constraints, solution of problems, and/or improvement of operations.

iii) Review of the the Implementation of the Recommendations made by the Second Independent Assessment of the Intensive Malaria Control Programme, 1984.

Out of 23 recommendations made by the last Review Team only 3 or 4 appear to have been fully implemented. About 7 others have been partially implemented.

Some of the recommendations which have not been implemented during the year under review relate to :-

- Increased facilities for supervision by senior staff.
- Prevention of misuse of malathion by farmers.
- Involvement of P.C workers in case detection and treatment.
- Prevention of slide shortages.
- Provision of mosquito nets for Mahaweli settlers.
- Provision of insectory facilities.
- Provision of adequate working facilities for the Review Team.
- Prevention of fuel shortages.

BACKGROUND TO THE EVOLUTION AND PRESENT SITUATION
OF THE AMC - REPORT SUMMARY

The resurgence of malaria in the mid seventies and its adverse effects on large scale development projects undertaken, especially the Mahaweli Development Project, led to the launching in 1977 of an intensified malaria control programme using malathion with donor assistance from USAID and governments of the United Kingdom and Netherlands. The government gave high priority to this programme - with allocation of over 50% of its budget on Community Health Services. The Anti-Malaria Campaign, a specialized decentralized unit of the Ministry of Health was responsible for the implementation of the Programme through its Headquarters, 16 Regional Offices and peripheral units located in the rural malarious areas. The sanctioned cadre of personnel for the AMC exceed 4000.

The malaria incidence declined from 262,460 in 1977 to 30566 in 1982. With the declining malaria incidence and on the basis of a stratification in 1981 the area of spray coverage was reduced and the spray pattern changed from 4 spray cycles to 2 spray cycles largely in the Northern Dry Belt and Eastern coastal areas with 4 spray cycles retained in highly receptive areas and where development projects were underway. However, adverse climatic conditions in 1983 especially in the epidemic zone and in the endemic zone in 1984 resulted in an upsurge of malaria with 127264 and 149470 cases recorded for 1983 and 1984 respectively.

The AMC has had to contend with administrative, managerial and operational problems which have been repeatedly brought out in the multidonor reviews carried out annually.

There has been a new dimension to the existing problems under which the AMC has laboured over the past years, with the detection of a focus of chloroquine resistant P.falciparum in a locality in Danbulla health area. This focus has spurred the AMC to vigorous action with rapid development of its resources, including manpower, to contain the spread of the resistant P.falciparum strain and by its sustained efforts it appears that the containment measures adopted have been successful.

This clearly demonstrates the AMC capacity to respond to an emergency situation. However, with regard to nonnal programme activities/operations the same measure of response has not been evident, e.g. long delays in the establishment of spray units in areas of seasonal spraying reverted to perennial spraying.

There has been an improvement in the staff position at Headquarters and Regional levels except for supporting services which have been further compounded by transfer of experienced staff and their replacement by raw hands. The recent recruitment and training of technical personnel, microscopists and entomological assistants would relieve the shortage of these categories of staff. However, spraying operations and case detection activities have been hampered by a shortage of field personnel - field assistants and spray machine operators; where the vacancies are about 21% and 22% respectively. Other factors hampering field operations have been the lack of adequate transport services. The AMC Workshop has virtually not been functioning since August 1984 with the Transport Foreman and 6 experienced mechanics being interdicted; an acute shortage of spray machines and spare parts which would be resolved with the arrival of supplies of spray equipment under USAID (ISTT) Technical Assistance Programme and Japanese aid.

Laboratory services have been handicapped largely because of an acute shortage of glass slides. The arrival of a large supply of glass slides and the appointment of recently trained microscopists should increase the blood examination output providing more extensive epidemiological intelligence for a better understanding of the epidemiological situation.

Supervision of field Units/operations especially by Headquarters staff have been greatly hindered by lack of transport and inadequate subsistence allowances. There is a reluctance on the part of Headquarters staff to visit the field as the allowance do not meet their bare expenses. This is unfortunate as the Regional Malaria Officers have been recently appointed and need guidance from the Headquarters technical staff.

This requires urgent action by the government by supplementation of the field allowance to induce them to visit the field regularly. The benefits to the programme would be substantial.

The excessive rainfall in 1984 especially in many parts of the Dry Zone provided favourable conditions for increased malaria transmission with an extension of the peak transmission months. In fact, the incidence of malaria would have been much higher than that recorded in 1984 but for the shortage of glass slides at crucial times. However, with the return of normal climatic conditions in 1985, there has been a sharp drop (33%) in the incidence of malaria for the first 4 months of 1985 compared to the corresponding period of 1984, however the relative prevalence of P.falciparum shows an increase. Many of these P.falciparum cases are occurring in the Mahaweli settlement areas and this requires urgent attention.

Mahaweli

The resettlement of population from hypoendemic and non malarious areas in the newly opened areas for agricultural production in the endemic malarious areas is another factor favourable for the malaria transmission process. This caused a severe strain on the AMC in providing protection to these populations without any financial resources from the agencies concerned.

The interplay of the above factors resulted in a diminished potential of the AMC to prevent the worsening malaria situation in 1984 though the epidemiological situation in the first 4 months of 1985 seems to be more encouraging largely because of return of normal climatic conditions and spray coverage in the endemic zone being completed in late 1984.

The supply of malathion up to 1987 is assured with the signing of a 3 year agreement with USAID for malathion supplies but with increasing government funds and corresponding reductions in USAID funding over the 3 years.

In another agreement with USAID on the provision of Technical Assistance aimed at improving the effectiveness of insecticide spray operations, institutionalizing improved surveillance and introducing alternative methods of control to minimize the need for house spraying with insecticide.

The emphasis is on Training, Operational Research & Pilot projects, Information and Education, Programme Planning, Management and Evaluation. A number of activities relating to Training, Management and Planning, Malaria Research, Social Marketing and intersectoral action have been carried out. However, the Plan of Action lags behind because of implementation delays on the part of the AMC.

The persistence of administrative and managerial problems is an indication that sufficient attention has not been paid by the 3 levels of the National public administration :-

Anti-Malaria Campaign

Ministry of Health

Higher level of the Government

to overcome, or at least minimize the adverse effects in the effective implementation of the Malaria Control Programme. There are deficiencies in the management of the Programme at the AMC. Some of them are beyond its control but within the AMC there are many areas where the management needs to be tightened :- clear definition of duties/functions of senior staff at Headquarters,

- delayed response to field requests for supplies, equipment
- delay in payment of travel claims etc to field staff
- delay in filling of vacancies of mid level technical and operational personnel
- delay in implementation of action on decisions taken at meetings largely because of delays in the circulation of minutes of meetings
- lack of coordination at Headquarters and between the Headquarters and the regional offices
- delegation of responsibilities to senior technical and administrative staff.

At the Ministry level processing of requests in respect of filling of vacancies, supplies and equipment, transfer of funds etc needs to be expedited. Intra-departmental coordination in the execution of AMC activities/operations such as utilization of Family Welfare Workers, Range Public Health Inspectors in field operations and of medical institutions in case detection and treatment activities lags behind and needs to be vigorously pursued.

The Ministry should take a more active role in strengthening interministerial/interdepartmental coordination for fostering intersectoral action by concerned agencies such as Mahaweli Economic Authority, Agriculture, Fisheries, Information etc. Implementation of the recommendations made at the National Malaria Control Seminar held in April 1984 would facilitate the process of intersectoral action for Malaria Control.

There is an urgent need of overcoming the administrative, managerial and operational problems by the 3 levels of administration as the AMC has now to contend with the technical problem of parasite resistance with the appearance of a focus of chloroquine resistant P.falciparum and possible resistance of vectors to malathion in the near future with 2 potential vectors already resistant to malathion.

1. EPIDEMIOLOGICAL/MALARIOMETRIC ANALYSIS

1,A INTRODUCTION

The malaria eradication programme commencing in 1965 achieved its peak success in 1963 when only 17 cases were recorded. Spraying ceased in 1964 and the country entered into consolidation phase. P.falciparum and P.malariae cases gradually reappeared, to a total of 3,446 in 1967 when P.vivax also began increasing. An explosive epidemic of P.vivax occurred in 1968 forcing the reintroduction of attack measures based on twice yearly spraying of DDT and chemotherapy. However in 1975 around 400,000 cases were recorded, 17% being P.falciparum; the vector An.culicifacies had become resistant to DDT. In 1977 a Revised Plan of Operations was introduced, initiating a 5 year intensive programme of malathion spraying, chemotherapy and surveillance. The programme received external aid from WHO, UK, Netherlands, and malathion supplied by US/AID. In 1981 stratification of malarious areas was undertaken in order to reduce areas requiring spraying and based on this stratification a new Plan of Operations was signed in 1982 for the period 1982 - 1986. According to this plan, areas with perennial transmission will receive four rounds of malathion spraying a year whereas areas with seasonal transmission will receive selective spraying one or twice a year. This stratified spraying of malathion was carried out for two years up to April 1984 when quarterly spraying had to be reestablished island - wide in all malarious areas, due to an upsurge of malaria transmission.

Three years, 1979 - 1981, of stable malaria incidence at about 47,000 cases per year (API about 3.0%) was followed by further reduction of the number of cases to 38,566 in 1982. However a resurgence of P.vivax malaria in the last two months of 1982, which accounted for 38% of all cases in that year, provided a ready reservoir of infection for the following year raising the number of cases in 1983 to a total of 127,264. This record occurred in spite of an adversely affected surveillance due to a consistent shortage of microscopists.

-(contd..)-

The incidence of P.falciparum infections in 1983 showed a similar increasing trend : 4,500 infections detected represented an increase of 181% over the 1599 detected in 1982.

Unfortunately the situation did not improve in 1984 as a total of 149,470 cases of malaria was recorded for the year, raising the SPR to 17.4% and the API to 9.5%. The 3,758 P.falciparum infections represented 2.5% of the total positives.

The freedom from real technical problems enjoyed in the past may not last much longer. The Entomology Section of AMC has already given warning of the onset of resistance to malathion in the vector An.culicifacies in a small proportion. Most recently, studies by in-vivo and in-vitro tests of P.falciparum cases have shown incipient appearance of strains resistant to chloroquine in a focus located within Dambulla Health area, some 150 kms. north-east of Colombo.

The period January - May every year supports the tail of the main seasonal peak of malaria transmission which starts around August - October of the previous year.

Figures on Table 2 show the trend of malaria in the period January - May from 1982 to 1985. Rising numbers of positives from 10,511 in 1982 up to 60,312 in 1984 is observed followed by a decrease of 37% of the positives in 1985. The SPR follows the same trend. However a steadily rising trend of P.falciparum from 258 cases (2.6%) in 1982 upto 1,689 cases (4.7%) in 1985 is a disturbing fact that deserves special attention particularly now that strains of P.falciparum resistant to chloroquine have been identified in the country.

TABLE - 1

MALARIA SITUATION IN SRI LANKA 1980 - 1984

Year	Blood films examination	Positive	S.P.R.	<u>P.vivax</u>	<u>P.falciparum</u>	Mixed	ABBR	API
1980	803,692	47,949	5.9	46,476	1,432	52	5.5	3.3
1981	892,143	47,383	5.3	46,143	1,211	29	6.0	3.2
1982	1,127,605	38,566	3.4	36,967	1,541	58	7.5	2.5
1983	1,055,636	127,264	12.1	122,764	4,341	159	6.9	8.2
1984	859,178	149,470	17.4	145,711	3,593	165 1Pm	5.5	9.5

Pm = P.malariae

sk

TABLE - 2.

MALARIA IN SRI LANKA DURING THE PERIOD JANUARY - MAY OF THE PAST FOUR YEARS 1982 - 1985

Concepts	Period January - May			
	1982	1983	1984	1985
Blood films examined	413,622	449,289	315,649	409,322
Positives	10,511	31,406	60,312	39,055
S.P.R.	2.5	7.0	19.1	9.5
<u>P.vivax</u>	10,240	30,145	58,735	37,277
<u>P.falciparum</u>	258	1,199	1,497	1,689
Mixed infections	13	62	80	89
P.falciparum relative prevalence	2.6	4.0	2.6	4.5

sk.

I. B . DETECTION AND TREATMENT OF CASES

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1. The current system of detection and treatment of cases.

1.1 description of the system as it is in principle

1.1.1 the different methods of case detection currently used

A number of different methods of case detection are currently in use; the following is a tentative list, subject to correction.

(a) methods of active case detection (ACD), n.l.

- (i) "classical" ACD, by full time ACD workers, visiting each household once a month, taking blood slides from fever cases and giving treatment; such classical ACD is currently limited to a few special areas.
- (ii) case detection by the primary health care (PHC) workers, i.e. the community nurse midwife, visiting each household once a month, taking blood slides from fever cases but giving no treatment; coverage of communities by PHC is high and expected to become total, but their collection of blood slides is, so far, negligible.
- (iii) in spray areas case detection by spray teams, visiting each household every 3 or 6 months, taking blood slides from missed fever cases; the contribution to case detection is probably negligible.

(b) methods of passive case detection (PCD), n.l.

- (i) "classical" PCD, in all health service stations providing treatment, taking in principle blood slides from fever cases; in practice they collect much fewer.
- (ii) "activated" PCD (APCD): same as above, but with the addition of a full-time blood slide collector; very roughly half of all PCD stations have been thus a "activated" and they provide the bulk of all blood slides collected

(iii) "indicator institutions" : same as APCD, but blood slides are collected from all OFD patients, i.e. including the non fever cases; this is done in a few selected institutions (one or two per region or sub-region)

(iv) voluntary collaborators, taking blood slides and giving treatment; so far they are very few.

(c) mass blood surveys (MBS)

they have been used in the investigation of cases or foci of P. falciparum, and in particular intensively where decreased response to chloroquine has been detected

1.1.2 operational definition and management of cases

- (a) clinical classification : persons are classified as "fever" (including "had fever" in the last month) and "non-fever"; fever cases are usually further subdivided into "clinical cases" (of malaria) and "other fevers"
- (b) collection of blood slides : they are in principle collected from all fever cases (plus non-fever cases in the few "indicator institutions"), but in practice the collection is much more selective; in all ICD it is left to the discretion of the person giving treatment
- (c) treatment : until recently, PT was, in principle, given to all fever cases, to be followed by RT in parasitologically confirmed cases; ^{currently,} following the detection of some chloroquine resistance, RT is, in principle, given at once to "clinical cases", no PT is given, and RT is given also to "other fever" eventually found parasitologically positive, and who are convocated by post card ; on first impression (to be checked) it appears that relatively few additional cases are detected among the "other fevers" and that, of these, only about half are eventually treated, so that the treatment has in fact become largely independent of the result of blood examinations (an obvious exception are the MBS's conducted in connection with chloroquine resistance); there is some variation in the way the new directives about treatment are actually understood and implemented.

1.1.3 laboratory diagnosis :

most slides are examined in the regional AMC laboratories, the central laboratory, Colombo, examines slides from regions without regional laboratory, as well as slides collected in excess of the capacity of regional laboratories; furthermore, the AMC is using immediate diagnosis of outpatients on a limited scale in connection with chloroquine resistance; finally, hospitals do a limited amount of laboratory diagnosis (is it included in the AMC statistics ?).

1.1.4 recording and reporting :

the system of recording and reporting of cases has not been reviewed in any detail, but the system appears rather complicated and heavy, involving much copying by hand, with attending risk of making errors.

1.2 the actual operation of the system

1.2.1 problems encountered :

a number of problems hamper the operation of the system, including the following :

- (a) very unequal motivation for collecting the blood slides supposed to be collected
- (b) shortage of blood slides (starting in 1964, still present in 1985)
- (c) loss of slides or their results; the proportion lost has not been calculated but one estimate put it as high as 20%
- (d) delays at one or more stages : collection to arrival in the laboratory, arrival to examination, examination to return of result, return of result to notification to the case, notification to attendance for RF; no detailed analysis was performed, but a total period of only 2 weeks appears exceptional, 4 to 8 weeks rather common, longer or indefinite not rare

- (e) the real case load is very probably too high to allow total or very high coverage of case detection (including microscopic examination) with the current resources
- (f) non attendance of cases convalesced by RT; a rough estimate puts such attendance around 50%
- (g) non compliance with the treatment: the first dose is in principle swallowed in the presence of the person administering the treatment, but the remaining tablets are apparently rather often put aside for later use.

1.2.2 Sensitivity of the system

(a) proportion of cases actually detected

given the above problems, any estimation of the proportion of "cases" (of parasitaemia) actually detected will be rather imprecise. In principle, the indicator institutions, in which blood slides are collected from both fever and non fever cases, allow an estimate, but with the following constraints :

- the institution may not contribute a representative sample
- the parasite rate of the remainder of the population (i.e. not included in the OPD sample) is unknown (the rate is likely to be lower than that of "non-fever cases", but unlikely to be zero)
- the size of the parent population out of which the OPD sample is actually drawn may not be known precisely (it is not identical with the population of the administrative unit in which the indicator institution is located, because people cross "borders", and because there are other providers of health care)

keeping in mind the above reservations, a very crude estimation of the proportion of cases actually detected might be derived as follows : In 6 indicator institutions reviewed by the Puttalan team, roughly half of the cases actually detected were detected among the non fever cases; if we suppose that there is an equal number of cases among those not attending the OPDs among the

non-fever OPD attendants (e.g. by supposing that about one-tenth of the population attends OPD per month, and that non-attenders have only one-tenth the incidence of non-fever OPD patients) then microscopic examination of all fever cases would detect one third of the cases ; if we suppose that only half of all fever cases actually undergo microscopic examination, then the system is currently detecting about one sixth of the total cases ($1/2 \times 1/3 = 1/6$)

- (b) detection of geographic variation and foci : in that respect, the system, notwithstanding its many imperfections, appears relatively sensitive, also in the detection of foci of *P. falciparum*
- (c) detection of trends and outbreaks : in that respect also, the system appears relatively sensitive; in particular, the number of "clinical cases" (of malaria) may be a better indicator than commonly accepted. For example, in the Kegalle sub-region, the epidemic - (of *P. vivax*) of May - June - July 1983 was very clearly reflected in the numbers of "clinical cases" (but not in "total fever") in every one of the 7 health areas; depending on the health area, a marked increase of "clinical cases" was detectable in the same month showing an increase in SFR, or (in at least one health area) in the month thereafter; the SFR showed a secondary peak in November - December 1983, not reflected in the "clinical cases" (was this secondary peak perhaps constitute of asymptomatic relapses ?). Further evaluation of "clinical cases" is recommended, see below.

1.3 Discussion

1.3.1 relative weakness of the system in terms of malaria eradication

The system is very far from achieving the high ("total") coverage of case detection (detection of infections) expected in the eradication strategy. Indeed the case load with which the system is trying to cope is much higher than that for which the surveillance mechanisms, developed as part of the eradication strategy, were actually conceived. This raises basic issues of the objectives and strategies of the programme, see below.

1.3.2 relative strength of the system in terms of malaria control

As already indicated, the system, with all its defects, is quite effective in detecting geographical variation, foci of transmission (including foci of P.2), time trends and outbreaks, all of which are crucial for a strategy of control (for which, on the other hand, total coverage of case detection is not required)

1.3.3 excessive complexity and heterogeneity

Over the years the system of case detection has become increasingly (excessively) complicated and non-uniform, by the progressive addition of new methods, while most (all ?) the older methods were also retained to some extent. This has increased the workload of collecting, recording and processing the data and complicated their interpretation, with little actual benefit.

1.3.4 cooperation and integration with regular health services and primary health care (PHC)

This is a sore point. There is a serious communication gap. The AMC passes an almost totally negative judgement on this issue, basing that judgement mainly on the fact that the regular health services and the PHC worker make only negligible contribution to blood slide collection, i.e. to surveillance for eradication; this may however not be the most appropriate criterion. On the other hand, the regular health services administer most of the anti-malarial treatments, collect useful information on clinical malaria, not always reported to, and little appreciated by, the AMC.

2. Suggestions

2.1 further analysis of existing data for the evaluation of the various components of the current system.

The following kinds of analysis of already existing data are likely to be useful for guiding any amendment of the system. Depending on the work involved and the resources available the analysis may be limited to a sample of data. The analysis would be facilitated by the use of a computer.

2.1.1 evaluation of individual clinical diagnosis
compare

(a) in indicator institutions/ "clinical cases", "other fevers" and "other outpatients" in terms of positivity rates, for P. vivax and P. falciparum (separately)

(b) in APCD institutions, compare "clinical cases" and "other fevers", in the same terms as above

2.1.2 evaluation of clinical diagnosis as indicators of geographic differences and time trends.

Retrieve the numbers of "clinical cases" according to space (health area or institution) and time (month, or, in periods of rapid increase, weeks, if data available). Evaluate "clinical cases" as indicators of geographic differences and time trends, in comparison with confirmed cases. Pay special attention to institutions providing both kinds of data, and to the sensitivity of "clinical cases" for the early detection of outbreaks.

2.1.3 evaluation of samples of the APCD stations to reflect geographic variation and time trends.

Study past incidence of confirmed cases of P. vivax and P. falciparum (separately) by institution and by geographical area (possibly at 2 scales : health areas and regions) to evaluate the extent to which individual APCD stations have been consistently reliable indicators of time trends in their health area and/or region, and in particular how reliable they have been for the early detection of outbreaks, especially of P. falciparum.

2.2 Possible amendments to the system

The following are submitted for further discussion

2.2.1 Revise the objectives of case detection

The current system : (i) defines a case as a parasitologically confirmed case, and : (ii) aims at total coverage (detection of all cases), (while falling far short of it). This may be justified within a strategy of eradication. However : (i) eradication for P.v. or P.f. or both) is probably not a realistic objective for Sri Lanka in a foreseeable time period;

(ii) the resources required to bring case detection close to total coverage are unlikely to become available in the near future. Therefore it would seem appropriate to reconsider the objectives of case detection. The following objectives are proposed (along with some of their implications).

(i) detection of cases whose clinical condition requires anti-malaria treatment (this may require microscopic diagnosis in some cases, not in others); (ii) measurement of geographical differences and time-trends, for the purpose of evaluating and guiding malaria control activities; for this purpose, the distinction between P.v. and P.f. (hence microscopic diagnosis) is important, but total coverage is not required, indeed, relatively small samples, properly drawn and observed, are likely to be more informative than a scheme aiming at total coverage in which under-reporting is variable, unpredictable priori, and impossible to calculate with any accuracy and posteriori; (iii) early detection of outbreaks, for the purpose of applying emergency measures if and as appropriate; it is desirable to detect as many as possible of the outbreaks, and to recognize whether P.f. is involved in the outbreak, total coverage by parasitological case detection being impossible, outbreaks will best be detected as increases in the number of "clinical cases", checked, if appropriate, by selective parasitology.

2.2.2 make better use of data on clinical cases of malaria : improve their systematic collection, recording, processing and utilization, as well as their evaluation in comparison with parasitological data.

2.2.3 uses of microscopic diagnosis : it is suggested to consider and discuss the limitation of microscopic diagnosis to the following indications :

(a) APCD in a relatively small (10% ?) sample of institutions, carefully selected and provided with the resources required to perform the job correctly and completely.

- (b) cases where the person in charge of giving the treatment estimates that he needs the microscopic diagnosis to decide upon the treatment to be given,
- (c) investigation of outbreaks, if the information collected under (a) and (b) is inadequate for the diagnosis and control of the outbreak,
- (d) evaluation of in-vivo response of *P. f.* to chloroquine (see the section on drug resistance)

2.3.4 streamlining and computerization of data processing : these two operations are best performed together, in conjunction with any other amendment of the system for case detection; such streamlining and computerization are likely to be equally useful for other kinds of data, e.g. entomology, vector control, supplies etc.

2.3 Possible ways of introducing and evaluating the the amendments actually adopted.

If any of the amendments suggested above, as any other amendments were to be adopted in principle, their introduction would require careful planning, management and evaluation.

The introduction of changes should definitely not consist on the addition of yet new methods of case detection to those already in use, which are rather too numerous and varied already; thus the introduction of changes should involve the deliberate phasing out of those methods from which no further input would be expected e.g. "classical" ACD, ACD by spray tears, blood slide collection by PHC workers, systematic blood slide collection from all fever cases in all treatment stations).

Changes would be introduced stepwise, for instance as follows :

1st year introduction of the changes on a trial basis in one region, perhaps a region without indigenous *P. f.*, if that is satisfactory, then in the 2nd year, the changes could be introduced in a second region, perhaps with indigenous *P. f.*; if that is also satisfactory the modified system could be progressively adopted in all regions.

1.C. Chloroquine Resistance and Malaria Therapy Policy

I. Response of Plasmodium falciparum to Chloroquine: 1984 Trends.

During 1984 the AMC documented the presence of P.falciparum infections in Sri Lanka with decreased sensitivity to Chloroquine. Coordinated with the WHO/SEAR Intercountry Program on Drug Resistant Malaria, AMC staff conducted in vitro and in vivo tests in 3 regions of Sri Lanka. The results of these studies and the operational response to the findings have been summarized in several documents including an extensive review in the 1984 Administrative Report of the Anti-Malaria Campaign.

Using the WHO micro in vitro assay for chloroquine, 101 P.falciparum infections were assessed and 57 (56%) yielded interpretable results. Tests were conducted in Puttalam, Anuradhapura, and Matale, based on the higher numbers of P.falciparum infections detected in those areas. In Puttalam and Anuradhapura the maturation of parasites was inhibited at Chloroquine concentrations ≤ 4 μ mol. Between August and December 1984, in vitro tests in the Dambulla area of Matale Region demonstrated parasites which were inhibited only at higher chloroquine concentrations (range 5.7 - 32 μ mol). In general, parasites inhibited at these concentrations are considered resistant to chloroquine.

It has been reported that health service staff had reported to AMC that chloroquine therapy failures had occurred in Dambulla prior to the in vitro testing. Therapy failures were suspected based on persons returning with renewed P.falciparum infections following chloroquine therapy. These observations were limited since drug therapy (25 mg base/kg body weight) had not been supervised, and the patients were living in the endemic area where reinfection was possible.

In vivo tests on 5 patients in Puttalam demonstrated that all had a prompt, "sensitive" response to chloroquine at the radical curative dosage, 25 mg base/kg. In Dambulla, 20 P.falciparum infections were tested in vivo over a 7 day observation. All parasitemas cleared by the 3rd day except for a single infection which had a persistent, very low density parasitaemia to day 7, consistent with a "resistant" in vivo response.

These observations in Dambulla have been interpreted by AMC as confirming chloroquine resistance in the 5 villages in the Dambulla area. A series of surveillance and operational activities have been implemented in the focus and surrounding areas - the stated objective being to eradicate chloroquine resistant P. falciparum.

A. Case detection:

Initially APCD activities in the focus area were relied upon, but a mass blood survey indicated that a majority of P.falciparum infections were "assymptomatic" - and not being detected by either ACD or APCD activities. Consequently a field laboratory, was established in Dambulla with 7 microscopists where immediate parasite diagnosis was available. In addition, every 10 days mass blood surveys have been conducted in the focus area and selectively in the intermediate (area B) zone surrounding the focus. Therapy of all P.falciparum infections in the focus consisted of metakelfin (2 tablets for adults) as a single dose and primaquine 45 mg. In area B, chloroquine 35 mg/Kg was administered over 5 days plus primaquine 15 mg/day for 5 days. P.vivax infections were treated with Chloroquine 25 mg/Kg plus primaquine 15 mg/day for 5 days. It is reported that both drug regimens were effective in 28-day followup - except for a single recrudescence on the Chloroquine 35 mg/Kg regimen.

B. Entomological studies in the focus area revealed 12 Anopheles species; interestingly, An.culicifacies constituted only 0.22% of 26,467 mosquitoes captured. Malathion residual and ULV space spraying have been conducted in Zone A.

Mass blood surveys and data from the malaria clinic have revealed a substantial decrease in P.falciparum infections through April 1985, yet infections continue to be detected even in recent months. P.vivax infections have, however, continued to be detected at approximately the same monthly rate. As of June 1985, at a time of lower transmission in the Dambulla area, clearly P.falciparum infections have diminished; coverage in the MBS's has, however, remained at about 70% of the registered population. Surveillance in surrounding areas has been less intensive, so it is not possible to assess whether P.falciparum incidence has decreased around the defined focus.

II. Commentary on status of chloroquine resistance:

With the development of chloroquine resistance in India over the past 5-10 years, Sri Lanka AMC has been highly aware of the threat of P.falciparum and chloroquine resistance posed to its program. The AMC has clearly responded vigorously to the discovery of P.falciparum parasites in Matale Region which are less sensitive to chloroquine by in vitro testing. Several points should be recognized in reviewing the response to chloroquine resistance to date and in planning future efforts.

A. The reported earliest indication of chloroquine resistance in the focus area came from clinicians who observed that chloroquine therapy was not curing some patients. This is particularly important in considering

future monitoring activities for resistance, in that the in vivo followup - either clinical or parasitological - at health facilities can be a highly effective and practical surveillance method. In this same context, it is important to note that prior to 1984 there were no in vitro or in vivo studies in the area of the current focus, so it is not known when these more resistant parasites were initially present there.

B. The in vitro and in vivo results accumulated to date indicate a certain disparity in the two indicator systems. In the Dambulla area, most of the interpretable in vitro tests yielded chloroquine inhibitory concentrations in what is considered the resistant range. Yet 95% of in vivo tests conducted in the same region suggested a sensitive or minimally resistant response to radical chloroquine therapy. There are several possible reasons for this difference in results. Firstly, the in vivo and in vitro test were conducted on different groups of patients, and of interest, the mean day 0 parasite density in patients in the in vivo was quite low (only 3 of 20 had an initial parasitaemia in excess of 1000 parasites/mm³). Consequently, these patients they have had relatively greater acquired immunity - enhancing their in vivo response. Conversely, since the success rate for in vitro testing has been 56% (somewhat lower than expected), there may have been a preferential selection of more resistant parasites in the successful in vitro tests. This would be consistent with results from studies in other countries, in which more resistant P.falciparum parasites mature better under in vitro conditions.

It is particularly important to note that very few (perhaps only 2) in vivo chloroquine resistant infections (an RI late recrudescence and an RII) have been documented in Sri Lanka. The inference of levels of in vivo resistance from the in vitro tests results is not to be recommended. Only for the macro in vitro test has such a correlation been developed; the micro in vitro cut off at 5.7 pmol is a relative indicator of resistance. Paired in vivo - in vitro studies will be required to establish whether chloroquine is failing to cure P.falciparum infections in Sri Lanka.

C. Despite the intensive efforts by the AMC to define and eliminate the P.falciparum in the defined focus, it is extremely doubtful that all P.falciparum infections have been detected or radically cured. During 1983-84 P.falciparum transmission occurred in many areas of Sri Lanka, and it was not possible for the AMC team to test infections in all areas. It is possible that parasites less sensitive to chloroquine are being transmitted more widely than the focus defined near Dambulla. Resurgence of P.falciparum either resistant or sensitive to chloroquine, remains a real threat in Sri Lanka; in the future such concentration of operational efforts to control outbreaks as have occurred in 1984 will not be feasible.

D. The operational response to chloroquine resistant P.falciparum in Dambulla was motivated by its serious implications for the AMC and Sri Lanka. Specifically, the surveillance activities, focussing on intensive detection of P.falciparum infections by MBS undoubtedly, permitted a more thorough description of the epidemiological situation - and it was the only practical method if the objective was to radically cure and eliminate all resistant infections. Similarly, the early decision to use Metakelfin as the primary therapy was predicated on an attempt to eliminate the focus. As discussed previously, it has not been proven that the pyrimethamine-sulfalene combination drug was required to decrease morbidity from P.falciparum infection.

The entomological findings in the focus area are of interest in that An. culicifacies constituted such a minimal component of sampled anophelines. Further evaluation is required to assess the impact of residual intradomiciliary and space spraying of malathion on the transmission of P.falciparum.

The decision to use an increased dosage of chloroquine for P.falciparum detected in the periphery of the focus (zone B) was empirical. Evidence from other countries affected by chloroquine resistance indicates that chloroquine dosages in excess of 25 mg base/Kg do not enhance the rate of radical cure. Logistically, this 5 day therapy is more complex and compliance will be lower than with the standard 3-day regimen. Before recommending the higher chloroquine dosage in the future it would be wise for AMC to evaluate its efficacy compared to the 3-day regimen.

III. Implications of drug resistance for Malaria Control in Sri Lanka.

Based on available data it is probable that chloroquine resistant P.falciparum parasites are being transmitted in Sri Lanka. The 1984 effort to eliminate the transmission has been intensive, yet one must be realistic in assessing the potential to eradicate P.falciparum given the operational constraints facing the AMC. To limit the extension or intensification of P.falciparum and its health impact on the Sri Lanka population a coordinated malaria control effort is required. The focus should be on defining priority malaria problems and geographic areas, and dealing with them using all available resources. As has been noted previously, a more effective integration of AMC activities and expertise with the general health services is a priority issue. This is particularly true if drug resistant P.falciparum should become more widely transmitted in Sri Lanka. Therapy for potential P.falciparum infections should be coordinated at the community level, as should be the evaluation of the efficacy of therapy.

The AMC drug sensitivity testing team is technically capable of coordinating and conducting the required monitoring program. As has been discussed, much greater priority must be given to in vivo testing of the chloroquine 25 mg base/Kg regimen in combination with in vitro tests. The formulation of drug therapy policies from in vitro data could lead to unnecessary early introduction of alternative drugs.

In vivo observations over 7 days, even with simplified methods requiring follow-up blood slides only on days 2 or 3 and 7 could form the basis of a very useful therapy monitoring program. Such observations could be incorporated selectively into the APCD and PCD programs, thereby including the general health services into the monitoring of malaria therapy and relieving the total responsibility from AMC staff.

As has been noted in the surveillance section, there is currently an overly complex and rather confusing series of malaria therapy regimens in operation in Sri Lanka. To date the AMC has developed drug policy based on the objective of eradicating transmission. The experience in the focus area during 1984 demonstrates fairly vividly the considerable allocation of resources required to detect and treat even a high proportion of the malaria infection in a defined area. Consequently, the AMC should develop therapy regimens which will assure that individuals with malaria will recover, with a high probability of radical cure, and with a reasonable probability of patient compliance.

The current radical cure regimen for P. vivax infections is appropriate understanding that the 5 day primaquine regimen does not radically cure all patients and relapses will occur. At present there are varied radical therapy regimens for P. falciparum infections. Until an in vivo profile of response to chloroquine is developed from representative areas of the island, the 3-day chloroquine regimen would seem to be the most regimen for primary therapy. In the future, the use of S-P drugs would best be reserved for the therapy of P. falciparum infections which have failed chloroquine therapy - as defined by clinical and parasitologic criteria.

If chloroquine resistance should become more prevalent, it will be necessary to develop a policy for the therapy of treatment failures including therapy for more severe infections at 2^o or 3^o hospitals. In the same sense, the AMC and health services should consider whether presumptive therapy should be used, and if so what regimen is appropriate. Specifically, if P. falciparum is prevalent in an area, presumptive therapy (given to minimise morbidity awaiting results of the blood slide examination) may be important.

Considering the potential for chloroquine resistance on the island, programs of mass drug administration or prophylaxis are to be discouraged.

IV. Status of G-6PD studies.

As noted in previous evaluations, physicians in Sri Lanka have reported instances of clinically - significant hemolysis associated with anti malarial therapy specifically following primaquine. The relevant clinical data on such cases has not yet been systematically compiled, yet this apprehension has limited the use of primaquine.

AMC staff have conducted G-6PD assays in North-Central regions using the Sigma qualitative assay. The prevalence of deficient individuals has been as high as 15% in some ethnic groups. Further studies are required to determine the exact G-6PD concentrations and whether there is a subpopulation in Sri Lanka with potentially clinically depressed G-6PD concentration. Obviously, considerable dialogue with physicians is required to resolve the issue and to develop a satisfactory policy for primaquine use. Until that time, the AMC is justified in continuing to advocate primaquine as a component of radical therapy.

1.D. Priority Epidemiological issues for AMC 1985

<u>Need</u>	<u>Method</u>
1. Time and geographical monitoring of malaria incidence in country to identify increases in transmission promptly and to form basis for identifying priority areas for operations.	1a. APCD in institutions which sample populations in all malarious areas. 1b. Clinical PCU at a matching set of institutions at which malaria therapy is given without slide diagnosis.

Changes indicated :

1. Discontinue all ACU.
 2. Discontinue collection of blood slides from asymptomatic patients esp at indicator institutions.
 3. Decentralize laboratories, disperse laboratories to regions, maintain small central laboratory to cross-check P.f. (20%) and as consultant group for drug sensitivity studies.
 4. Develop a trial in 2-3 regions of collection of "clinical malaria" data from institutions which have not been activated.
 5. Conduct study to determine factors which influence patient compliance with therapy.
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- | | |
|---|--|
| <ol style="list-style-type: none"> 2. Sensitive and rapid detection of outbreaks of <u>P. falciparum</u> | <ol style="list-style-type: none"> 2a. Assure that APCU of <u>fever and clinical malaria cases</u> is functioning in those areas which have experienced <u>P.f.</u> transmission during preceding 12 months. 2b. Develop system of cross-checking of random 20% of all P.f. (+ve) blood slides. 2c. Develop notification system for reporting of all clinically serious malaria cases from hospitals. |
|---|--|

3. Monitor the susceptibility of P.falciparum to major anti-malarials :
Chloroquine
Amodiaquine
Fansidar (S/P)
Quinine

3a. In vitro - in vivo testing in areas of country which experience more than cases of P.f. at APCD institutions in any month.

3b. Monitor clinical malaria incidence to cross-check for outbreaks.

3c. Develop simplified follow-up for P.f. treatment in selected institutions with blood slides on day 7 post-treatment.

3d. Provide additional training for AMC staff on drug testing methods through WHO inter-country programme.

3e. Conduct studies of current drug therapy practices at all levels of health care system to identify needed changes.

2. ENTOMOLOGICAL ASPECTS

2.1. INTRODUCTION

Entomology remains an important component of the anti-malaria campaign involved as it is with the monitoring of the impact of insecticide spraying on vector densities and the selection of resistance, the persistence of insecticide deposits, determinations of the potential importance of species other than Anopheles culicifacies as possible additional vectors, the appraisal of possible effects of environmental changes such as that due to the Mahaweli Development Scheme with its attendant population resettlement and considerations of suitable alternative vector control methods aimed at a reduction in reliance on the use of insecticide.

As in the rest of the organization there are undoubted staffing and equipment inadequacies. Only 5 teams serve the whole operations area of the island. The Colombo insectary and laboratory whose construction started in 1981 is still not occupied in spite of the strong recommendation of 1984. Meanwhile important insecticide research work is being carried out in makeshift conditions in the grounds of the Colombo Meteorological Institute. Here, however, the mobile laboratory provided by WHO funds has once again proved its worth (though of course if the base insectary and laboratory was available the mobile unit could be usefully employed elsewhere). The sophisticated biochemical research on resistance mechanisms in various anopheline species, which is going on in Colombo, might be thought by some^{to} have little relevance to operational considerations and to be^{an} unnecessary drain on the manpower and financial resources of the organization. The outcome of this research will in fact revolutionise resistance detection and recognition. It will not only overcome the ambiguities of the present susceptibility test but also, by recognizing actual resistance mechanisms, give immediate information on expected cross-resistances and determine the choice of alternative insecticides. Most of this research is funded by grants from the WHO/TDR Programme and most of the personnel involved have been recruited separately from outside the AMC.

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The frequent finding of significant transmission of both P.vivax and P.falciparum and apparent absence of the known vector A.culicifacies has often led to the questioning of the worth of entomology in the campaign. What is forgotten is the time-lapse between the occurrence of the vector and the appearance of transmission. In IMILWINEGAMA (Gokarella sub-region of the Kurunegala Region) for example, where an outbreak of P.falciparum (including the detection of chloroquine resistance) occurred in February 1985, the entomological team was called in (for spot checking) only at the end of the month when the houses had already been (focally) sprayed. No A.culicifacies could be found. There is a possibility of course that other species may be important as vectors in some instances and the susceptibility of M of them to P.vivax has already been established by the Colombo entomology research team. A similar investigation is now going on at Mudatugama (Mahaweli System 'H') to determine the susceptibility of other species to P.falciparum. Data on the man-biting habits of the species so far tested would seem to minimise this possibility of species other than An.culicifacies being important as vectors but a few natural infections of salivary glands have been detected in A.subpictus, A.vagus, A.jacobi and A.kayseri. All this is not to say that entomology is blameless. An element of rigidity in choice of catching method and station and reluctance to try others is detectable. A more fluid approach should be encouraged though the team cannot be blamed if the most efficient method of collecting A.culicifacies cannot be practised (the use of a cattle-baited unsprayed caljan hut) because the HQ has not supplied the necessary finance (200 rupees per hut) for the purchase of caljan and its construction.

2.2. ASSESSMENT OF IMPACT

Two series of observations are carried out by the field entomology teams :

- (a). Monthly trend observations - In 1984 these were made in Mannar, Puttalam, 2 localities in Mahaweli 'H', Kurunegala (Intermediate Zone) and Valachchenai.
- (b). Spot checks, mainly in malaric foci based on advice from R.M.OO.

All sampling techniques are employed and mosquitoes caught are identified, classified according to blood digestion, ovarian development and parity state and, if caught alive (in window traps), delayed mortalities recorded. Also blood meals are sampled for precipitin tests. In addition susceptibility tests are carried out on all species and susceptible species are used for bioassay tests to test the toxicity of insecticide deposits on the various types of surface net with in houses. Selected results from extensive tables provided by HQ. Colombo for 1984 are -

- (i). of 8758 nymphs found in 242 localities in 43 Health areas caught biting man, 12 species were identified in the following proportions : subpictus 21%, nigerrimus 16.5%, vagus 14.3%, culicifacies 12.9%, annularis 12.2%, pallidus 7.7%, varuna 5.1%, tesselatus 4.7%, maculatus 1.0%, jonesi 1.0%, barbistris 0.4% and karwari 0.07%.
- (ii). indoor sampling of resting mosquitoes showed culicifacies and subpictus to be the main species but some gravid vagus also occurred.
- (iii). of 9655 houses visited by entomological teams only 40% were within 3 months of malathion spraying; (the usual spraying cycle) and 56% were overdue or unsprayed. Of 3009 culicifacies collected indoors 74.0% were from the 50% of houses overdue or unsprayed. 4.7, 7.0 and 13.0% were from houses within 1, 2 and 3 months of spraying; respectively. These results indicate that malathion is effective if sprayed properly. Of 13265 subpictus collected indoors by pyrethrum spray catches 68.9% were from the overdue or unsprayed houses.
- (iv). window trap catches indicate a significant exodus of culicifacies from houses but 6% died within 24 hours of capture. Of 919 females caught 40.4% were gravid and 39.2% blood-fed. Gravid females within sprayed houses are a sign of insufficient insecticide presence.

(v). bioassay tests have confirmed this insufficiency :

Days of spraying	Type of surface	Range of mortalities
1 - 30	mud	27 - 100
	cadjan	63 - 100
	wooden furniture	99.5 - 100
31 - 60	mud	15 - 62
	cadjan	63 - 100
	wooden furniture	96 - 100
61 - 90	mud	42 - 58
	cadjan	78 - 100
	wooden furniture	100
Over 90	cadjan	20
	wooden furniture	10

These results emphasise the relatively short persistence of malathion on absorbent mud surfaces.

(vi). the results of 1064 precipitin tests showed only 3 positive for man, 2 out of 618 subpictus and 1 out of 26 nigerrimus. Both the positive subpictus were caught in houses; the positive nigerrimus came from a window trap. 95 vagus, 51 tenelatus and 6 culicifacies all proved negative

(vii). larval collections from 15 different habitats produced 14 species and showed the vector An.culicifacies to be common in pools in river beds or the margins of slow-moving rivers or streams. It was also found in rock pools, paddy fields, irrigation channels, rain water pools, and borrow and quarry-pits. An.nigerrimus and An.vagus were the common species in rice fields, An.subpictus was equally common in river beds and rainwater pools. Other species commonly collected were An.annularis, An.pallidus and An.barbinotris

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2.3. Susceptibility testing

Susceptibility tests carried out in 1984 with 12 species showed significant survival from exposure to the WHO discriminating dosages in the following :

5% malathion for 1 hour	: <u>culicifacies</u> , <u>varuna</u> , <u>annularis</u> , <u>nigerrimus</u> , <u>subpictus</u> , <u>vagus</u> , <u>tesselatus</u>
1% fenitrothion for 2 hours	: <u>nigerrimus</u> , <u>subpictus</u>
5% chlorphoxin for 1 hour	: <u>nigerrimus</u>
0.1% propoxur for 1 hour	: <u>nigerrimus</u>
4% DDT for 1 hour	: <u>culicifacies</u> , <u>varuna</u> , <u>nigerrimus</u> <u>subpictus</u> , <u>vagus</u>
0.4% dieldrin for 1 hour	: <u>varuna</u> , <u>annularis</u> , <u>nigerrimus</u> , <u>vagus</u> , <u>janesi</u> , <u>pallidus</u>

New foci of malathion resistance in the vector An.culicifacies were indicated in Mannar and Trincomalee bringing the total localities where survivors have occurred from exposures to 5% malathion for one hour to 8. Previous records from Puttalam and Vavuniya have been confirmed but the proportion of survivors has declined from 7.4 (of 162 exposed) and 4.9% (of 112 exposed) in 1983 to 0.8 (of 2502 exposed) and 3.4% (of 123 exposed) in 1984, respectively. Survivals of An.culicifacies, An.varuna, An.annularis and An.pallidus on exposure to 1% fenitrothion for one hour (instead of 2 hours) may be indicative of resistance to this insecticide but this needs more confirmation. Resistance to fenitrothion seems certain in An.nigerrimus and An.subpictus, however, an.nigerrimus is also resistant to chlorphoxin, propoxur and possibly deltamethrin also. No An.culicifacies survived 0.4 dieldrin for one hour.

2.4. Entomological Studies at Wewala, Dambulla Health Area
(the chloroquine resistant P.falciparum focus)

Of 26467 female anopheline caught in this area (mainly from cattle-baited huts and net-traps), 41.7% were An.vagus, 23.9%, An.jamesi, 11.2% An.nigerminus, 7.2% An.pallidus, 5.3% An.varuna, 3.8% An.subscriptus, 5% An.annularis, 1.3% An.barbros-tris, 1.1% An.sconitus, 0.6% An.naculatus 0.35% An.tesselatus and only 0.22% An.culicifacies.

Bioassay tests carried out on mud surfaces in this area using susceptible anopheline species showed mortalities ranging from 96.6 - 100% in houses 1 - 30 days after spraying and 57.1 - 100% in houses 33-46 days after spraying. On cadjan surfaces mortalities were 81.8 - 100% and on wooden furniture 10 - 100% up to 46 days after spraying.

A preliminary evaluation of the effect of the use of space spraying at Wewala was inconclusive and needs repetition and elaboration. Susceptibility tests showed no evidence of malathion resistance in An.culicifacies, An.sconitus, An.varuna, or An.annularis. Some survival from 30 minutes exposure to 5% malathion occurred in An.vagus, An.jamesi and An.pallidus. 10 out of 11 An.subscriptus survived one hour exposure to this insecticide.

2.5. Research on Insecticide Resistance

In collaboration with Dr. Janet Heningway of the Entomology Department of the London School of Hygiene and Tropical Medicine, a start has been made in characterising the different organophosphate (OP) and carbamate resistance mechanisms in those species showing resistance. While high esterase activity (as determined by *spectrophotometric measurements of reactions between mosquito homogenate and α and β naphthyl acetate) was associated with broad spectrum organophosphate resistance in Culex quinquefasciatus, C. gelidus, C. tritaeniorhynchus and Aedes albopictus (all potential disease vectors), it was not so in anophelines in spite of the wide range of activity demonstrated.

*A spectrophotometer has been provided from funds given by Overseas Development Administration, U.K.

Evidence of qualitative change in esterase activity affecting resistance to malathion and other OP's with a - COOH grouping in the molecule e.g, phenthoate, but not affecting most of the OP's, while shown from studies on An.culicifacies in London : ^{has yet} to be investigated in Sri Lanka. There was no evidence of such a qualitative change in An.nigerrimus. What was found in this species was an altered, insensitive acetylcholinesterase (AChE) giving resistance to a wide range of compounds including the OP's malathion and fenitrothion and the carbamate, propoxur. Any one of the numerous OP's and carbonates used as agricultural sprays could have selected this resistance and it now seems that the prohibition of use of malathion and fenitrothion for agricultural purposes did not necessarily delay the appearance of such resistance. The adult resting behaviour of female An.nigerrimus (seldom found in houses) precludes selection of resistance from indoor malathion usage.

In An.subpictus, in spite of wide ranging resistance, there was no evidence of an insensitive AChE and it seems that malathion and propoxur resistance are not controlled by the same genetic factors. Of 19 strains of culicines belonging to the genera Annigeres, Aedes and Culex, only Cu.tritaeniorhynchus from Madatugama showed the insensitive AChE.

Identifiable shortcomings in the Entomological programme which it is hoped to rectify soon are :-

- (i). A dearth of identifications of sibling species in the An.culicifacies complex. 3 species are known; only one has so far been recognised in Sri Lanka from a relatively few females sampled from one locality in the south of the island.
- (ii), the sporogites found in An.culicifacies and species other than the known vector remain to be definitively identified. The immunoradiometric assay (IRMA) method or the ELISA technique, at present being developed in the U.S.A., should be applied for this purpose at the earliest opportunity.
- (iii). more activity in the direction of trying alternative methods of mosquito control is urgently needed in order to reduce the present reliance on insecticides.

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3. Operational Aspects

3.1.1 Spray Operations

The results of the 1984 spray operations is reported for two types of health areas : (1) where spraying is carried out quarterly in 64 health areas and (2) where spray applications are made seasonally (two times) in 16 health areas for one round. Health areas may have had both types of spraying during 1984. The only insecticide used operationally by the AMC is Malathion, 50% w.d.p. applied at 2 gms. (tech.) per square meter. In 1984, the AMC reported that 58% of the targetted houses were completely sprayed ; 25% of the targetted houses were partially sprayed and 17% were not sprayed (almost equal percentages of closure and refusal). The percentage in 1984 house coverage is almost identical to 1983 and 1982 results. The average population and houses covered per round under the quarterly applications are reported as 3,881,260 and 1,063,486 respectively. The major change in the 1984 spraying operation was a change from seasonal to quarterly spraying for 35 health areas in April, 1984 due to epidemiological changes in malarionetic pattern. At present 64 Health areas are sprayed quarterly. The total amount of Malathion used in the 1984 spray operation is reported as 1,775,066 kgs. (quarterly) plus 95,653 kgs. (one round seasonal) for a total of 1,870,719 kgs. or 4.12 million pounds. In 1984 the AMC ordered 5.01 million pounds of Malathion for the 1985 operation which will be adequate even with the increased health areas changed from seasonal to quarterly spraying through late 1985. However, additional insecticide is requested for the last part of 1985 according to the planning documents of the NMQ operations office.

The evaluation teams visited field spray operations in Regions Hambantota (W.U. Beragana, W.U. Thanjanagaraya, W.U. Kataragama); Monoragala (one W.U.) Kandy (W.U. Oththakade), Kurunegala (Team 4) and Maho (W.U. Mahadivulwowa). All evaluation teams indicated spraying techniques were often found faulty with defects in overlapping swaths, incorrect speed of application, and poor coverage with many of the spray personnel observed. In brief, the results of these field visits indicated that more intensive supervision and effort is required to ensure a correct dosage of the insecticide on the targetted surfaces.

Field checks indicated that charges of insecticide were of proper weight. Nozzle discharge rates were often found excessive which leads to overloading of the surfaces.

Safety and health precautions were carefully studied at the field sites. Annex 1 provides the results of the Cholinesterase estimations carried out by the AMC during 1984. There were 5792 estimations carried out and the results were 1104 (100%), 2169 (87.5%), 1093 (75%), 544 (62.5%), 02 (50%) and 15 (below 50%) in 24 regions and sub-regions. The AMC reports that it has 550 Walking Units (4 men) and 41 Mobile Units (6 men) in the quarterly sprayed areas. The AMC personnel list includes 1795 spray machine operators (casual and permanent). Even if Field Assistants and other supervisors connected with spraying were not routinely checked for cholinesterase, the reported results is far below the standard of checking each person after each round and needs to be increased. Although there were no reports of serious Malathion intoxication among any AMC operations employee in 1984, more efforts need to be done in training, supervision, storage, use of protective equipment and Cholinesterase testing in the Malathion programme. The Kandy Region reported that 21 and 47 tests were below 62.5 in Rd. 1 and Rd. 2 respectively. No tests were done in Kandy for Rd. III and Rd. IV. All the evaluation teams remarked on the proper use of protective clothing by many of the sprayers observed.

The reported spray coverages are not indicative of the true picture as generalizations mask less effective units such as Dankotuna (Puttalam) where fully sprayed houses were only 31.52% of houses targeted. Epidemiologically, the inclusion of partially sprayed houses in the total houses sprayed has marginal significance on the control of malaria in a given area. The AMC is simply being misled if such figures are used to demonstrate spray efficiency.

In summary, the spray operations continues a work pattern noted in other evaluations which does not apply insecticide in its most effective and economical manner and without due precautions being taken in regards to safety and health safe-guards. The economic costs to the AMC and the GSL are enormous if the insecticide of choice is not applied as planned.

The Government is paying staff, providing materials, supporting logistic costs and rightly expects a satisfactory result for the investment. A much more determined and effective spray operation which manages its field programme and data correctly is required and strongly recommended.

3.1.2 Space Spraying

During 1984 a limited amount of space spraying with concentrated Malathion was carried out at the annual festivals at Amuradhapura, Kataragama and Madhu Road. In addition, the AMC used space spraying at Wewala, a focal area for P. falciparum, every three days to reduce vector density. The recorded results of adult mosquito mortality tests done in Wewala indicated that the ULV application procedures may have been faulty i.e. too much pressure, discharge, discharge unit at incorrect angle, time of day. It is imperative in space spraying that trained operators apply the insecticide with exact methodology to obtain maximum results. The importance of adequate entomological evaluation of such spray procedures cannot be stressed enough to guide the operation. One of the teams which visited the Kataragama area suggested ULV applications be considered by the AMC for the November to February period to determine if the present high incidence of malaria can be controlled. This specific situation appears to be an ideal one to try out ULV techniques and it is hoped that AMC will set up a ULV activity in this area to demonstrate its usefulness.

3.1.3 Larviciding

According to the 1984 Administration Report the only recorded larviciding operation for 1984 was in Hambantota Region utilizing Abato (Temophos). The evaluation team that visited this area was informed that no larviciding had been done in 1984 and that the report concerned a 1983 activity. There are opportunities to carry out useful operational research using various larvicides, but those opportunities are being missed by the AMC. The Evaluation Team encourages the AMC to look for areas especially during the dry season which may be responsive to larviciding.

3.1.4 Source Reduction, Water Management and Biological Control

None of the teams reported any specific activities in source reduction, biological control or water management for malaria control in any Region. Part of the problem in not using these techniques in the AMC programme is the lack of awareness and training on the part of the AMC staff. It is hoped that suitable places to carry out such training and the initiation of biological control (HFI, fish) through well-planned operational research will be carried out in 1985/86.

3.2 Logistics

3.2.1 Supplies

The evaluation team paid particular attention this year to the matter of supply. In general, the supply of Central Store anti-malaria drugs and insecticides were generally adequate, but not always available at the field level in the amounts desired. The shortages of microscope slides did affect the AMC programme in 1984 and is only now being corrected by the arrival of new glass slides. The replacement of AMC field spray pumps is now in full swing. By the end of 1985, it is expected that 1,500 or more new spray pumps will be available to AMC. These new sprayers should improve spray performance and provide better protection to spray personnel who have had to struggle with leaking, inefficient spray pumps over the last few years.

A rapid review of the store facilities and procedures at National Headquarters was made during the evaluation. The crowded, untidy stores containing vehicle spare parts, operational items, cloth, tyres and other items are unworthy of the AMC. The stock control procedures need review and strengthening to meet GJL standards. It was not possible in this brief review to determine how re-order levels are set, whether the periodic internal audits are productive or standard management control of the AMC multi-million dollar inventory is given adequate supervisory importance. However, random checks at the National Headquarters store indicate much more improvement is necessary. The key staff assigned to supply responsibilities requires basic supply management training as well as periodic refresher training to increase their skills.

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It would also appear that specific technical assistance in supply management could be usefully employed by the AMC to improve and modify its existing system. It is possible that an external supply specialist or a contract management institute could be of help to AMC with this effort. The team also visited the central malathion warehouse in Angoda. This warehouse was found in good order and operating satisfactorily. There was a roof leak which should be repaired to avoid damage to stored insecticide. The disposal of the old DDT should be carried out promptly. The team suggests a check on the technical quality of the DDT to expedite a decision on disposal. The Team was also very impressed with the continued success of AMC in clearing Malathion from the Port and the organization to transport insecticide to the central warehouse. Much of this success is due to the AMC Accountant and his initiative in this matter.

An important control mechanism for Malathion was initiated in 1985 by the introduction and approval of a bill on April 8, 1985 "to prohibit the possession, transport, sale and use of Malathion in Sri Lanka by unauthorized individuals, and for matters connected therewith or incidental thereto".

Random samples of supply documentation between the National Headquarters and the Regional Offices of Hambantota, Badulla, Moneragala, Embilipitiya, Kurunegala, Puttalam and Maho were studied by the Evaluation Team. The results of this study are provided in Annex 10. In summary, the supply of Malathion between Central and Regional Offices was satisfactory during the year. There were major time-lags in supplying anti-malaria drugs, soap and tyres. Some regions like Maho and Puttalam had much better service on their supply requests than did Moneragala and Hambantota. The logging and follow-up action procedures for supply requests need improvement especially on such items as drugs. There was also an attempt by the Evaluation Team to study time lags between the Embilipitiya Region and National Headquarters in the ordering of Malathion. The important supply defect that surfaced by this review is that Malathion receipts were not available at the control headquarters for a number of 1984 shipments of Malathion to Embilipitiya. The team found that the shipments were acknowledged by receipt in the Region but these receipts were not received and/or logged at National Headquarters.

Follow-up action was not taken by National Headquarters on missing receipts and the procedure is in need of more supervision. These simple attempts to define supply problems is by no means a definitive study, but meant only to illustrate to the AMC the kinds of field evaluations which are possible in the supply management area.

It is understood that a supervisory position in the store management has been vacant for some time. The recruitment of this person plus the addition of the new administrator should result in an improvement in supply management in 1985.

One action which would improve the control of supply situation in the Headquarters and regional warehouses would be the immediate procurement of additional metal racks (angle-iron). A study should be made to determine how much more shelving is required and prepare procurement actions. The division of the large central warehouse into separate areas for various activities may improve supply control, but the basic supply structure needs careful study and an improvement plan. It appears to the team that supply management is an area for technical assistance either from internal or external sources.

3.2.2 Transport/Sprayers/Sprayer parts

The present general state of transport is considered as adequate with the arrival of the new vehicles from the Japanese grant. Most of the old AMC vehicles which have been in use for a considerable length of time can now be replaced by a further consignment of new vehicles expected under the Japanese grant.

The Transport Workshop, however, is in a neglected condition. The Team understood that six (6) workers are under interdiction. The administrative set up of the workshop needs immediate improvement with better coordination as, otherwise, the position will deteriorate further. This workshop is one of the better project workshops in Sri Lanka and is capable of providing an excellent standard of service.

It is important that the workshop is kept clean and unusable AMC vehicles disposed of by auction to avoid congestion.

The Team also noted that tools and spare parts are inadequate for the fleet of vehicles available. Transport details are found in Annex 2. The Badulla Region reported that only two out of four vehicles are presently running until the new vehicles arrived. This loss of vehicles means that field work was not done as planned which reflects on the work production. Several teams mentioned the delay in settling petrol and repair bills (Hambantota, Kurunegala) and attention is called to this lag. More action is suggested in disposing of the non-repairable vehicles lying at AMC Headquarters. Previous evaluation teams have noted this problem and while some such vehicles have been disposed of there is as yet more work to do in this regard.

3.2.3 Personnel

During 1984 there was a considerable improvement in the personnel situation with the addition of the new Regional Malaria Officers and increased improvement in general recruitment. Badulla reported two important vacancies in PHI(VU) and over 73 vacancies for labourers. Ebbilipitiya and Hambantota both had 41 vacancies for spray machine operators. These regions were selected to report vacancies as they are not being subjected to internal difficulties and should be relatively stable. The IMO position in Kandy was also reported as vacant as there were several retirements (PHI/AMC, DO). The present wage scale was given as one of the main reasons for the vacancies for labourers as some of these areas have projects being developed which draw off manpower. The over-all personnel situation for 1984 is found in Annex 3.

3.2.4 Supervision/Management connected with the Regions

Annex 4 provides the actual number of days of field travel in 1984 for Key National Headquarters supervisory personnel. In brief, the percent of available time spent in field supervision is considered unsatisfactory for all National Headquarters personnel as one of their major roles in Regional evaluation and supervision.

Facilities for telephone communication to Regions for all senior staff officers in NR/AMC are an urgent necessity.

The evaluation team visiting Badulla made specific reference to the need for improved management in this critical region. This region should receive priority attention for supervision and assistance to the Regional Malaria Officer to help in solving problems. In general, the teams were impressed with the new IMOs and the effort they are making in carrying out their important tasks. The PHI group serves as the backbone of the AMC AND THE Team found this group had made important contributions to the 1984 programme in operations and field management. The work of the FA in surveillance was generally good but extremely variable in the spray operations.

3.2.5 Accommodation

The new offices/stores built under a grant from the Government of Netherlands in the Regions have improved the accommodation quality of the AMC. There were noticeable improvements in the AMC compounds and the team urges a continual effort in this regard during the next few years to improve the crowded condition of many of the offices. The new insectary is still not being occupied and the team urges the Government to take prompt action to put this facility into operation.

3.3 Management Structure and Programme Planning.

3.3.1 Plan of Operations

The AMC programme is guided by a Plan of Operations covering the 1982-1986 period. One of the targets of this Plan of Operation was to achieve a Annual Parasite Incidence (API) of 2.0 (2,000 cases/million population) by 1987. It appears that with a reported API of 9.5 in 1984 and the present trends of malaria coupled with other national problems that this target will be difficult to reach. Technical problems such as drug resistance and mosquito resistance as well as the noted operational defects will impede the accomplishment of the planned targets. There is no question that the GSI will have to give priority attention to malaria in the foreseeable future. While more coordination with Primary Health Care System is encouraged it is considered unwise to attempt to integrate the AMC into the health services during the Plan of Operation period. The Plan of Operation specifically calls for field applied research and epidemiological and parasitological assessment. To strengthen these aspects of the planned programme it is necessary to increase efforts in research and in the epidemiological/parasitological fields through training, additional assignments or re-assignment of personnel to do this work and provision of technical assistance.

The financial means to support this work activity are presently available. If such actions are delayed, the appropriate funding may not be available at the time funds are required. In April 1984, a modified Plan of Operations was put into effect which changed the spraying status of specific health areas from seasonal to quarterly. The 1982-1986 Plan of Operations was designed on the principle of stratification of areas and reducing the spraying activity over the Plan of Operations period. The rise in malaria necessitated a change in design and major mid-course corrections in programme direction. This change will result in large scale cost increases for Malathion and additional programme expenditures in operational costs. The AMC is presently planning to order 6.0 million pounds of Malathion for the 1986 programme with the first shipment to arrive by 1st December 1985. This procurement schedule requires immediate steps by the GSL to provide adequate budget, meet USAID conditions precedent for USAID loan support and to initiate procurement actions by July. Under the present GSL-USAID agreement the GSL is expected to fund 40% of the cost of the insecticide in the 1986 programme. The Team certainly encourages the AMC to initiate the preparation of Plan of Operations for the 1987-91 period in early 1986 to facilitate long term planning and early identification of resources.

The Director of AMC prepares an annual administrative report which is not only an excellent summary of AMC activities but contains the primary technical information for the programme. The 1984 report is of very high standard and represents a large scale effort. The AMC did prepare a Plan of Action for the year of 1984 ^{Annex 9} but its programming quality in setting up activity targets can only be considered marginal. A national Plan of Action for a malaria control programme should have quantifiable targets that can be evaluated at the end of the planned period. It is urged and recommended that a determined effort be launched to prepare a working Plan of Action for 1986 that gives detailed and quantified programme goals. Such Plans of Action are built from the Regions upwards to National Headquarters following national policy guidelines and direction.

3.3.2 Finance

Annexure: 5 presents a financial summary of the AMC during the year in relationship to the National budget, the Ministry of Health budget, the AMC approved budget and foreign source inputs. In brief, the AMC programme has been adequately supported and there were no major gaps in the funding pattern. In spite of major decreases in the budget of the Health Ministry, the AMC had an increase in funds for the year 1964. The rate of expenditure of approved budget allocations was satisfactory.

Malaria control has been given very high priority during the past five decades and substantial amounts of funds have been allocated through the local funds budget as well as the foreign aid budget Annex 6. The increasing trend of allocations during the past five years is shown in Annex 7. It is evidence that the present annual allocation is a heavy burden on the government budget. The major recurrent cost item is malathion which consumes two third of the AMC allocations. The present AMC programme is highly dependent on scarce resources including medical manpower. Therefore, it is necessary to decide the strategy for the future of this programme emphasizing cost reduction methods.

Though the financing is centralized, the implementation of the programme is prepared at a lower level. Financing of divisional activities are based on the information given in the implementation plans.

There were specific incidences found by the evaluation teams of delays in financial response to urgent program needs. For example, the Entomology team was not able to obtain a small sum of money to carry out their work in construction of a capture hut even after several attempts.

3.3.3 Information System

The built in information system of the AMC administration facilitates the preparation of village level implementation programmes which will help the budget officers of the AMC to prepare the annual budget Annex 8.

Furthermore, all the information regarding operation activities is available at the central level for easy access to the users. However, there are certain instances where the existing management system has not placed sufficient emphasis on cost reduction methods.

3.3.4 Planning

The Ministry of Health has a well planned net-work for national health development activities. Annex 11.

In expectation of political support and with a view to ensuring intersectoral coordination and more effective resource mobilization, a top level policy-making body, The National Health Council (NHC), was set up under the Chairmanship of Hon. Prime Minister in 1980. The National Health Development Committee (NHDC) under the Chairmanship of the Secretary, Health and its six standing committees have been appointed as technical supporting bodies to the NHC. Furthermore, there are district health development committees, sub-division committees and village level committees for health development activities. It seems to the evaluation team that AMC is rarely utilizing these resources. It is unreasonable to expect the effective coordination and cooperation from various levels without utilizing the above institutions.

However, it is a credit to the AMC that AMC has proved that community involvement and resources mobilization would be able to give better results by utilizing school teachers and children in Wewala endemic area as well as volunteers at Bowatenna village for AMC work. The success of this effort may be due to a special effort of the Director AMC but it demonstrates that coordination of health and education and community involvement at the village level can be successfully accomplished.

However, very little attention has been paid to intra-sectoral and inter-sectoral coordination at the top level to ensure the resource mobilization. For example, Family Health Worker support is minimal. Furthermore, support from other sectors such as Mahaweli Development Authority is not sufficient though it is their responsibility to control malaria before they settle the colonists.

3.3.5 General Administration

Planning and implementation of malaria control programme today is more complex than a 'straight forward' oriented to 'eradication' programme. Monitoring and evaluation of malaria control activities for implementing field operations following an epidemiological stratification requires skills in management that cannot be executed without sufficient flexibility and decentralization of some administrative and financial matters.

The reported increased incidence of malaria during the last two years after the substantial reduction achieved by 1982 has been attributed not only to the adverse pattern of climatic conditions of the last two years but to a large extent to constraints and shortcomings in staff at Central and Regional levels and its management which have led to lack of supervision, deterioration of field operations as a whole and inability to contain on time the rising malaria transmission.

The evaluation team offers the following specific administrative suggestions to improve management in the AMC to the Ministry of Health and concerned GSL officers :-

1. To increase delegation and authorization to the D/AMC for recruitment and deployment of Spraying Machine Operators, Field Assistants, Microscopists and Malaria Supervisors.
2. Deployment of Drivers, Public Health Inspectors and Regional Medical/Malaria Officers to be made to the Anti-Malaria Campaign delegating to the Director of AMC authority for assignment of the said staff to the most convenient and needed duty station of the AMC.
3. To delegate authority to the Regional Malaria Officers to reprimand or to impose a fine not exceeding 1 week pay in the case of officers under his administrative control the initial of whose salary scale is less than Rs. 3,000/- per annum. (Consolidated new salary scale). The Regional Medical Officers have this power at present and it is essential to extend this power to the Regional Malaria Officers for good administration of the AMC.

4. To create supernumerary Class I posts for Science Graduates in the AMC for promotional aspects in the career. There are at present 16 Regional Malaria Officers, 5 Entomologists and 1 Parasitologist. It is considered wise to have at least 3 Class I posts since it is expected to have 36 Science Graduates in the future.
5. The present delegation of authority given to the D/AMC to make purchases without tender requirement upto Rs. 1,500/- should be increased up to Rs. 6,000/- which is the amount authorised to the Regional Directors of Health.
6. To implement the recommendations made by the Assessment Team in 1984 concerning approval for an adequate field allowance to enable the Senior Staff of the A;M.C; to stay overnight during supervisory visits.

4. TRAINING AND HEALTH EDUCATION

4.1. Training carried out

An outline of the general training and health education activities organised by or participated in by the AMC during 1964 is given in Annex 12 to 15. Besides the above, the field personnel are given 3 days "inter-cycle" training once every three months.

A leaflet on malaria was produced in 5000 copies. One Regional Medical Officer attended a comprehensive Vector Control Short Course at the University of South Carolina.

4.2. Further training requirements

In general there should be much more training of the entire AMC staff. Much of this could be done on an ad-hoc basis in order to help the understanding of the programme. The Field Assistants in the spray squads in general need more training in supervision and the need for high quality operations.

There is also a need for training more personnel in cholinesterase testing (e.g. AMOs and Senior Microscopists) since this is at present inadequate. The inter-cycle conferences should be more meaningful and have definite themes.

4.3. Health Education Activities

As regards health education there is a need for further training of AMOs and SMOs with emphasis on working with communities and their leaders. The AMOs also require more epidemiological training to enable them to analyse a situation and take appropriate decisions on the spot. The Team feels that much more could be done in the use of visual education materials such as posters and T.V. "spots". Volunteer treatment centres would benefit from a distinctive notice, particularly in development areas.

In other areas where many people congregate posters should indicate where one can be checked for malaria. It appears that the Bureau of Health Education is not able to meet the heavy load of its own work and cope also with the specific nature of the AMC activities. In these circumstances a full time health educator assigned to the AMC would be of great benefit.

4.4. National Institute for Health Sciences

The team visited the National Institute for Health Sciences (NIH) in Kalutara to review malaria training for health workers. Currently the NIH has a very active programme for the training of regional medical officers, public health inspectors and nurse midwives. Both didactic and limited field training in the basic principles of malaria are included in the curriculum, and AMC staff have participated in the instruction.

Discussions were held on whether additional malaria training elements could be added to the curricula. Particular topics which were identified were the training of MDOs in management skills, more in-depth training of PHC workers in community based malaria control methods, and refresher courses for PHC on newer theory and practice of malaria control. Considering the well trained staff and the expanded physical facility of NIH, collaborative efforts between the health education component of AMC and the NIH might also facilitate the development of badly needed malaria health education strategies and materials.

5. INTERSECTORAL COOPERATION

Health for All by the year 2000 through ^{the}PHC approach including effective control of locally endemic diseases as malaria cannot be achieved through efforts of ^{such}the health sector alone. A multisectoral contribution is felt essential including all Governmental and non-governmental organisations dealing with individual or society development. The main intersectoral activity of the Anti-Malaria Campaign in the past has been with the Mahaweli Development Authority, Irrigation and Forestry Departments; however this cooperation does not function nearly so well as it should. In order to expand and strengthen intersectoral cooperation, a National Malaria Control Seminar was carried out during 22 to 28 April 1985. Objectives of the Seminar were a) to aim at highlighting the problems of malaria and its control; b) to discuss means of cooperation between AMC and other Ministries, Departments and Organizations; c) to develop an inter-institutional network to collaborate and share responsibility with AMC for malaria control. Representatives from the Ministry of Local Government, Department of Irrigation, Mahaweli Development Authority, Central Environmental Authority, Ministry of State, State Gen Corporation, Ministry of Finance and Planning, Ministry of Fisheries, Forest Department, Department of Agriculture, Department of Highways, Health Education Bureau, Ministry of Lands and Land Development, Department of Education and Sarvodaya Movement in addition to representatives of the Ministry of Health, AMC, WHO and USAID/ISTI. The Seminar was sponsored by the AMC/USAID/ISTI project.

The main recommendation was to establish a National Malaria Control Coordinating Committee comprising representatives of all the National Organizations/Government Departments represented in the Seminar. This Committee should meet at least twice a year to ensure intersectoral Coordination/Collaboration for achieving the objectives of the National Malaria Control Programme. In addition, specific fields of intersectoral coordination/cooperation were identified as well as the corresponding actions for implementation. (A copy of the 20 Recommendations is attached as Annex 16).

The Team considers that this Seminar has been a step forward from the AMC/USAID/ISTI Project seeking for intersectoral coordination/cooperation, However it wishes to emphasize that the hardest but essential part still is to come, i.e. the necessary initiative and follow up by AMC for implementation of the recommendations, and strongly encourages the national authorities of the AMC to go ahead to reach the objective.

During the field visits the Team could identify only a few voluntary treatment centres from governmental organizations collaborating in anti-malaric activities such as ^{those} of Irrigation/Development Schemes at Lunugawehera (Embilipitiya), Forest Department (Tanamalwila), Sugar Corporation (Embilipitiya). Treatment centres in the private sector (Pelawatte Sugar Co., Hazana - Toda Construction Company) together with volunteers in the Mahaweli System C were also seen.

6. PRIMARY HEALTH CARE (PHC) AND INTEGRATED APPROACH TO MALARIA CONTROL

An integrated approach for malaria control through PHC requires the consideration of the function of the Family Health Worker (FHW) and the participation of the community.

In the "three tier" model of organizational structure of PHC in Sri Lanka, the Gramodaya Mandalaya is an organization of voluntary bodies at village level. It is planned to have a Gramodaya Health Centre (GHC) staffed by a Family Health Worker (FHW) in each Grama - Sevaka area (Administrative Sub-division of Assistant Government Agent - AGA Division). The GHC will provide a work place to the FHW within the community where all elements of PHC could be given.

This is a suitable structure to develop malaria control through the PHC approach involving FHW and community participation, but still this plan is not fully under implementation.

The Government of Sri Lanka is mobilizing all resources for efficient implementation of PHC system in the country and a great deal of work has been done in placing the community in an advanced position within the South East Asia Region. However, in consideration of the natural epidemiological condition of malaria in the country, plans for the eventual development of an integrated system of malaria control would be made in future jointly by the AMC and the Health Department, provided appropriate studies are carried out in advance to analyse the malaria risk and the technical, operational and administrative requirements for a phased integration.

At present the FHW has mainly midwifery functions in addition to another 17 functions that they are expected to perform, excluding activities for malaria control. In the absence of a residence in many places, the FHW does not necessarily stay within the community as planned.

Some steps have been taken towards the involvement of FHW in malaria control, such as the training of about 800 FHW out of nearly 4000 planned and the issue by the Director General of Health Services of Circular P.C. 15/83 in June 17, 1983 in which the role of the FHW in malaria control operations is described. The importance of this circular as a way for the AMC to enjoy the benefits of participation in malaria surveillance including anti-malaria treatment by the important cadre of FHWs was discussed extensively by the Assessment Team in their report of 1983.

However two main considerations have to be made in order to assess the degree of participation obtained from the FHWs in malaria control activities during the past two years :

After the training given by the AMC to the FHWs, the AMC was not able to provide supplies and equipment necessary for the FHWs to perform the activities as described in the Circular P.C. 15/83 of the DGHS. Such supplies included glass slides, anti-malaria drugs, blood film record forms, containers for posting of slides. In addition, no further visits to FHWs in their places of work for supervision or simply for maintaining contact with such important potential collaborators seriously discredits the peripheral facilities of the AMC.

The Circular P.C. 15/83 of the D.G.H.S. describes the role of the FHWs to give vital support to the Malaria Control Programme by participating in malaria case detection and treatment activities. Apparently this Circular is not the administrative instruction necessary for the FHWs to recognise that anti-malaria activities have to be performed by them as one of their normal duties; but with the Circular the FHWs recognise that they may participate in malaria control activities. There is another administrative instruction listing the duties of the FHWs and in that listing the anti-malaria activities apparently have not been included. This could be interpreted as in accordance with the policy of the Ministry of Health which considers that malaria control, for the time being, would continue as a separate responsibility for the AMC and that integration with other services of Health Department will be carried out in future, by stages, having in mind the special high risk of malaria in many areas of the country. However, the non inclusion of anti-malaria activities in the list of duties of the FHWs is not an obstacle at present, to obtain their vital support by participation in anti malaria activities on the basis established by the Circular PC 15/83 of the DGHS. In consequence, delivery of adequate supplies and equipment to enable the FHWs to perform the role that has been instructed in the Circular P.C.15/83 of the DGHS, as well as carry out appropriate supervision and in-service training to ensure continued participation of the FHWs in malaria control activities should be arranged by the AMC in coordination with the Health Department, as indicated in the Circular.

It is felt that provision of necessary supplies and equipment to the FHWS should be made in close coordination with the Regional Directors and Medical Officers of Health in order to identify the channels of communication, supervision and reporting system. Since the AMC benefits the most from the collaboration/participation of the FHWS in malaria control, they must take the initiative of organizing such collaboration and pursue all necessary steps towards achievement of the objective.

The second component of an integrated approach for malaria control is the community participation which can be oriented toward application of anti-vector or anti-parasite measures, this including participation in surveillance and anti-malaria treatment.

Community participation for anti-vector measures in Sri Lanka is still in the exploratory stage. Perhaps the only organization involved in such studies is the Sarvodaya Shramadana Movement which with support of foreign agencies and non government organizations is promoting this venture. Although the AMC is also nominally involved at the advisory level coordination/participation has not materialized and results of the studies are not available.

Community participation oriented towards malaria case detection and administration of anti-malaria treatment is a well developed activity in the country.

Voluntary collaborators responsible for Treatment Centres (VTC) at the village level are numerous in most of the AMC/Regions as the Teams had the opportunity of noticing during their field visits. Although in some regions, as in Puttalam, only 5 VTC exist out of which only three are productive, in other areas such as in Hambantota there are 20 and the Region is expanding the programme, in Tannamalwila there are 30 VTC functioning very satisfactorily under the special care of the PHI/VU of the area.

Participating as VTCs are mainly members of the community such as members of various Religious Organizations, Rural Development Societies, the Sarvodaya Movement, school teachers, members of the Finance Corporation, Sugar Corporation, State Engineers, etc. etc.

Voluntary collaborators have participated up to now in anti-malaria treatment but the field of participation in case detection activities still remains unexploited. The team observed with satisfaction that in many rural areas there are still persons willing to participate as VTC.

Although in some Regions the AMC staff is enthusiastic in this programme as in Moneragala, Hambantota and certain others, it is necessary to increase the enthusiasm and interest of AMC staff and to use initiative for promoting and expanding the VTC organization.

The Team also noted that some of the existing collaborators expressed their desire to take blood films from persons visiting the VTC, provided they are properly trained, oriented, supervised and the necessary supplies and equipment are made available. It is the opinion of the Team that AMC must take this opportunity for strengthening surveillance operations through Voluntary collaborators who, being residents in the villages, are available 24 hours a day to detect and treat malaria cases so serving their community and AMC as well.

Another component of community participation in malaria control is the "acceptance" of intervention measures carried out by the AMC such as the insecticide spraying.

Although community participation in the form of "acceptance" does not give the idea of "action" which is implicit in the meaning of participation, the open refusal of community members of insecticide spraying or the insidious practice of closing the house at the time of spraying makes this lack of participation the most serious and dangerous obstacle that AMC is confronting at present and is threatening its main objective. The Team was distressed to observe that in the case of many spraying units the proportion of houses completely sprayed is only 30 or 40 percent of the houses found by the unit and that the number of houses found is much less than the target planned. While the percentage of houses protected decreases the slide positivity rate remains high or even sometimes increases after the spraying. Whether it is this lack of community participation which is responsible for this critical situation or it is the result of lack of enthusiasm and motivation of the AMC staff or it is the product of both is not possible for the Team to assess at this time. But the fact is serious and every effort must be made to identify and evaluate the causes and to implement appropriate remedial measures.

7.4 There is evidence of a number of deaths being reported by the Registrar to the Ministry of Health as due to malaria but there seems to be a considerable delay in such information reaching the RMO who is responsible for investigating such an event. In addition, if the death is not confirmed as due to malaria a record of the event is not included in the statistics of the AMC. The Team recommends that action be taken to -

- a) shorten the period between notification by the Registrar and the investigation of the death, by establishing a direct communication between the Medical Officers of Health and the RMO/AMC.
- b) that notification of deaths due to malaria be recorded in the statistics of AMC specifying whether it has been confirmed or not.

CHEMOTHERAPY

7.5 Given the pressing need to develop a national malaria therapy policy which will provide effective therapy and also prolong the period of efficacy of the few available antimalarial drugs, the Team agrees with the findings and recommendations of the Meeting on Drug Resistant Malaria Studies in SEAR - New Delhi - 13 to 15 May 1985, and urges the Ministry of Health to implement the various recommendations made, at this meeting.

ENTOMOLOGY

7.6 Recognising the important role entomology plays in the AMC, in both operations and research, the Team recommends that more attention be paid to the supervision of field teams by H.Q personnel and the prompt fulfillment of requests for supplies for these teams. At the same time these field teams need to be more fluid in their choice of SPOT CHECK stations, aiming always at creating the best opportunity to collect vector species.

OPERATIONS

7.7 The main operational deficiency in the anti-malaria campaign is the poor spray coverage of houses by insecticides. The proportion of houses fully sprayed declines from one cycle to the next and there is ample evidence that coverage is insufficient to prevent transmission in many areas. An analysis of the performance of individual spray teams reveals considerable variation in their efficiency.

To improve their performance it is recommended that individual team performance be closely monitored and evaluated at the Regional level

7.8 Being aware that the Medical Statistics Branch of the Ministry of Health updates estimates of population by Health Area every year and issues a list, the Team recommends that the Director/AMC makes the information available to his Regional Offices. The latter should then utilise these figures in their calculation of population for operational planning and evaluation. The estimates of population under spray coverage will, of course, be updated by the Region after each round of spraying.

In case of a MOH area belonging to more than one Region, agreement should be reached on the population allotted to each Region.

7.9 Due to the continued serious threat of malaria transmission in the Kataragama pilgrim area, the Team recommends that ULV application of malathion from November to February/March be implemented on an applied field research basis for one season. There is good supporting data from entomology and the indicator institution.

SAFETY

7.10 Cholinesterase tests of spray personnel were insufficient in 1984. It is recommended that these be carried out more frequently in 1985 so as to verify that protective precautions are being taken. It is suggested that AMC request ISTI vector control specialist to assist in the administration of this activity part of his duties.

LOGISTICS

7.11 In view of the unsatisfactory situation as regards the AMC stores, the Team recommends that records be maintained in a more satisfactory way, the vacant position of Extra Office Assistant Stores should be filled and that the storemen should be trained in supply management.

The Team encourages the newly assigned Assistant Director(Admin) to make a special effort during the next year to improve stores management activity.

ADMIN/PLANNING

7.12 In view of the considerable discrepancies in data presented in different reports produced by the programme, and which are utilised for operational planning and administrative and evaluation purposes, the Team recommends that increased attention be paid to the production of compatible data throughout the reporting system.

7.13 In view of the ever increasing trend of expenditure and need to improve planning, management and operations in order to ensure maximum utilization of available resources, the Team recommends that the strategy for the evolution of the AMC be geared to the gradual integration process but with the maintenance of a comprehensive vector borne disease control department within the ministry which would provide facilities for operational advice, epidemiological monitoring and field applied research.

COMMUNITY PARTICIPATION

7.14 In view of the emphasis put on the essential contribution which community participation has to play in the delivery of Primary Health Care, the Team recommends that the drive for Voluntary Treatment Centres be intensified, particularly in new settlement areas where health facilities may be more than 3 Km distant.

Efficiency through training, supervision and maintenance of supplies must be ensured.

HEALTH EDUCATION

7.15 The Team, considering the heavy workload of the Bureau of Health Education and the specific nature of AMC activities, recommends that a full time Health Educator be assigned to AMC, and recognizing the importance of approach to the community in the implementation of anti-malaria activities the Team also recommends training in health education for all AMC personnel with emphasis on RMOs and SRMOs.

COMBINED ALLOWANCE

7.16 Recognizing that an insufficient combined allowance continues to constitute a significant constraint on field supervision activities, the Team recommends that serious consideration be given to increasing this allowance.

A C K N O W L E D G E M E N T S

The Review Team wished to express its appreciation to the Ministry of Health for the facilities provided.

The Team is also grateful to the Director, Anti-Malaria Campaign and his Staff for their full cooperation and assistance. Field visits were smoothly organised.

The W.H.O. Programme Coordinator and Representative, together with the WHO Malaria Staff, provided valuable support, as did the ISTI personnel.

The participation of representatives of the Ministry of Finance and Planning and of External Resources was gratefully appreciated.

The Team acknowledges with thanks the very capable typing of Mrs. Anne Therese Xavier, Miss. Senehalatha Kathriachchi and Mrs. Yvonne Theabold and the valuable assistance of Mr. B. Nanayakkara and Mr. A. Pathmanathan.

CHOLINESTERASE TESTS

REGION/SUB-REGION	Date of Testing	No. of tests	100%	07.5%	75%	62.5%	50%	Less than 50%
Jaffna	2.7.04 - 9.7.04	141	29	63	49			
Kilinochchi	1.10.04-10.10.04	116	33	53	30			
Amuradhapura	25.9.04-26.9.04	150	30	70	39	3		
Kekirawa	17.9.04-18.9.04	167	52	61	21	20	5	
Trincomalee	20.6.04-25.10.04	166	37	43	50	34	2	
Kahatagesdigiliya	20.9.04-27.09.04	267	59	62	06	56	4	
Puttalam	20.2.04-22.02.04	140	13	64	50	11	2	
Maho	23.1.04-20.01.04	207	23	62	96	26		
	25.6.04-30.06.04	241	34	09	100	10		
	1.10.04-06.10.04	211	45	92	60	6		
Kurunegala) Gokarella) Bingiriya) Wariyapola)	5.3.04 - 19.3.04 17.9.04-29.9.04 19.12.04-26.12.04	1629	239	775	527	06	2	
Hingurakgoda	(11.06.04-12.6.04 25.09.04-26.9.04 10.12.04-19.12.04	303	65	02	62	50	12	04
Matala) Danlulla)	16.4.04 -6.6.04	139	27	34	29	46	1	2
Batticaloa	22.6.04 -31.2.04	162	54	71	36	1		
Valachchennai	21.6.04-20.12.04	226	40	72	102	11	1	
Anparai) Thirukovil)	30.10.04	00	34	26	24	04		
Monaragala	4.4.04	200	52	71	53	22	2	
Indulla	13.3.04-15.3.04	175	61	72	33	7	2	
Bibilo	15.3.04	03	33	30	17	1	2	
Hambantota	10.5.04-20.0.04 24.9.04	224	76	96	43	9	-	
Matara	10.9.04-22.12.04	195	03	63	43	6		
Enbilipitiya	6.4.04-7.4.04	96	12	25	40	10	1	
Inlanigoda	2.4.04	21	4	6	0	3		
Kandy	11.6.04-20.6.04 12.9.04-26.12.04	341	37	70	135	60	26	5
Koggallo	10.6.04	00	4	9	29	22	20	4
		5792	1104	2169	1790	544	02	15

Transport Position in A.M.C.
as of May 30, 1985

(A) Total A.M.C. Fleet

<u>Category</u>	<u>In service</u>	<u>Repairable</u>	<u>Condemned</u>	<u>Total</u>
Jeeps	37	09	00	54
Station Wagons	01	-	-	01
Land Rovers (Diesel)	40	26	-	66
Land Rovers (Petrol)	20	21	-	41
Unimog	-	-	-	-
W.V. Pick-up	01	01	09	11
W.V. Micro bus	-	-	02	02
Trucks (Lorries)	06	02	-	08
Cars	-	-	01	01
	---	---	---	---
Total	<u>105</u>	<u>59</u>	<u>20</u>	<u>184</u>

(B) Headquarters

Jeeps	02	-	04	06
Station Wagons	01	-	-	01
Land Rover (Diesel)	10	-	-	10
Land Rover (Petrol)	01	01	-	02
W.V. Pick-up	01	01	-	02
Trucks (Lorries)	06	02	-	08
Car	-	-	01	01
	---	---	---	---
Total	<u>21</u>	<u>04</u>	<u>05</u>	<u>30</u>

A/-

DISTRIBUTION OF VEHICLES AS AT 30 MAY 1985

<u>Regions/Sub Regions</u>	<u>No. of vehicles</u>	<u>Type of vehicles</u>
1. Jaffna	3	2 Land Rovers 1 J 32
-Kilinochchi	1	1 Land Rover
2. Vavuniya	4	3 Land Rovers 1 Mitsubishi
Mullativu		
Mannar	2	2 Land Rovers
3. Amaradhapura	8	6 Land Rovers 2 Mitsubishi
4. Trincomalee	7	7 Land Rovers
Kahatagasdigiya	4	3 Land Rovers 1 Mitsubishi
5. Puttalam	5	4 Land Rovers 1 Mitsubishi
6. Colombo	28	25 Land Rovers 3 Mitsubishi
7. Kurunegala	5	3 Land Rovers 2 Mitsubishi
Gokarella	2	1 Land Rover 1 Mitsubishi
Bingiriya	1	1 Mitsubishi
Wariyapola	2	2 Mitsubishi
8. Maho	3	1 Land Rover 2 Mitsubishi

	1 9 8 4			1 9 8 3			1 9 8 2		
	Sanctioned cadre	Present strength	Vacancies	Sanctioned cadre	Present strength	Vacancies	Sanctioned cadre	Present strength	Vacancies
29. Hood makers Grade II	02	01	01	02	01	01		01	01
30. Black Smith Grade II	01	01	-	01	01	-		01	01
31. Welders	01	-	01	01	-	01			
32. Carpenters	05	04	01	05	04	01		04	01
33. Painters	02	02	-	02	02	-		02	
34. Cinema Operator	01	01	-	01	01	-		01	
35. Electricians	03	04	-	03	04			03	
36. Lab Orderly	05	04	01	05	04	01		04	
37. S.M.OO - Casual	538	389	140	538	392	146			
- Permanent	1788	1406	382	1788	1413	375			
38. Ordinary Labourers (Office)	03	03	-	03	03	-			
39. Finker Grade II	03	01	02	03	01	02		03	
40. Latheman	01	-	01	01	-	01			01
41. Sanitary Labourers	03	03	-	03	03	-			02
42. Roneo Machine Operator	01	-	01	01	-	01			01
T O T A L	4772	3718	1103	4522	3771	763	Total information on A.T.C personnel for 1982 is not available		

	1 9 8 4			1 9 8 3			1 9 8 2		
	Sanctioned cadre	Present strength	Vacancies	Sanctioned cadre	Present strength	Vacancies	Sanctioned cadre	Present strength	Vacancies
17. P.P.A.	30	13	17	30	19	11	30	21	09
18. P.H.II	60	80	-	68	79	-	53	82	29
19. Driver Overseers	20	19	01	20	17	03	20	18	02
20. Malaria Supervisors	58	48	01	58	43	10	58	48	10
21. Field Assistants F.A. Permanent 1411 Casual 210	1621	1202	339	1621	1489	132	1621	1509	112
22. Microscopists	233	174	59	233	184	49	233	147	66
23. Telephone Operator	01	01	-	01	-	01	01	01	-
24. K.K.S.	05	04	01	04	02	02	04	04	1
25. Watchers - Permanent	05	02	-	05	04	01	05		
Casual		06			06				
26. Drivers - Permanent	59	92	-	59	117	86	59		71
Casual	167	54	113	167	25		167		
27. Book-binders	01	-	01	01	-	01	01	-	01
28. Motor Mechanics - Grade I Seg. A 04 Grade I Seg. B 09 Assistant Motor Mechanic Grade II 02 Casual 02	17	17	-	17	17	-	17	16	01

ANTI-MALARIA CAMPAIGN (AMC) HEADQUARTERS SUPERVISION SUMMARY IN NUMBER OF DAYS
IN 1964 BY MONTH FOR SENIOR OFFICERS

Head Quarters Officers	Jan.	Feb.	Mar.	Apl.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Director - AMC	-	-	-	04	-	-	-	*	*	*	01	-	05
Deputy Director -AMC	-	06	03	04	-	03	05	-	03	06	01	-	36
LPI - 1	06	07	-	-	03	06	-	03	-	-	02	-	27
LPI - 2	04	06	-	02	-	06	-	-	-	*	*	*	18
LPI - 3	03	10	02	01	05	12	-	*	-	02	-	-	40
MO/Training	----- Not in service upto October						-----			-	-	-	00
Entomologist	03	04	06	05	02	06	02	03	-	01	03	05	45
No. of days	21	33	11	16	10	38	07	06	03	09	12	05	171

* Abroad on duty

Note : Combined Allowance per diem rates = Rs. 90/-

A/-

ANTI MALARIA CAMPAIGN FISCAL POSITION 1980 - 1984

ANNEX 5

- 70 -

Year	Total Health Ministry Budget	Total AMC Approved Budget	Total AMC Budget Expended	Budget Amount from Donor Sources	Yearly rupee value of the US \$ end of the year each year
1980	853,672,617	82,858,456	81,481,350	44,488,904	US \$ = Rs.18.00
1981	968,346,820	105,543,300	94,607,162	58,120,693	US \$ = Rs.20.55
1982	975,910,000	123,508,000	118,024,607	71,421,946	US \$ = Rs.21.32
1983	1,827,107,000	151,172,000	148,275,728	81,595,123	US \$ = Rs.25.00
1984	1,463,316,000	266,298,000	238,987,133	142,187,284	US \$ = Rs.26.26

Note :

- (a). For 1984 the AMC approved budget equal 18.2% of Health Budget
- (b). For 1984 the AMC approved budget equal 70.9% of the Preventive Budget of MDI
- (c). 65% of AMC budget is for insecticides
- (d). 20% of AMC budget is for personnel (all categories)

sk.

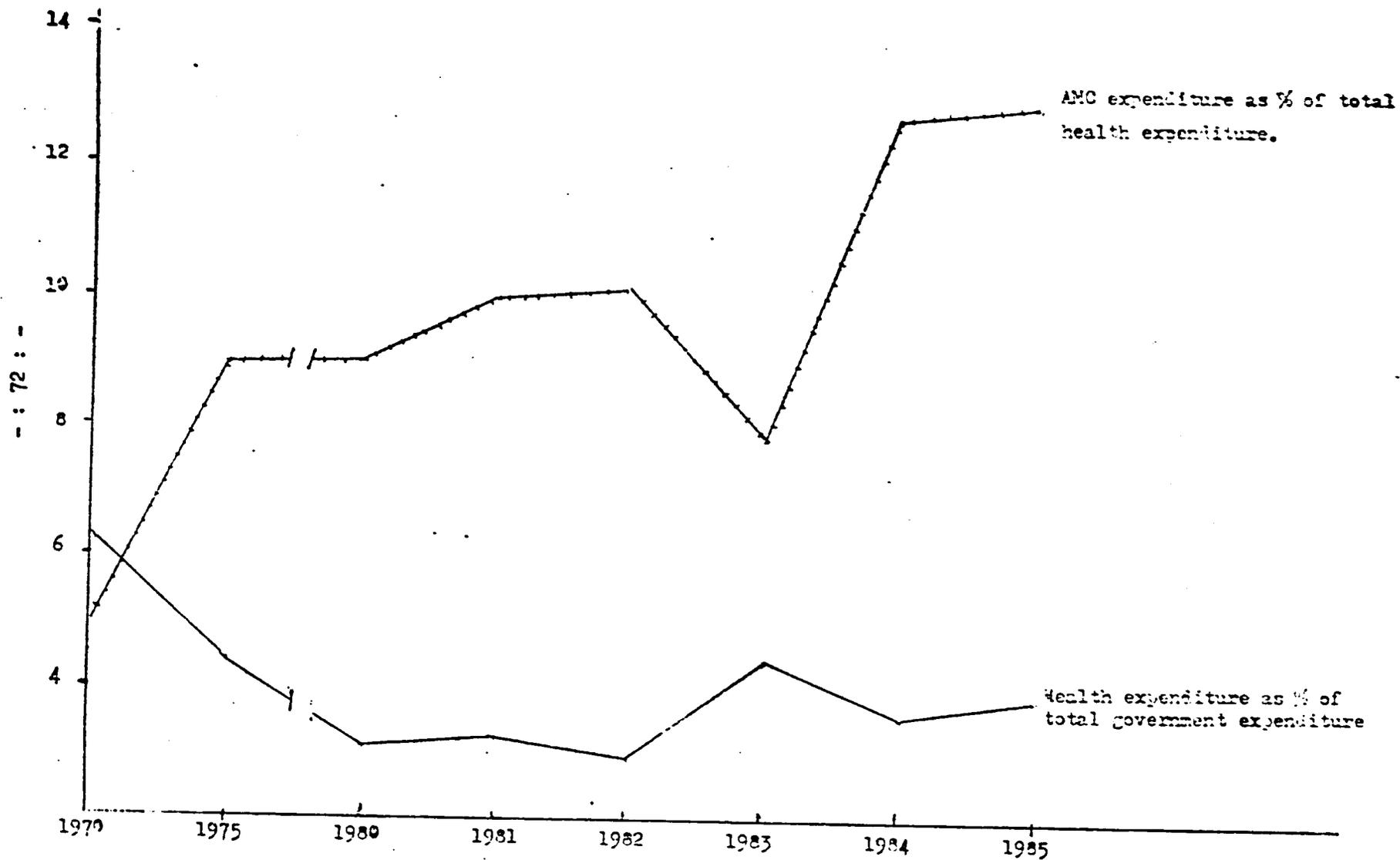
Health Expenditure Distribution Pattern (1980-1985)Government Expenditure on Health Preventive Services and Malaria Control

(Rs. Million)

Annex 6 Year	Health Exp. as a % of total Govt. Expenditure	Total Health Expenditure			Foreign Aid	Expenditure on Preventive Services		Expenditure on malaria Control Programme			Expenditure on insecticides	
		(1) Capital	(2) Recurrent	(3) Total		(4) Total	(4) as % of (3)	(5) Total	(5) as a % of (3)	(5) as a % of (4)	(6) Total	(6) as a % of (5)
1985*	3.95	457	1902	2435*	190	602	20	322	13	47	206	64
1984*	3.67	244	1607	1851*	147	400	26	241	13	36	137	57
1983	4.56	714	1367	1027	79	310	15	143	8	40	79	53
1982	3.06	182	999	1181	72	241	20	118	10	43	66	56
1981	3.30	101	813	953	56	279	29	95	10	33	50	53
1980	3.10	122	763	885	39	133	15	31	9	59	40	49

* Estimated Expenditure

EXPENDITURE PATTERNS - OF AMC & HEALTH SERVICES



PLAN OF ACTION FOR MALARIA CONTROL PROGRAMME
IN SRI LANKA FOR THE YEAR 1984

1. Programme Objective :

The Plan of Operations for Malaria Control in Sri Lanka during the period 1982/1986 had the following objectives.

- 1.1 Reduction and subsequent elimination of indigenous P. falciparum infection.
- 1.2 Control of malaria in the whole country to prevent epidemics, to maintain and increase the gains achieved in the reduction of malaria incidence with eradication of the disease as the ultimate objective.

2. Present Situation/Situation Review :

In 1982 there were 38,566 of microscopically positive cases of malaria, of the 1,127,601 blood films examined with an S.P.R. of 3.4% P. falciparum infection which steadily decreased upto October 1982 showed a steady increase may a sharp rise. In fact 35% of the total cases and 40% of the P. falciparum cases in 1982 were in November and December 1982 and this increase continued into 1983.

In 1983 there were 127,264 microscopically positive cases of 1,055,626 blood films examined and P. falciparum reached 4,500 cases.

In depth analysis of the 1983 incidence has revealed that the epidemiological picture has completely changed. Table I depicts the situation at the end of 1983.

<u>TABLE I</u>		
<u>A.P.I.</u>	<u>No. of MOH areas</u>	<u>Population.</u>
Above 50	1	99,448
40.1 - 50	1	120,096
30.1 - 40	3	393,563
20.1 - 30	13	1,840,958
10.1 - 20	23	2,361,811
3.1 - 10	24	3,263,123
2.1 - 3.0	2	493,575
1.1 - 2.0	10	1,462,789
Below 1.0	15	299,370
Non-malarious	16	2,338,115
Total :	<u>108</u>	<u>15,372,050</u>

Thus the situation is very bleak and it has been decided to revamp the programme.

contd.....

3. Strategy :

3.1 Measures against the vector :

All areas currently under seasonal spraying will be brought under perennial spraying from Mid March 1984.

This does not mean that stratification adopted in 1982 was a failure it has only reconfirmed that the country was not well equipped with the facilities to step in, nor were alternate methods available to step in where spraying was withdrawn. One must realise that withdrawal of spraying must be followed or go hand in hand with alternate control methods. Sri Lanka had no trained personnel or facilities available in alternate integrated vector control methods to substitute insecticidal spraying.

3.1.1 Alternate/candidate insecticides are being tested together with monitoring of the susceptibility of An. culicifacies to malathion and other insecticides.

3.1.2 Research is being carried out to study the bionomics of Anopheles and other potential vectors.

3.2 Measures against the parasite countrywide surveillance by the AMC and the general Health Services is being augmented by temporarily deploying all PHC personnel for urgent Anti-Malaria Activities.

3.3 It is proposed to involve the community to participate actively in the programme at least in making them accept spraying of their houses, taking the full course of treatment and using personal protection methods for the present. If and when other safe methods could be designed or become available they will be made available to the community.

4. Activities :

4.1 Geographical Reconnaissance :

To update the geographical reconnaissance in all areas where spraying is in progress.

4.2 Spraying :

Quarterly spraying in all malarious areas with malathion with an estimated population of 4 million.

4.2.1 Focal Spraying :

Focal spraying in areas if and when necessary.

4.3 Supplementary measures :

4.3.1 Larviciding :

Larviciding with abate in areas indicated by epidemiological and entomological studies.

4.3.2 Space Spraying :

Space spraying in areas where pilgrims congregate in large numbers e.g. Madhu, Anuradhapura, Katarugama.

5. Surveillance :

5.1 PCD & APCD :

PCD & APCD to take blood films from all fever cases.

5.2 ACD :

ACD in areas where APCD & PCD facilities are not available and in special areas e.g. chena-yayas and development projects.

5.3 Laboratory Services :

To examine all blood smears with the least possible delay so as to ensure immediate remedial measures.

All *P. falciparum*, 15% of positives and 10% of negatives will be cross-checked at random.

The figures for cross-checking is on the basis of the present strength of the cross-checking staff.

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5.3.1 Drug Sensitivity :

These tests will be carried out to cover the Island both in space and time.

Further R.M.OO. will carry out in-vivo tests which may be further checked by in-vitro studies where indicated.

5.4 Case Investigation :

All *P. falciparum* cases and all *P. vivax* cases within MOH areas of an API below 1 will be investigated.

The FMW and other PHC personnel will be utilised for this exercise together with AMC personnel.

6. Entomology :

The entomological division will continue their studies on operation assessment, investigation of malaria foci, detection of vector resistance, confirmation of suspected resistance etc.

It must be pointed out that with the depleted staff it may not be possible to undertake all activities programmed or which are ideal to help in the control programme.

7. Research Projects/Studies :

All on going projects will continue. New Projects/Studies will be undertaken when men, money and material are available.

8. Health Education and Training :

It is envisaged to train all new PHC personnel and retrain others. AMC personnel will also be retrained in keeping with the goal of achieving the ultimate objective of eradication.

8.1 Community Participation :

It will be a major problem to be tackled by the Health Education Division and all efforts will be directed to achieve this goal.

9. Management :

As envisaged in the policy of the Ministry of Health the AMC will function as a vertical programme as in previous years. Attention is now being paid by the directorate to enlist the M.O.O.H. and SS.H.S. to take an active part in Anti-Malaria Operations. The Directorate is now actively participating in the working of the AMC.

Sgd. Dr K. Subramaniam
Director
Anti-Malaria Campaign.

Random Samples of AMC Supply time-lags in 1984
in specific Regions

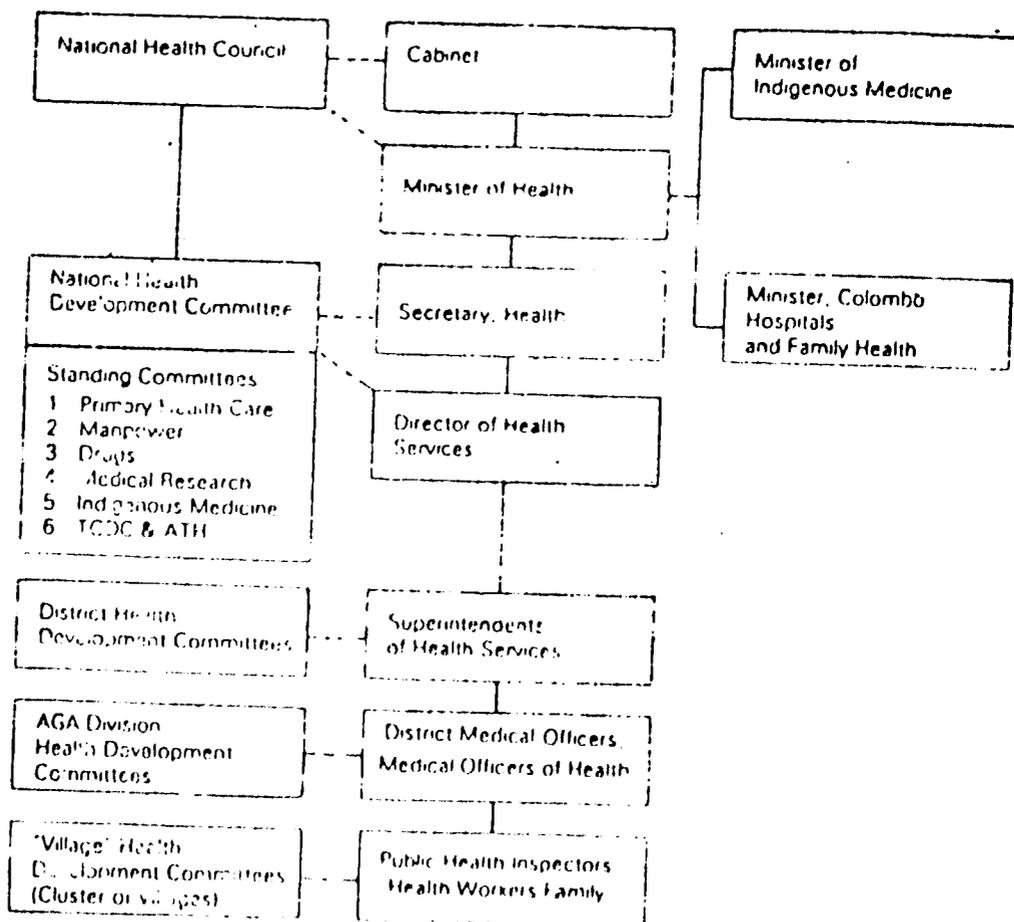
Region	Item and Requisition No.	Date sent to NHQ.	Date received at Region	<u>Time lag in Days /Months</u>
KURUNEGALA	1. Soap, Nozzles Spirits RKC/8/82	27.6.84	Not yet received	
	2. Sprayers RKC/8/82	14.2.84	22.3.84	36 days
	3. Stationery	3.2.84	2.3.84	29 days
	4. Tyres (4) RKC/313/82	9.8.84	Not yet received	
PUTTALAM	1. Malathion 300 lxs. RPC/SK/8/78	21.5.85	14.6.85	24 days
	2. Anti-malaria drugs RPC/SK/8/78	7.4.84	31.5.84	24 days
	3. Glass slides	7.4.84	14.4.84	7 days
MAHO	1. Malathion 300 lxs. SK/13/7/78	17.2.84	1.3.84	12 days
	2. Printed forms	5.3.84	11.4.84	6 days
	3. Malathion 150 lxs.	10.5.84	26.5.84	16 days
	4. Anti-malaria drugs	25.5.84	7.7.84	43 days
MONERAGALA	1. Anti-malaria drugs	02.08.84	02.12.84	4 days
	2. " " "	25.02.84	22.04.84	2 months
	3. Stationery	01.12.84	24.02.84	1 month/5 dys.
	4. Soap	30.03.84	19.09.84	5 mths.18 dys.

- : 80 : -

<u>Region</u>	<u>Item and Requisition No.</u>	<u>Date sent to HQ.</u>	<u>Date received at Region</u>	<u>Time lag in Days/Mths.</u>
EMBELLIPITIYA	1. Malathion RE/1/84	30.11.84	11.12.84	11 days.
	2. Stationery	5.1.84	18.03.84	2 1/2 mths.
	3. Tyres	27.12.84	1.04.85	4 months
BADULLA	1. Slides (No numbers for all requisitions)	23.08.84	19.9.84	27 days
	2. Anti-malaria drugs	5.05.84	27.06.84	53 days
	3. Sprayers	9.07.84	18.09.84	69 days
	4. Soap	1.01.84	1.03.84	2 months
HAMBANTOTA	1. Spraying equipment RT/A/31/71	27.12.83	17.01.84	3 months
	2. Soap and spraying equipment RT/A/31/71	02.03.84	11.05.84	2 months
	3. Stationery	12.06.84	16.07.84	34 days
	4. Chloroquine	02.03.84	21.07.84	4 months

NOTE : Samples taken at Regional Office using a random selection. This table used first four - six items in sample. Table is considered only illustrative of time-lags.

HEALTH DEVELOPMENT NETWORK IN SRI LANKA



Performance of the M.D.T.C. Colombo - 1924

ANNEX 11

Category trained	No.	Period	Duration	Remarks
Regional Malaria Officers Parasitologist Entomologist	37	01.12.03 - 29.02.04	33 months	Training at the M.D.T.C. Colombo
Regional Medical Officers	44	19.03.04 - 02.04.04	02 weeks	
Microscopists (in-service)	12	30.05.04 - 31.05.04	02 days	at Regional Malaria Office
-do-	16	01.06.04 - 02.06.04	02 days	at Regional Malaria Office
-do-	10	03.06.04 - 04.06.04	02 days	at Regional Malaria Office
-do-	23	20.06.04 - 22.06.04	03 days	at M.D.T.C. Office for Malaria and Batticaloa Dist.
-do-	57	10.07.04 - 11.07.04	02 days	Central Lab.
-do-	17	16.07.04 - 17.07.04	02 days	Regional Lab. Batticaloa
-do-	13	18.07.04 - 19.07.04	02 days	Regional Lab. Batticaloa
Microscopists (pre-service)	31	02.07.04 - 20.09.04	03 months	
-do-	10	02.10.04 - 31.12.04	03 months	
Entomological Assistants	10	07.11.04		This training is not yet
Regional Malaria Officers	03	02.10.04 - 31.12.04	03 months	
Public Health Inspectors (New recruits)	35	13.12.04 - 14.12.04	02 days	
-do-	35	20.12.04 - 21.12.04	02 days	
Medical Officer from Madura Jya Scheme	01	13.12.04 - 14.12.04 and 20.12.04	03 days	

Training conducted out side the Training Centre

ANNEX 13

Organized by	Venue	Category	No.	Date
NIES Kalutara	NIES Kalutara	Family Health Workers	35	11.11.83
MOH Monagana	MOH's Office Monagana	Family Health Workers	30	21.11.83
NIES Kalutara	NIES Kalutara	Family Health Workers	25	27.11.83
NIES Kalutara	NIES Kalutara	AMP Students	40	30.11.83
MOH Panadura	MOH's office Panadura	Family Health Workers	35	01.12.83
MOH Monagana	MOH's Office Monagana	Family Health Workers	35	17.12.83

- : 83 : -

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Exhibitions, participated by the AMC - 1984

ANNEX 14

Organised by	Venue	Period	Estimated cost
UNICEF	Man Maha Vidyalaya	14.01.84 - 17.01.84	7,000
St.Peter's College Dambalapitiya	St. Peters' College, Dambalapitiya	23.02.84 - 27.02.84	1,000
Lions Club, Padukka	Padukka Maha Vidyalaya	11.02.84 - 24.03.84	12,000
International Womens' Day Celebrations	Dibile Maha Vidyalaya	07.03.84 - 14.03.84	25,000
Red Cross Organization	Tapodanaramaya, Mt. Lavinia	16.05.84	5,000
Gas Udawa Movement	Anuradhapura	21.06.84 - 03.07.84	30,000
Health Organization, Moratuwa	Panadura, Town Hall	16.07.84 - 21.07.84	7,000
Sankyadana Movement	Thaksala Maha Vidyalaya, Morana	25.08.84	1,000
Science Section of the Maharagama Teachers Training College	Maharagama Teachers' Training College	12.09.84 --16.09.84	15,000
CHIAT Negambo Branch	St. Peters College, Negambo	23.09.84 - 30.09.84	2,000
Health Organization Moratuwa	Super Market, Mt.Lavinia	15.12.84 - 23.12.84	15,000

- : 84 : -

Film shows conducted - 1904

ANNEX 15

Region or Sub-Region	Nature of the Programme	Period	Venue
Mabilipitiya	Film Shows lectures discussions	19.01.04-24.01.04	Sarvodaya Centre at Shanaralwila & other villages-centres.
Polonnaruwa	-do-	12.02.04-16.02.04	3 Schools, home for the aged and pilgrim -est Polonnaruwa
Dibile	-do-	15.03.04-18.03.04	One School, one Divisioned office and two village centres
Mingurakgoda	-do-	26.03.04-29.03.04	One School Mahaweli Authority office and three village centres
Kegalle, Behiowita	-do-	01.04.04-10.04.04	3 Schools 4 temples 3 village centres
Matale	-do-	07.06.04-11.06.04	4 Schools and 2 village centres
Puttalam	-do-	09.07.04-25.07.04	Cement Factory Puttalam 3 Schools and one temple
Kandy	-do-	07.09.04-17.10.04	2 Schools and 10 village centres
Kegalle	-do-	05.11.04-13.11.04	2 Schools, 2 temples one village centre
Mabilipitiya	-do-	14.11.04-21.11.04	2 Schools 4 village centres

A/-

RECOMMENDATIONS

1. GENERAL

1. Considering that the activities of several Ministries/Departments affect the malaria control programmes, and realising the need for close collaboration and coordination among these Ministries/Departments, it is recommended that a National Malaria Control Coordinating Committee be established comprising -

- (a) Ministry of Health
- (b) Ministry of Agriculture
- (c) Ministry of Finance
- (d) Ministry of State
- (e) Ministry of Local Government
- (f) Department of Irrigation
- (g) Land Commission Department
- (h) Land Development Department
- (i) Forest Department
- (j) Education Department
- (k) Department of Inland Fisheries
- (l) Mahaveli Economic Agency
- (m) State Gen Corporation
- (n) Anti-Malaria Campaign

This Committee should meet at least twice a year to ensure intersectoral coordination/collaboration, for achieving the objectives of the National Malaria Control Programme.

2. In order to facilitate decision making and implementation on matters of high priority pertaining to anti-malaria activities, it is recommended that relevant coordination between all agencies/authorities and the AMC be at central, intermediate and peripheral levels.
3. Realising that planning and implementation of field health activities, particularly those of malaria control in development areas can be enhanced by close cooperation between these development authorities and the AMC, it is recommended that this cooperation be strengthened and continued at all levels from the centre to the periphery.

II. LAND SETTLEMENT

4. Recognising that adequate prior notice is now not available to the AMC to give timely protection to new settlers in all development areas including the Mahaweli, it is recommended that information relating to origin, time of departure and numbers of new settlers and their destinations be provided to AMC by the relevant authorities at least three months in advance to enable the AMC to plan adequate and appropriate malaria control activities.
5. Recognising the importance of a uniform regimen for treatment of malaria, it is recommended that the AMC appraise medical officers in development areas of approved treatment schedules and the concerned authorities ensure that such schedules are adhered to.

III. MALARIA CONTROL

A. Water Management

6. Being aware that the free flow of water in irrigation channels is essential to minimise mosquito breeding, it is recommended that the design, construction, operation and management of irrigation channels by all agencies/authorities be carried out in collaboration with the Anti-Malaria Campaign.
7. Being aware of the increased construction of shallow wells in the dry zone areas, particularly in the eastern littoral, which may lead to increased vector breeding, it is recommended that the National Water Supply and Drainage Board, Water Resources Board, the Department of Agriculture, etc. inform the Anti-Malaria Campaign of such planned constructions so that appropriate larval control would be considered.
8. Considering the different types of agricultural practices in the dry zone of Sri Lanka, realising that some of these practices lead to increased mosquito breeding, being aware of the beneficial effects of collaboration between the Ministries of Agriculture, Mahaweli, Land and Land Development and the Anti-Malaria Campaign, it is recommended that a collaborative study be undertaken by these agencies to identify effective measures of water management for vector control.

B. Environmental conservation

Gem Mining

9. Recognising the mosquito breeding hazards in abandoned gem pits, and being aware that the deposits for issue of permits are totally inadequate for filling of such pits by the Gem Corporation, it is recommended that the deposits be substantially increased to encourage the miners to refill the pits and in the case of defaulters for the Gem Corporation to utilise these deposits to do so.

Fisheries

10. Recognising the potential in using larvivorous fish for malaria control in Sri Lanka, it is recommended that the Inland Fisheries Division of the Ministry of Fisheries assist the AMC to establish at village level, mass breeding centres of these fish species.

Forestry

11. Recognising the influence reforestation has in creating suitable conditions in streams and rivers for prolific vector breeding that leads to epidemic outbreaks of malaria, it is recommended that -
- a) the Forest Department gives priority to its reforestation programmes to cover the catchment areas of rivers/streams in the wet and intermediate zones.
 - b) that the Forest Department, State Timber Corporation and the Mahaweli Authority provides the AMC information regarding programmes for jungle clearance, specially in the dry zone areas, to enable suitable malaria control measures to be taken.

IV. AGRICULTURAL PRACTICES AND PESTICIDE USAGE

12. Being aware that anopheline vectors/potential vectors of malaria are more attracted to animals such as cattle, buffaloes, and being concerned at the rapid dwindling of the cattle, buffalo population in the village because of increasing use of tractors for agricultural practices and consequently deviation of mosquitoes to man which would promote malarial transmission, it is recommended that animal husbandry be actively encouraged in these areas/

V. MASS MEDIA, EDUCATION AND COMMUNITY PARTICIPATION

13. In order to gain/sustain the interest and the confidence of the community in vector control techniques in which community participation is anticipated, it is recommended that -
 - a) all such techniques be scientifically assessed for effectiveness and suitability by appropriate technical personnel prior to their operational use.
 - b) that a Technical Advisory Committee be established comprising and headed by AMC and other appropriate personnel.

14. Realising that an understanding of malaria control activities by the community results in better cooperation in the implementation of the AMC programme and recognising the importance of health education in this regard it is recommended that -
 - a) personnel from AMC be directly associated with the Curricula Development Centre of the Ministry of Education on matters pertaining to anti-malaria activities.
 - b) that RMOs of the AMC strengthen the on-going dialogue with school teachers and adult education officers in order to disseminate knowledge on malaria both to school children and adults.
 - c) that the Ministry of Education inform the relevant officers concerned to cooperate with AMC authorities in this regard.

15. Realising the role of Gramodhya and Pradeshia Mandalayas in improving acceptance of malaria control activities, it is recommended that -
 - a) Regional Malaria Officers be made members of Pradeshia Mandalayas by gazette notification and that they attend meetings to further the achievement of AMC targets.
 - b) until such time the RMOs are gazetted, they be invited to attend the meetings.

16. Recognising the role of the Community Development Officers (CDO) of the Mahaweli Economic Agency in malaria control activities, it is recommended that the AMC plan and implement an effective training programme for the CDOs and other relevant officers where malaria control is stressed.

17. Recognising the vast amount of representation of the influential Non Governmental Organisations (NGO) based in the community, it is recommended that the NGOs be made to actively participate in the AMC programme through health education activities and vector control activities.

18. Since the interests of the community both at the National and local level has to be sustained, it is recommended that -
- a) a Health Educator trained in mass media methods be appointed to the AMC to enable it to put across its programme.
 - b) Radio/TV programmes pertaining to AMC activities be developed and time obtained on the air waves free/at a special nominal rate.

VI. FINANCE

19. Recognising that the lack of a proper preventive health component in the Mahaweli and other development project budgets is a serious obstacle to the delivery of health care activities particularly those of malaria control, it is recommended that such a component be included immediately and made available to the AMC, to prevent a breakdown in these activities.
20. Being aware of the large sums of money being expended on the purchase of residual insecticides, it is recommended that an integrated vector control programme be developed and implemented.