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February 13 to March 9, 1994

5. Author(s)

1. Richard G. Andre	4. Robert A. Wirtz
2. James C. Sonnemann	
3. Tara S. Upreti	

6. Contributing Organization(s)

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VBC PROJECT

Tropical Disease Control for Development

**An Assessment of the Needs
of the Expanded Research and Training Centre
at Hetauda, Nepal**

February 13 to March 9, 1994

Richard G. Andre, PHD

James C. Sonnemann, MD, MPH

Tara S. Upreti, RN, MPH, PHD

Robert A. Wirtz, PHD

VBC Report No. 82221

Authors

Dr. Richard G. Andre is a medical entomologist employed by the Henry M. Jackson Foundation on a subcontract to the VBC Project.

Dr. James C. Sonnemann is a medical epidemiologist employed by Medical Service Corporation International on the VBC Project contract.

Dr. Tara S. Upreti is an international development training specialist and a consultant for the VBC Project.

Dr. Robert A. Wirtz is a research entomologist and a consultant for the VBC Project.

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Acronyms and Abbreviations

ACD	Active Case Detection
APCD	Active Passive Case Detection
AHW	Auxiliary Health Worker
ANM	Assistant Nurse Midwife
CDD	Control of Diarrhoeal Disease
CHW	Community Health Worker (same as FHW and WHV)
DHO	District Health Officer
DPHO	District Public Health Officer
EPI	Expanded Programme on Immunization
FP	Family Planning
FHV	Female Health Volunteer (same as CHW and WHV)
G	Gazetted (civil service classification)
HA	Health Assistant
HIS	Health Information System
HP / HPI	Health Post / Health Post In-Charge
HTRC	Hetauda Training and Research Centre
IOM	Institute of Medicine (health training, Kathmandu)
JSI	John Snow International (USAID Contractor)
LA / LT	Laboratory Assistant / Laboratory Technician
MA / MI	Malaria Assistant / Malaria Inspector
MCD / MCP	Malaria Control Division / Malaria Control Programme
MCH / MCHW	Maternal and Child Health / MCH Worker
MFW	Malaria Field Worker
MIS	Management Information System
MO	Medical Officer
MoH	Ministry of Health
MRTC	Malaria Research and Training Centre (Hetauda)
NG	Non-Gazetted (civil service classification)
NGO	Non-Governmental Organization
NMEO	National Malaria Eradication Organization
PCD / PCDV	Passive Case Detection / PCD Volunteer
PHC / PHCC	Primary Health Care / PHC Centre
PHN	Public Health Nurse
S-HP	Sub-Health Post
SLC	School Leaving Certificate (secondary school completion)
STC	Short Term Consultant
TBA	Traditional Birth Attendant (with training)
ToT	Training of Trainers
VBC	Vector Biology and Control (Project of USAID)
VBD	Vector-Borne Disease
VDC	Village Development Committee
VHW	Village Health Worker
WHV	Woman Health Volunteer (same as CHW, FHV)

Executive Summary

At the request of USAID/Nepal the VBC Project sent a four-person team to assess the needs of the newly expanded and renovated Malaria Research and Training Centre at Hetauda. The principal goals were 1) to review and make recommendations concerning the personnel required to operate the Centre; 2) to determine the furnishings, supplies, and equipment needed to make the center operational, particularly the parasitology and entomology research facilities; 3) to recommend supplies, equipment, and procedures for maintaining an insectarium; and 4) to review training curricula and recommend revisions for the training of various levels of health workers.

The VBC team visited health and training facilities at national, regional, district, and local levels. Five intensive days were spent with current staff and trainees in Hetauda. The team delineated training needs as fully as possible given the uncertainties of reorganization, determined what new furnishings, equipment, and supplies will be needed, noted last-minute corrections and modifications to be made before the new center is reopened, and identified research needs.

The team found the construction of new buildings to be nearly complete and the old buildings in the midst of renovation. The transformation from the cramped old structures to handsome new buildings is astonishing. From a single building housing all research and training functions, the center has expanded into a large training/laboratory/office building and a separate research building. In place of a single dormitory room for 20 students, the new dormitory will house 60 students in 30 two-person rooms. It has modern bathrooms and a large kitchen and dining hall. New staff housing is also provided. Once the center is furnished, equipped, and fully staffed, it will constitute a valuable resource for training and operational research in vector-borne diseases.

The Hetauda Centre will expand its focus from malaria to vector-borne diseases in general. Kala-azar, Japanese encephalitis, dengue, and filariasis will specifically be included. It will also have a mission to disseminate current information on those diseases. The team believes the center should also develop the capability to carry out

epidemiologic surveillance and rapid investigations of disease outbreaks. The insectarium will provide mosquitoes and sand flies for training and research and support routine insecticide bioassays in the five regions of Nepal.

Two aspects of manpower were assessed. The first was staffing for the Centre; the second, health personnel to be trained in vector-borne disease control at Hetauda or elsewhere. Both are characterized by great uncertainty at this time due to the reorganization of the Ministry of Health and the impending elimination of the "development staff" posts that have provided almost all expertise for the control of malaria in the past.

A broader range of health workers will be trained in the future, requiring a broader perspective and greater integration with other training programs and institutions. Review of the new list of authorized staffing for the Centre revealed a lack of critical expertise in epidemiology, training skills, and information dissemination. New posts should be added to supply these skills. Other expertise can be acquired through staff training and short-term technical assistance. On the administrative side, additional staff recommended include a warden to manage the dormitory, a storekeeper, and drivers to permit field activities.

Many training officials were contacted, and training sessions observed both at Hetauda and at the Regional Training Centre nearby at Pathlaiya. In recent years the Hetauda Centre has offered basic training in malariology, entomology, and malaria microscopy; refresher courses on these subjects; and orientation courses on malariology for persons in charge of health facilities. Curricula are sketchy. Course content appears to be standardized, but not adapted for different levels of workers. Extensive revision is needed to conform with new global malaria strategies, restructuring of the MoH, and the increasing integration of services. Training should be tailored to job requirements and training of trainers inaugurated. Training in the control of other vector-borne diseases must be added to that for malaria.

Detailed recommendations are to be found in chapter three of this report. Major recommendations include the following:

- USAID should take over the new facility from the contractor by May 18, 1994 if all corrections and modifications have been completed. One lecture room in the new lab/training building should be made available to the existing staff to complete the rest of the training scheduled for this year while the laboratory building is renovated.
- USAID should provide the recommended furniture, equipment, supplies, and building improvements to permit the effective and safe operation of the Hetauda Centre. These actions should be completed by June 30, 1994 at the latest.
- The Ministry of Health should secure the additional staff positions recommended, move to staff the center completely as soon as possible, and budget adequately for the larger recurrent expenses that this expanded facility will require. These actions should be accomplished by June 30, 1994 or sooner.
- If the previous conditions are met, USAID should officially transfer the new Hetauda to the Ministry of Health by the first week of July, 1994.
- USAID and the Ministry of Health should carry out an intensive 3-month orientation, training of trainers, and team-building for the new Hetauda staff. The new facility should then be ready for full-scale operation of both training and research functions by October 1, 1994.

1. Background

Scope of Work and Expectations

USAID/Nepal requested the VBC Project to provide a four-person team of experts on vector-borne diseases to assist in the revitalization of the Malaria Research and Training Centre at Hetauda. Objectives for this activity and a detailed scope of work are delineated in Appendix I. The team would consist of a medical entomologist, a parasitologist/virologist, an epidemiologist, and a health training specialist. These consultants were to review the overall needs of the newly expanded Hetauda facility. The review was to include manpower requirements for the Hetauda center, training curricula in vector-borne diseases for all appropriate levels of health workers, furniture requirements for all buildings at the center, equipment and supply requirements for both training and research, and insectarium requirements for rearing mosquitoes and sand flies. The review findings were to be analyzed and conclusions drawn. Specific, detailed recommendations were to be presented to USAID and the Ministry of Health, including a detailed list of all training and research requirements. Estimated budgets for furniture, equipment, and supplies were to be prepared.

In addition, the team was asked to carry out a detailed inspection of the physical facility and to recommend any last minute corrections to be made before the new and reconstructed buildings are handed over to USAID by the contractor. Also, an estimate of recurrent expenses was to be prepared through USAID/MoH collaboration and presented to the Division of Epidemiology and Disease Control that will operate the Hetauda Centre. USAID also requested that the team suggest a new name for the center and provide a list and time line for short term technical assistance to bring it to full operational capability by December 1994.

Malaria and Vector-Borne Diseases in Nepal

Nepal is an extremely diverse country: the people represent many different ethnic backgrounds; the topography ranges from the flat Terai in the south to the world's highest mountains; temperature

varies from below freezing to 48 degrees Celsius. This diversity is reflected by the diversity of disease patterns, including the vector-borne diseases — malaria, kala azar, Japanese encephalitis, dengue, and filariasis.

Malaria has plagued the Nepalese people for centuries and prevented much of Nepal's agricultural land in the Terai from being developed until the 1960s. Malaria eradication efforts began in 1954, and the campaign became fully operational with USAID assistance in 1960. In the early 1950s an estimated two million malaria cases occurred annually, but by 1968 only 2,468 cases were recorded. Success in controlling malaria is credited with contributing greatly to the economic development of the country over the past two decades. At present, approximately 25,000 cases are detected annually by bloodsmear examination.

Of greater concern than malaria at present is the rising number of kala azar cases resulting from the resurgence of the vector sand fly following cessation of residual house spraying in the Terai. Very difficult to diagnose and treat, kala azar can be expected to cause many deaths of children and adults and to have a serious negative economic impact on Nepal.

Nepal first recorded an epidemic of Japanese encephalitis in 1978. The disease probably has been endemic in the Terai for many years, and severe outbreaks have taken place recently. In 1988 1371 cases and 397 deaths from JE were recorded. Patients who survive JE may suffer permanent neurologic damage and be unable to work or attend school.

Bancroftian filariasis is a debilitating disease with serious economic and social consequences in Nepal. The mosquito that transmits this disease breeds in contaminated water in close association with human habitation in both rural and urban situations. Control of this mosquito is very difficult unless polluted water sources near human settlements are eliminated.

Reorganization of the Ministry of Health

The health services of Nepal are in the midst of two significant

changes, and the programs for the control of malaria and other vector-borne diseases are caught up in the resulting turmoil. The first change is a complete reorganization of government services to improve effectiveness and efficiency through decentralization. The second is the announced abolition of the so-called "development" positions that staff a significant portion of government services. To plan realistically for the effective use of the newly expanded and reconstructed Hetauda Research and Training Centre, it is essential to monitor the changes occurring and to recognize their implications.

As part of the Eighth Plan (2049-2054¹) of His Majesty's Government of Nepal, a major restructuring of the Ministry of Health is being implemented. The former heavy concentration of program management staff at national level has been rendered impossible by a thorough decentralization of personnel and responsibilities. A greatly reduced national staff at the central level will assure coordination of policies and programs, but implementation is delegated to the five regions and, most importantly, to the 75 districts of the country. The aim is to create effective district level health teams along the classic lines promoted by WHO.

For the Malaria Control Division this means that the number of positions retained for malaria and vector-borne disease control at the national level in Kathmandu has been reduced from about 100 to four persons. The supervision and management of the Hetauda Research and Training Centre is one of the major functions retained at the national level. Most other malaria and vector-borne disease responsibilities have been delegated to peripheral levels, with disease control responsibilities to be shared with general health workers. To counter the loss of central staff, positions for vector-borne disease control have been modestly increased at regional and district levels.

Reorganization will mean the decentralization and integration of many health functions. Numbers of personnel assigned solely to malaria and vector-borne disease control will surely diminish, and greater disease control responsibility will be shared with general health service personnel. This will necessitate more training of

¹ 1992 - 1997

general health workers in specialized disease control. It will also be important to coordinate the training given at Hetauda with pre-service training provided through other health training programs. An obvious subject for coordination is training in malaria case management.

Elimination of Development Staff Posts

As disconcerting as the reorganization will prove to be, the loss of its development staff may prove an even more difficult problem for the Malaria Control Division in the short term.

One of the legacies of the donor-financed activities that have contributed so greatly to the expansion of public services in Nepal in recent decades is a whole cadre of government personnel who were hired to staff special development programs but were never made part of the permanent civil service. Some of those positions were intended to be temporary; others were intended to be absorbed over time into the regular civil service.

Malaria personnel are an example of a large, fairly autonomous organization of special purpose workers who were expected to be required only for a limited time. They would no longer be needed once eradication was achieved after perhaps a decade of intensive, perfectly coordinated effort. Although eradication proved to be impractical, a large measure of control had been achieved which had then to be sustained. Almost all of the Malaria Control Division's current staff are therefore development staff.

There seems to have been an expectation that development posts created to permit the rapid start-up of critical programs such as EPI and CDD would become permanent posts as the civil service created regular posts to incorporate them in its ranks. By and large that did not happen, and the Government found itself supporting an enormous cadre of personnel that it cannot afford for the long term.

The solution was to abolish these development posts. All development personnel will be let go, and only those under 35 years of age will be permitted to apply for the new permanent posts. The age limit was presumably set to assure that new staff contribute many years of service to the government as permanent employees. The Malaria

Control Division will lose almost all of its experienced personnel, and few candidates with any experience are available to replace them. The wholesale retirement of large numbers of experienced staff will necessitate the replacement training of far greater numbers than in previous years, and this as quickly as possible so as not to leave the health facilities without personnel any longer than absolutely necessary. The actual abolition of jobs has not yet occurred, and ministries having large numbers of development personnel are seeking special exemptions to retain critical individuals. Whether and how that can happen were not apparent at the time of this visit, but the resolution of the development staff problem is certain to have major implications for the Hetauda Centre.

Significance of the Hetauda Research and Training Centre

The Malaria Research and Training Centre was established in 1979 to provide training and operational research in malaria. It is located in the inner Terai about 60 km southwest of Kathmandu (see map) but is a 5 to 6-hour drive over the mountains. Over 1700 health staff have been trained at the facility and several operational research projects carried out. An insectarium was established and mosquito colonies begun in 1981. These accomplishments are most impressive considering the very poor facilities, equipment, and supplies that the small staff (sometimes only 1 or 2 health trainers and a few support personnel) had to work with during the past 10 to 15 years. Fortunately, training and research support was provided by the central and regional malaria staff. Living conditions at the center became so bad in the last decade, however, that it was difficult to attract students and staff. To overcome this problem, USAID/Nepal agreed in 1992 to finance the renovation and expansion of the center. As of February 1994, the construction of the Centre's new buildings was almost complete. They now remain to be furnished, equipped, and staffed.

The primary mission of the new center at Hetauda will be to carry out training and research in vector-borne diseases such as malaria, kala azar, Japanese encephalitis, filariasis, and dengue. In addition, the Centre will distribute information on vector-borne diseases gained through operational research, review of recent literature, contact with international experts, review of district and regional MIS data, and in-country observations of field and health facility situations. The staff

at the center will assist in setting up sentinel surveillance sites in regions or districts with endemic vector-borne diseases. Also, the staff will assist the regions and districts in the rapid investigation of outbreaks and provide advice on the prevention and control of vector-borne diseases. The following factors will render the Hetauda Centre a unique national resource:

- The center will have the physical facilities and staff to handle up to 60 students at one time, including lecture rooms, teaching laboratories, a library, dormitory sleeping and study rooms, common rooms, modern bathrooms, and dining facilities.
- The staff will have expertise in training and research in epidemiology, parasitology, entomology, virology, vector control, health information systems, and training-of-trainers.
- The center will have transportation for training field visits and field operational research.
- The training facility will be equipped with modern visual aids and laboratory equipment (e.g., slide and overhead projectors, video, television, compound microscopes, and computers).
- The research building will be equipped and supplied to support current research methodologies on vector-borne diseases, including various immunological and serological procedures (e.g., immunofluorescent and enzyme-linked immunosorbent assay techniques).
- The insectarium will support the production of over 10,000 mosquitoes and sand flies per week for use in training, routine bioassays, and operational research projects (on vector competence, for example).
- The research and training staff will be housed at the Hetauda center and easily contacted for rapid epidemiological assessments of vector-borne disease outbreaks.
- The Hetauda center is located in the center of the principal endemic region for vector-borne diseases in Nepal.

2. Findings and Conclusions

Manpower

The VBC Team considered manpower from two perspectives. The first, the primary concern, was staffing for the Hetauda facility. The staff required for the Centre — at least those required for the training function — can only be determined on the basis of the numbers and needs of personnel to be trained, however. Thus the second perspective was to consider the different types of health personnel who will need training for the control of malaria and vector-borne diseases. Both manpower issues are characterized by great uncertainty because of the Ministry reorganization and the elimination of development staff posts.

Other staff required for Hetauda are justified by need to develop the capability to carry out the surveillance and investigation of communicable diseases, particularly vector-borne diseases, and to conduct operational research. The changing requirements for manpower trained in vector-borne disease control are considered first.

Personnel Responsible for Malaria Control (Old System)

Table 1 describes the major categories of staff currently involved in malaria control in Nepal, listing their educational background, training provided, type of posting, supervision roles, and responsibilities for malaria control. Note that the Malaria Field Worker and the Insect Collector positions will no longer exist in the reorganized staffing pattern.

Personnel To Be Responsible for Malaria and VBDs (New System)

The Human Resources for Health Master Plan for Nepal (1993) described some 2661 personnel assigned to the Malaria Control Programme as "hitherto monofunctional staff from vertical programmes." (p. 15) The vast majority of these individuals are development staff who are too old to be retained in the reorganized personnel structure. Moreover, many of the old positions — the malaria program alone was noted to have 51 different categories of

**Table 1. Health Categories Involved in Malaria Control Activities (Old System)
Background, Training, Postings, and Responsibilities**

Position	Educational Background	Training Received	Posted at	Supervised by	Supervisee	Malaria Responsibilities
Health Assistant (HA or HPI)	SLC ¹ plus 2 yrs.	2 years at IOM ²	Health Post, PHC Centre, DHOoffice	DHO / DPHO	AHW, MCHW, VHW, TBA, ANM	Case management, supervision, reporting
Sr. AHW	SLC	AHW plus 6 mos. at IOM	Health Post as HP In-Charge	DHO / DPHO	AHW, MCHW, VHW, TBA, ANM	Case management, supervision, reporting
Auxiliary Health Worker (AHW)	SLC	1 yr. at IOM or Reg. Tng. Ctr.	Health Post or Sub-HP as I/C	DHO	VHW, CHV, MCHW	Case management, supervision, reporting
Village Health Worker (VHW)	8th Class	3 mos.	HP or Sub-HP to cover VDC area	HP I/C or Sub-HP I/C	---	Case mgt, follow up, reporting, H. educ.
Malaria Field Worker (MFW)	8th Class	2 wks. at District level	VDC (field work) HP (recording)	MI, MA, Dist. Malaria Off.	---	ACD, APCD, follow up, PCDV coord.
Mal. Inspector (MI)	SLC	6 wks.	Dist. H. Office	DHO / DPHO, MA	MFW, PCD(V)	Superv., spraying, case investig., surveil.
Malaria Asst. (MA) V. C. Asst.	BSc	6 wks. at MRTC Basic vector cntl	Dist. of Regional Health Office	DPHO, Dist. or Reg. Ento.	MI	Superv., spraying, case investig., surveil.
Asst. Entomologist	BSc	5 wks. at MRTC	Region, MRTC	Entomologist	MI (in entom.)	Supervision, field studies
Entomologist	MSc	10 wks. at New Delhi	Reg. HQ, MRTC	Sr. Entomologist	Asst. Entom., MI, insect coll.	Supervision, field studies
Insect Collector	SLC	1 wk. at MRTC	(no post)	Entomologists	---	Collect anopheles
Lab. Technician	SLC	2 yrs. at IOM	DHO or Hosp.	DHO	Lab. Asst.	Microscopy
Lab. Assistant.	SLC	2 yrs. NatPHLab	Dist. Hosp., HP	Lab. Tech.	---	Microscopy
Health Ed. Tech.	BSc	?	Dist. + Schools	DHO / DPHO	MCHW, TBA	Commun. awareness

¹ School leaving certificate (10 years of schooling)

² Institute of Medicine

staff — have not been retained in the new structure. The new organogram does appear to be recognized as the definitive staffing plan, but the retirement of the development workers has not yet been carried out, and it is not known when that will occur. The result is a great deal of confusion and uncertainty. While this situation remains to be clarified, it seems reasonable to consider the staffing patterns prescribed in the new organogram to determine just who will be available to deal with malaria and VBDs in the future, and to predict from that who will need to be trained and with what sorts of skills.

National level. The new organogram includes very few positions for single function malaria and VBD control personnel. At the national level, a limited staff will deal with policy formulation and coordination with other programs. No quality control or implementation activities will be carried out from the national level. Supervision and support for the Hetauda Research and Training Centre will be a major responsibility of national level staff.

Regional level. Regional health teams will each have a Malaria Officer, a Malaria Assistant, and a Health Assistant to monitor and guide the VBD program and to assist the Medical Officer, the Supervision Officer, and other members of the multifunctional Regional Health Team to incorporate VBD control into an integrated package of health-related activities. The Regional Health Training Centres will introduce the concepts and practices of VBD management and control into the pre-service training of Health Assistants, Auxiliary Health Workers, and other community-based, multipurpose health workers. The relationship of these training facilities to the Hetauda Centre has not been defined.

The capacity of the regional teams to monitor malaria and other vector borne diseases, to investigate possible outbreaks, and to coordinate focused interventions will be strengthened by the creation of one malaria-specific team — known as the *District Malaria Unit* within one district of each region. These teams, together with regular district staff, will have the capability to intervene promptly as needed. Each District Malaria Unit will have the following supplementary personnel to deal with malaria and VBDs:

1 Entomologist	(Civil Service Grade G-III)
1 Assistant Entomologist	(Grade NG-I)
4 Malaria Inspectors	(NG-II)
1 Laboratory Technician	(NG-I)
2 Laboratory Assistants	(NG-II)
1 Microscopist	(NG-II)
1 Pump Mechanic	(NG-III)
1 Laboratory Aid	(non-graded)

According to the reorganization document, "the Entomological programme conducted for the past three decades by development staff will be continued by the creation of [these] 60 new posts."

District level. Nepal is divided into 75 administrative districts. Staff at district level have been reorganized into a single team, much along the lines of the classic WHO District Health Team model. Each *District Health Office* is headed by a Medical Officer, and his highest ranking deputy is the person in charge of the Public Health Section, either a Health Inspector or a Public Health Officer. In malarious areas there will also be a Vector Control Officer and one or more Malaria Inspectors. The laboratory function will be primarily the responsibility of multipurpose laboratory workers (the number varies with the expected work load). Other district-level malaria and VBD control functions such as training, monitoring, HIS, and supervision will be shared with the rest of the District Health Team.

Electoral Constituency level. The next level of health facility is the newly created *Primary Health Care Centre*. The plan is to have such a Centre (headed by a doctor and assisted, for purposes of malaria and VBD control, by one Health Assistant or Senior AHW, one Laboratory Assistant, one Village Health Worker, and two Auxiliary Health Workers) in each electoral constituency that does not have a hospital. Each of the 18 existing Health Centres will be converted into either a Primary Health Care Centre or a District Hospital. An additional 100 PHC Centres will be created during the present 5-year plan. This will be the most peripheral level at which laboratory services are certain to be available. Some documents reviewed by the Team suggest that the goal of providing malaria slide examination and other laboratory services at every Health Post and some Sub-Health Posts will be pursued, but that is not clear at this time.

Ilaka level. In general, every District is divided into nine *Ilaka*, each of which has one *Health Post* managed by an individual known as the Health Post In-Charge (a Health Assistant or Senior AHW) assisted by one or two AHWs and an Assistant Nurse Midwife (ANM) or MCH Worker (MCHW). In the past the Health Post staff has also included Village Health Workers (VHW), multipurpose outreach workers who toured the area served by the Health Post and supported health volunteers working at village level. VHWs are not assigned to Health Posts in the new structure, however.

VDC level. The most peripheral of the official health facilities is the *Sub-Health Post* at the Village Development Committee level. There are 3199 VDCs in Nepal. Each Sub-Health Post is headed by an AHW assisted by one VHW and one MCH Worker. The Sub-Health Post is supervised by the Health Post. The Sub-Health Post system is new; approximately 700 S-HPs are functioning at present.

Ward and Village level. Workers peripheral to the official health system include the Female Health Volunteer³, trained to provide house to house health education and to create health awareness. Presumably this includes advice on dealing with fever that might be malaria. FHV's are selected by mothers' groups in every Ward and receive four weeks of training and a special kit for their work. About 36000 such volunteers are expected to have been trained by the end of the current 5-year plan in 1997; the number will double in the future.

Also working at the village level in malarious areas is the Passive Case Detection Volunteer (PCDV) who is trained to take malaria slides from persons with fever and to give immediate presumptive malaria treatment. He sends the slide to a nearby laboratory and gives follow-up radical treatment if the slide is reported back positive for malaria. The 4044 PCDVs now functioning will be increased to 4691 according to current plans. They are trained and retrained twice a year and are given a kit with the materials needed. About 30% of all positive malaria blood slides are now taken by the PCDVs. In recent years 7-8% of their slides have been positive, a good performance. The PCDVs have been supported and supervised in the

³ Also known as the Woman Health Volunteer or the Community Health Worker (Female).

past by Malaria Field Workers, but they are not part of the new structure. It is not clear who will supervise and support the PCDVs in the reorganized system.

Annex A.1 summarizes the numbers of staff who may have some responsibility for malaria and VBD control according to the staffing lists in the reorganization plan. Annex A.2 is based on organograms in that document and provides additional details on the leadership of each district and malaria-specific staffing.

Who Will Need To Be Trained at Hetauda?

It is apparent from the above descriptions that a variety of persons will have some responsibility for malaria control in Nepal. The Hetauda centre will be expected to provide different levels of training to different cadres of staff. Table 2 summarizes the broad types of training that will be needed. It is difficult to predict just how many new personnel will need to be trained, however. Furthermore, as the malaria strategy evolves to give more emphasis to case management and less to slide confirmation, the mix of persons to be trained, and the skills they need, will change as well. Hetauda must be ready to accommodate such changes as well as the demands of the vector borne disease outbreaks.

Table 2. Persons needing malaria and VBD training

Persons to be Trained	Suggested Content for Courses and Workshops					
	Training / Supervision	Case management	Strategy planning	Outbreak investigation	Laboratory procedures	Vector control
At Hetauda Centre:						
Trainers	X	X		X		
Regional Technical Management Team			X	X		
District Supervising Team	X	X		X		
Entomologists and Vector Control Assistants	X		X	X	X	X
Malaria Inspector	X	X		X		X

Persons to be trained (continued)	Training / Supervision	Case management	Strategy planning	Outbreak investigation	Laboratory procedures	Vector control
Microscopist, Laboratory Technician, Lab. Asst.					X	
To be done elsewhere:						
Medical Officers at PHC Centres		X ⁴		X		
Health Post Team Sub-Health Post Team	X	X		X		
Village level volunteers and workers		X				

Recommendations concerning curricula that could be used for training the different types of personnel are presented in the next major section of this report.

An Expanded Training Capacity

The new Hetauda facility represents a great increase in capacity for housing and training MoH personnel. The old facility could house 20 trainees in its single dormitory room, but recent courses have invited a maximum of 15 trainees to participate. How thoroughly has that existing capacity been utilized, and how much increased capacity will the new facility with 30 two-person rooms and at least four training rooms represent?

If one assumes that the old facility could train 15 participants at a time throughout the year, a capacity of 780 person-weeks (15 X 52) can be postulated. According to its records, the Centre has planned and carried the following numbers of person-weeks of training in recent years:

<u>Year</u>	<u>Person-weeks of training</u>	
	(planned)	Completed
1985/86	()	883
1986/87	()	700

⁴ Particularly for referred, severe, and complicated cases.

1987/88	()	689
1988/89	()	678
1989/90	(677)	534
1990/91	(490)	392
1991/92	(573)	339 (180 canceled due to elections)
1992/93	(204)	106
1993/94	(260)	254 (104 completed to date)

It can be seen that the amount of training has diminished in recent years, but the Centre has clearly continued to function. It was heavily used in earlier years in spite of the poor condition of the limited facility.

The new facility at Hetauda will permit a four-fold increase to more than 3000 person-weeks of training per year. What staff have been employed, and what changes can be anticipated?

Hetauda Research and Training Centre Staffing

The current (old pattern) staff at Hetauda numbers 22. All are development staff and not scheduled to be retained under the new organization. A number of additional senior technical posts have been vacant for years, presumably because it is difficult to convince higher level personnel to live away from Kathmandu and under the limited conditions of the old MRTC at Hetauda. The posts currently filled are as follows:

<u>Position</u>	<u>Grade</u>	<u>Number</u>	<u>Remarks</u>
Parasitologist	G-III (Tech.)	1	Acting In-charge
Health Educator	G-III (Tech.)	1	
Storekeeper	NG-II (Adm.)	1	
Head Clerk / Typist	NG-II (Adm.)	1	
Malaria Inspector	NG-II (Tech.)	3	
Insect Collector	NG-III (Tech.)	9	
Mechanic	NG-III (Tech.)	1	(Pump mechanic)
Lab. Aid	Gss	2	
Driver	Gss	1	
Peon	Gss	1	
Gardener	Gss	1	

The only technical staff from this list who also appear in the staffing plan for the new center are the parasitologist and the health educator. The current parasitologist has clearly been the key individual responsible for keeping the training center functioning in recent years. He has been at the center for more than ten years and constitutes its institutional memory. In addition, he has done most of the teaching in recent years. If a means to retain his expertise could be found, it would be extremely valuable to the new facility. It was difficult for the team to evaluate the role and contributions of the health educator.

Recently, an Assistant Entomologist and an Accountant were posted to the Centre under the new staffing plan (see below). It was not clear what functions they are currently serving. It should also be noted that the Makwanpur District Malaria Control Office, scheduled to serve as the District Malaria Unit for the Central Region, is located in Hetauda and has reportedly provided assistance to the training center at times. Hopefully, such collaboration will continue.

Authorized Staffing for the Hetauda Centre

The new MoH organizational and staffing plan lists twenty positions for the Malaria Research and Training Centre, Hetauda, in Table 23 of the reorganization document:

TABLE 23 Existing and Proposed Staffing Pattern for MALARIA RESEARCH and TRAINING CENTER, HETAUDA

S.N	Post	Class	Service	Existing	Proposed	+/-
1	Chief (US)	G-II	Tech		1	+1
2	Entomologist	G-III	"		1	+1
3	Parasitologist	"	"		1	+1
4	Vector Control Off.	"	"		1	+1
5	Asst. Entomologist	NG-I	"		1	+1
6	Lab. Technician	"	"		1	+1
7	Vector Control Asst.	"	"		1	+1
8	Nayab Subba	"	Adm		1	+1
9	Accountant	"	"		1	+1
10	Jr. Ento-technician	NG-II	Tech		2	+2

11	Microscopist	"	"		1	+1
12	Typist/Comp. Asst.	NG-I	"		1	+1
13	Peon	None	-		3	+3
14	Gardener	"	-		1	+1
15	Watchman	"	-		2	+2
16	Sweeper	"	-		1	+1
	Total				20	+20

Note. Twenty new posts have been created to continue the programmes long conducted by development staff.

Staffing Recommendations

In reviewing the expected functions of the center, the Team concluded that critical skills are missing in this staffing plan. On the technical side, essential expertise in epidemiology, statistics, training methodology, and information dissemination are not represented in the authorized positions. It is crucial to have full-time staff with specific training and experience in those areas. Expertise in medicine, arbovirology, and toxicology can be expected to be represented by the Chief, the Entomologist, and the Vector Control Officer respectively. Additional training should be provided as needed.

On the administrative side, the team felt that a warden will be needed to manage the new dormitory and that drivers are required to allow the Centre to carry out field research. A storekeeper will be required to maintain inventories and supplies. Other administrative support such as computer skills, repairs, and maintenance can best be obtained through the private sector.

The full complement of staff already authorized plus those recommended by the VBC team is presented in Table 3. A more detailed list is presented in Annex A.3 in which the two individuals already posted are named, as are additional sources of assistance that will be required.

Table 3. Staffing Pattern Recommended for the Hetauda Centre

S.N	Post	Class	Service	Proposed
1	Chief	G-II	Tech	1
2	Parasitologist	G-III	"	1
3	Entomologist	"	"	1
4	Vector Control Officer	"	"	1
5	<i>Epidemiologist*</i>	"	"	1
6	<i>Statistical Asst.*</i>	NG-I	"	1
7	<i>Training Officer*</i>	G-III	"	1
8	<i>Health Educator*</i>	"	"	1
9	Asst. Entomologist	NG-I	"	1
10	Laboratory Technician	"	"	1
11	Vector Control Asst.	"	"	1
12	Junior Entomol. Tech.	NG-II	"	2
13	Microscopist	"	"	1
14	Nayab Subba	NG-I	Adm	1
15	Accountant	"	"	1
16	Typist/Computer spec.	"	"	1
17	<i>Storekeeper*</i>	NG-II	"	1
18	<i>Warden*</i>	none	-	1
19	<i>Driver*</i>	"	-	2
20	Peon	"	-	3
21	Gardener	"	-	1
22	Watchman	"	-	2
23	Sweeper	"	-	1
	Total			28

* New positions proposed by VBC Team

Summary of Manpower Findings and Conclusions

1. Like the rest of the MoH, the Hetauda Centre is in the midst of fundamental changes that will affect both its own staffing and the mix of persons who will be trained there. The first of the two most important changes is the reorganization of the MoH, with commitments to service integration, decentralization, and reassigned responsibilities. The second is the abolition of the development staff cadre. The re-organization appears to have been accepted, but how it will work out in reality, and what flexibility in staffing will remain, are unclear. The transition from development to permanent staffing is still uncertain in terms of timing and comprehensiveness. The team observed that the new posts are not being filled rapidly.
2. Malaria control in Nepal faces the imminent loss of most of its personnel and the reassignment of malaria control responsibilities to multipurpose health workers. There is a clear preference for multipurpose workers and a need for multipurpose supervision and training in the government health system.
3. The external assessment of the Malaria Control Programme, which is about to begin, may well result in a change in the malaria strategy. More emphasis on case management and focused studies is likely to result. Plans for manpower to staff Hetauda and to be trained there must remain tentative until some of these issues are resolved. Flexibility will have to be built in to the training program in order to accommodate changing requirements.
4. As the emphasis in malaria control moves from entomology and microscopy to management of the disease in humans, the numbers of persons required to read malaria slides will probably decrease. Not only is malaria microscopy not recommended for management of all cases in the current WHO Global Malaria Strategy, but decreased numbers of malaria microscopists, located more centrally, will be unable to continue to provide rapid diagnosis and feedback. This can be expected to require a change in presumptive treatment as well. Training will have to reflect these changes.

5. It is clear that malaria-specific staff will be expected to broaden their focus. The Hetauda Centre was developed specifically for malaria. It is now apparent that other vector-borne diseases also pose serious risks in certain parts of Nepal. Among these are visceral leishmaniasis (kala-azar), Japanese encephalitis, Bancroftian filariasis, and dengue. There is consensus that the Hetauda Centre should deal with all vector-borne diseases.
6. Variations in quantities and sources of supply in recent years have destabilized the spray program. Future training needs must be assessed. There is a possibility that insecticide impregnation of bed nets may become a more appropriate approach than residual spraying.
7. The existing staff at Hetauda constitute a resource that does not exist elsewhere in Nepal. Their expertise, particularly in the area of malaria, is clearly valued by the MoH.
8. Defining staffing and training needs is hampered by the lack of written job descriptions for many key positions. In particular, the team could find no job descriptions for malaria-specific workers. It is difficult to design training without a clear understanding of what skills are needed, and it cannot be easy to supervise personnel without agreement from both sides on performance expectations. Similarly, it is difficult to define staffing needs in terms of job categories without knowing what skills belong in each category.
9. The mix of skills represented by the staff proposed in the reorganization plan for the Hetauda facility is rather heavy on the side of entomology and light in the areas of epidemiology and human behavior.
10. Health personnel observed and interviewed by the team demonstrated little familiarity with the variety of training techniques that could be used.
11. Supervision appears to be used for quality control, identifying and correcting errors, rather than for support.

12. It was difficult to assess the research capabilities and interests of current personnel because no research is being carried out at present. In particular, the ability to design limited research studies to investigate worrisome situations was not apparent. This is a critical capacity that a vector-borne disease institution such as the Hetauda facility should have.
13. It is difficult to keep highly trained personnel in government positions and hard to get them to accept staff posts outside of Kathmandu. The MoH has little leverage on such personnel after it supports their training.
14. If the abolition of development staff is carried out as announced, there will be large numbers of new personnel to train or retrain as quickly as possible. This may necessitate some compromise in the length of training to be offered and the numbers of trainees to be accommodated at any one time.
15. The Hetauda training team will need the capability to assess the training needs of a wide variety of health personnel and to tailor appropriate training.
16. As decentralization continues and an ever increasing proportion of malaria control is in the hands of peripherally based health workers, the Hetauda Centre will be able to provide less and less of the training needed in a direct fashion. Instead, most training for the control of malaria and other vector borne diseases will be conducted by other trainers, and Hetauda will be responsible for training the trainers.
17. In addition to outside financial support for research, the Hetauda staff will require technical assistance in research and focal surveillance methodology.
18. The Nepalese epidemiologists trained overseas in recent years do not appear to have remained in government service, and better mechanisms will be required to find and keep the epidemiology expertise needed.

19. Since job descriptions are not available, and formal qualifications do not always reflect the skills possessed by individuals, the Hetauda team will have to develop its own job descriptions and procedures for team collaboration.
20. Unless the staffing plan for the Hetauda facility is expanded to include more expertise in the areas of epidemiology, training, human behavior, and communications, the center will find itself unable to measure and respond appropriately to changing disease patterns and to teach others to do so. It will also be unable to fulfill the functions of monitoring information from around the world and disseminating relevant information within Nepal, two of the four functions ascribed to the Centre in the reorganization plan.
21. Malaria Control Programme personnel do not appear to have recognized their potential for transmitting HIV and other pathogens when they routinely clean lancets with alcohol without sterilizing them. USAID has responded by ordering 200,000 disposable lancets for the PCDV program, but the rest of the system will be unchanged, and there is little reason to trust that the disposable lancets will not be saved for reuse. *Instilling an adequate appreciation of the risk of spreading AIDS and taking corrective action are immediate priorities.*

Curriculum

In order to assess the adequacy and appropriateness of the training curriculum for malaria control, health managers, malaria workers, and other health service providers were interviewed, training materials reviewed, and training sessions observed.

Curriculum Content

Almost all the health officials interviewed stated that cases of Japanese encephalitis, leishmaniasis, and filariasis are also increasing in some areas. Training needs to be expanded to include all vector-borne diseases. The content of malaria training courses is therefore no longer adequate or appropriate.

Because of the integration of all health services and reductions in malaria-specific workers as development posts are eliminated, training in the control of malaria and other vector-borne diseases needs to be given to all health service providers, supervisors, and managers.

In order to review the existing training materials and to assess their appropriateness, training manuals as well as job descriptions for malaria-specific and other health workers were sought. Job descriptions were difficult to locate. Only those for Health Assistants, Auxiliary Health Workers, Village Health Workers, and MCHWs were found. Training manuals for AHW, VHW, and MCH workers and operational manuals for Health and Sub-Health Posts were also obtained and reviewed.

The VHW manual has 20 pages describing his/her responsibilities for malaria control. The AHW (CMA⁵) trainer's manual shows 10 hours of content on malaria, filariasis, and kala-azar. MCHW training does not cover malaria; it is only mentioned under fever. The Health Post operational manual indicates that the HP In-Charge has a significant role in malaria control activities as a supervisor, trainer, and health service provider. Unfortunately, the training manual for Health Assistants was not available for review.

Job descriptions for malaria specific workers (Malaria Inspector, Malaria Officer and Assistant, Parasitologist, Entomologist and Assistant, Insect Collector, Vector Control Officer and Assistant, Malaria Field Worker, PCDV, and Microscopist) were not available for review. Training materials that existed had limited detail and consisted mainly of handouts, notes, and outlines. No manuals were found for the training of malaria-specific workers. The trainer at Hetauda stated that comprehensive and thorough lectures are given from a number of texts.

The above situation calls for developing or adopting a standardized training curriculum for general and malaria specific workers based on their job descriptions.

⁵ Prepared by a Canadian project for "Community Medical Auxiliaries"

Training at the Hetauda MRTC

Three training sessions were observed to assess the methodology used — one at the Hetauda MRTC on Basic Malaria Microscopy and two at the Regional Training Centre at Pathlaiya. The Basic Malaria Microscopy Course at Hetauda is a six week course comprised of two weeks of theory and four weeks of practice. According to the participants, theory is presented as lectures and practical experience consists of examining 10-12 slides per day under the microscope. In the morning, the trainees are given the slides to read and instructed to note their results. In the afternoon, the trainer reviews their work and informs them which of the slides were read correctly. Slides read incorrectly are reviewed together.

At the Hetauda MRTC courses in three areas have been conducted in the years 1990 - March 1994: malariology, microscopy, and entomology. Basic courses have generally been of six weeks' duration although some have been only four. The duration of refresher courses varied from one day for Insect Collectors to a two week course for Health Post In-Charges. The orientation to malariology courses have been of two weeks' duration. In general, two week courses are most frequently offered.

An attempt was made to locate and review training materials for these three types of courses. The result was disappointing. No manuals were available. Course content was available only by topics, either as notes or outlines. It was explained that the trainer gives the lectures and notes are taken by students. Sometimes handouts are also provided (life cycle of malaria parasites, drugs used in treatment, slide preparation, etc.).

Training at a Regional Training Centre

At the Regional Training Centre in Pathlaiya, two basic training courses for MCH workers (3 months) and AHWs (1 year) were being conducted concurrently. A total of 72 students (8 female, 64 male) were enrolled in the AHW course which started in July 1993. There are 31 MCHW students (all female). Each trainee had a participant's (trainee's) manual, and there was one copy of the trainer's manual for each training. The availability of AHW and MCHW training manuals

demonstrates a real effort given to standardizing training materials. This achievement deserves to be appreciated and further supported.

AHW training includes field visits. However, between July 1993 and the end of February 1994, a total of only three days was spent in the field although 45 days were scheduled. The reason cited for not being able to go out to the field was the non-availability of fuel and vehicles. In such instances alternative practical experience should be provided for training to be adequate and appropriate.

Training and Supervision Methods

Training methods used both at Hetauda and Pathlaiya consist of lectures and demonstrations. In the training of MCHWs, some discussion was taking place, and procedures were being demonstrated and practiced. This is encouraging. Continued efforts are needed to make teaching more interactive and field oriented and to use additional training aids.

During the visits to health facilities, supervisory style and frequency were noted. The HP and Sub-HP visited had received a number of supervisory visits during the year. During these visits the centers' activities were checked. From discussion, it was learned that no plan existed for supervisory visits. They are *ad hoc*; the staff considers them an administrative requirement, not a means of support to field staff. This indicates an urgent need to establish a supportive supervisory system and to provide appropriate training to supervisory personnel.

The Need for Training in Sterilization of Equipment

From interviews with malaria workers and auxiliary health workers at the health post, sub health post and training centers, it was found that lancets used for obtaining blood samples are wiped only with spirit (alcohol) between patients. This indicates a need for proper instruction on sterilization. Acceptable alternatives include boiling for 20 minutes or soaking in a chlorine bleach solution.

Physical Facilities

The Old Buildings

When the Hetauda Malaria Research and Training Centre (MRTC) was established in 1979, a single office building (referred to as the existing office building) housed all research and training activities. This two-story building had three rooms on the ground floor and four rooms on the top floor. Lectures were presented in one room (8 x 7 meters; seating 26 people) on the ground floor, and laboratory work was conducted in a similar room (seating capacity 16 people) on the second floor. An insectarium was established in a small room (5 x 5 meters) on the ground floor. Offices were located in three small rooms on the second floor. The building had few electrical outlets, few water outlets, poor lighting, no air conditioning, and was in general not well set up to support either training, research, or the rearing of mosquitoes.

In addition to the single training and research building, the MRTC had one small dormitory or hostel (9 x 6 meters; sleeping 20+ people), a staff quarters building (referred to as existing staff quarters), a storage building, and a garage. There were two single outdoor latrines, one near the training building and one near the hostel. All of these structures were completely inadequate to meet the demands of the staff and student body. In fact, it became difficult to attract students because of the poor conditions of the center, and all research was conducted either in the field or at the regional malaria offices. In 1992, USAID/Kathmandu agreed to finance the construction of an entirely new complex at the MRTC to include a new training building, a new dormitory, and a new staff (Chief's) quarters. In addition, the existing office building and existing staff quarters building were to be completely renovated.

New Construction at the Hetauda Centre

Construction on the new MRTC complex began December 1, 1992. Construction and renovation were nearing completion at the time of the team's visit in late February 1994. The difference between the physical facilities of the "old" MRTC (observed in 1990 by one of the team members) and the "new" MRTC was astounding. It was

immediately apparent upon entering the compound that USAID had contracted both a good architect and a good general contractor. The major new construction had proceeded rapidly and on schedule.

The new construction includes a two-story lab/training building with two large classrooms (5.6 x 8 meters), two large laboratories (5.6 x 8 meters), a conference room, a library, two storage rooms, six offices, and two multi-person bathrooms. A large, 3-story dormitory has 30 two-person bedrooms, several common rooms, four multi-person bathrooms with showers, several storerooms, a large dining room, a kitchen, a preparation room, a pantry, a complete Warden's quarters (office, sitting room, bedroom, kitchen, and bathroom), two guest Professor's quarters (bedroom, sitting room, kitchen, and full bath), and a servant's room (with outside shower and toilet). A single house for the Chief of the MRTC (two bedrooms, a living room, two baths, a kitchen, and a storeroom) was also constructed. Two new outside latrines were constructed for visitors or research building staff. A general outline of the landscaping of the compound has been completed.

Renovation of the Existing Structure

The interior of the new buildings was substantially complete, but the renovation of the existing office building (to become the research building) was not near completion. Much remains to be done. The delay in renovating the existing office building was not the fault of the contractor but due to the need to continue training health workers in this space. Only the top floor of the building could be renovated while training was being carried out on the ground floor. Once renovated, the research building will contain a main laboratory, an isolation laboratory, two offices, a day room, a work room, an insectarium with two rooms, and an animal room.

Renovation of the existing staff quarters was near completion. This building contains two complete quarters, each with two bedrooms, a living room, a kitchen, and a bathroom. Nothing had been done to the old latrines, the storage building, the garage, or the old dormitory.

Identification of Deficiencies to be Corrected

Upon closer inspection of the newly constructed and renovated facilities, the team found a number of items to be completed or changed before the contractor turns the building over to USAID. Some of these things were called for in the original plans and blueprints; others specifically related to the research and training needs of the center should have been in the plans but were not. The latter changes may need to be renegotiated with the contractor. Almost all deficiencies and changes were discussed on site with the USAID engineer, Mr. B.N. Pradhan, on 21 and 22 February. He noted the changes on the blueprints of each building. A general description of the deficiencies and changes follows.

The largest remaining problem is that the renovation of the ground floor of the research building has only begun, and much needs to be completed. Unfortunately, concern about the structural integrity of the walls of this building prevented the replacement of doors and windows, many of which are misaligned and do not close tightly. Most of the doors on the second floor are so low that tall individuals must constantly lower their head as they go from room to room.

A large number of smaller problems was noted:

- Many rooms throughout the complex contain inadequate or misplaced electrical outlets.
- Outlets for air conditioners and refrigerators have not yet been installed.
- A backup generator and a building to house it have not been provided.
- Additional outside lighting is needed for security.
- Plumbing fixtures in the training building and research building need to be modified to accommodate the cleaning of laboratory glassware and equipment.
- Hot water has not been supplied to the cage washing facilities or to the guest faculty quarters.
- Many windows and doors in all buildings need to be screened, as do the rooftop water tanks.
- Facilities for clothes washing and drying has not been provided at the dormitory.

- Cross ventilation of dormitory rooms and the guest faculty quarters has not been provided, nor has the privacy and security needs of female students been addressed.
- Water supply from a new, 3-meter well may not remain (or be) potable because it is too shallow.
- Disposal of grey water from the research building is improper since it drains directly into an outside, open drain and not into a soak pit.
- A rooftop water tank for the research building has not been installed.
- Problems with electrical grounding plumbing leakage have not been investigated adequately, in particular in places where pipes are buried in the wall.
- No high temperature incinerator or compost pit has been established.
- The two old latrines and the old rusty storage building have not been removed.
- Some landscaping has been accomplished, but the construction of brick retaining walls to hold the soil and the planting of grass, trees, and bushes has not been completed.

Summary of Findings Relating to the Physical Facilities

In summary, the contractor has done an excellent job overall and all new construction was almost complete by the end of February 1994 in accordance with the terms of the initial plans. Renovation of the existing office building was estimated to be about 50% complete. However, there are deficiencies in both the new and old buildings as noted above. There are also construction needs related to the specific research and training mission of this center that were not taken into consideration in the initial plans. Therefore, much remains to be done, and the center should not be turned over to USAID until the changes and deficiencies have been addressed. If administrative procedures concerning changes to the initial plans can be completed in a timely fashion, the contractor should be able to meet the turnover date of May 18, 1994.

Materials and Equipment

Research

Recent operational research associated with the MRTC has been primarily limited to development of a key to the mosquitoes of Nepal (Darsie and Pradhan, 1990), a study of anopheline mosquito ecology in relation to malaria transmission in the Terai (Reisen et al. 1993), and a study on the vector-host interactions on the epidemiology of kala-azar (Lawyer et al., in preparation). The field portions of these studies were conducted in Nepal. However, the lack of facilities and trained personnel required the laboratory studies to be conducted outside the country. Currently, laboratory resources for conducting operational research at the MRTC are essentially nonexistent. This greatly limits the potential for laboratory operational research on vector-borne diseases in Nepal.

During the team's visit an existing MRTC building was being renovated for use as a ground floor insectarium and three research laboratories, with two investigator offices and a common room on the second floor. The laboratories will be screened and equipped with air conditioners (heating/cooling) to maintain the required environment.

The largest room will be the general research laboratory, with equipment for insect identification, dissection, reagent preparation, and computer-assisted enzyme-linked immunosorbent assay (ELISA) capability. ELISAs can be used to identify the host for mosquito and sand fly blood meals as well as malaria-infected mosquitoes. A liquid nitrogen freezer system will also be in this room.

The second large room will also be equipped as a general research laboratory. Double entry doors will reduce air-borne contaminants to permit electrophoresis, *Leishmania* parasite culture, and molecular biology studies. Operational resources and equipment for these studies will be required from external grants.

The small lab will have a double screen door barrier and is designed for work with infected insect vectors. This will be the location for the fluorescent microscope, used to identify insect-transmitted parasites and human antibodies to those organisms.

The new MRTC laboratory has the potential to serve as a unique national and international resource. Rarely do scientists have ready access to both infected patients and the vectors transmitting diseases such as malaria, leishmaniasis, Japanese encephalitis, and filariasis in conjunction with excellent operational laboratory facilities. The team envisions the new MRTC laboratory as the nucleus of an international research effort supported primarily by outside granting agencies. The findings from operational research conducted at the MRTC laboratory will permit Ministry of Health personnel to make informed decisions regarding the reduction of insect transmitted diseases using limited financial and personnel resources.

Visiting scientists will be available for consultation with the MRTC staff and to assist with training.

Training

The MRTC was found to be operating with remarkably little training equipment and supplies. USAID plans to replace almost everything. Old desks and chairs will be used elsewhere by the MoH. Textbooks and teaching notes will be retained, but by and large the Centre should be completely refurbished and re-equipped.

Insectarium

An insectarium was established in 1981 at the Hetauda MRTC to support operational research efforts as well as routine bioassay and insecticide susceptibility tests for Nepal's Central, Western, and Eastern Regions. The insectarium measures only 5 x 5 meters and has no temperature, humidity, or light controls. Humidity was raised by hosing the insectarium floor with water. Temperature in the insectarium reflected the outside temperature (10-40° C.) but was less extreme. Lights were turned on during the daytime work hours and otherwise were off. Despite these conditions, some species of mosquitoes were maintained up to 57 generations (e.g., *Anopheles fluviatilis*, *An. maculatus*, and *An. annularis*). Because of the renovation of the existing laboratory building which housed the insectarium, all colonies were eliminated at the end of 1993. At the time of the team's visit to the MRTC, there was little evidence,

except for a few cages for adult mosquitoes, that an insectarium had existed, but one of the team members had observed the colonies in 1990.

Once renovation of the existing laboratory building is complete, the insectarium will occupy two large rooms on the ground floor, one for holding larval mosquitoes and the other for holding adult mosquitoes and sand flies. These rooms will be subdivided by screen partitions into various sections for processing live material and for holding the live insects in screened areas. To support the colonization efforts, the ground floor also has a work room for washing and sterilizing pans and cages. There will be a room to hold laboratory animals (e.g., hamsters, guinea pigs, mice) by species. The two large rooms will be air conditioned (with heating and cooling capability) and the adult insect room will have a portable humidifier. Both rooms will have fluorescent lighting and incandescent lights connected to a timer. Shelving will be designed to hold up to 234 larval pans and 96 adult cages, allowing production of over 10,000 mosquitoes per week.

This new insectarium will be a national resource for Nepal. No other institute will have such a capacity for producing a variety of mosquito and sand fly species for research and training. Many research protocols on malaria, leishmaniasis, Japanese encephalitis, and filariasis will require a constant source of laboratory raised insects. In addition, some of the training courses at the center will utilize live mosquitoes and sand flies in the laboratory portion of the instruction course. The production capacity of this facility will also support critical insecticide susceptibility tests and routine bioassays in the five regions of the country. The results of these tests will guide decision makers in their expenditure of limited financial resources for pesticides, dispersal equipment, and insecticide-treated netting to control or prevent outbreaks of malaria and kala-azar.

3. Recommendations

Manpower Recommendations

The following is a listing of the main recommendations for action regarding issues related to manpower. Recommendations concerning persons to be trained for malaria and vector-borne disease control are included with those relating specifically to staffing of the Hetauda Research and Training Centre.

1. Recommendations concerning the sanctioned staffing pattern at the Hetauda Research and Training Centre are summarized in Annex A.3. The additional posts recommended by the team should be requested from the planning authorities using the justifications presented in this document.
2. The MoH should make a special case for the retention of the current Parasitologist at Hetauda who has been the long-time principal trainer at the Centre in order to assure continuity and to take advantage of his special skills. The MoH might also wish to retain the services of the Makwanpur District Entomologist who has training experience and is familiar with the area.
3. Additional field staff who may be required for research activities should be engaged specifically for the activity concerned and paid out of the research grant concerned.
4. Job descriptions for Hetauda personnel should be developed, if not available, and reviewed and modified by the Hetauda staff as one of their early tasks as a team.
5. The Ministry should be encouraged to prepare job descriptions for all health personnel, where not already available, to facilitate their training and supervision.
6. The Malaria Control Programme should endeavor to integrate its district and peripheral level supervision activities with those of related services through the development of common supervision methods and shared supervisory visits.

7. USAID should consider the temporary funding of the new Hetauda staff positions recommended but not yet officially sanctioned until such time as those positions are sanctioned and persons officially appointed.
8. USAID should consider funding the temporary employment of former development staff with special malaria control expertise to assist in the on-the-job training of new, inexperienced personnel for the Hetauda team.
9. USAID should provide dedicated liaison, technical, and administrative support through the next half year as that is a critical period for transferring the Hetauda facility to the government of Nepal and beginning its new operations. After that period, less administrative support should be required, but arrangements for continued technical support in developing real field capability at the Hetauda Centre in vector-borne disease control would be extremely helpful. That individual should be someone very experienced in dealing with the national program and with the epidemiology of vector-borne diseases in Nepal. If USAID cannot provide such continued support itself, it should endeavor to persuade WHO or another sponsor to do so.

Curriculum Recommendations

The present trainers at Hetauda maintain that the malaria courses they present are thorough and complete. The team noted, however, that they concentrate only on malaria as a vertical program in spite of the government's policy which has been in force since the late 1970s to integrate all health services. The present malaria course content is very comprehensive, and the same information is provided to all levels of health workers. Recently, other vector-borne diseases have also been added — Japanese encephalitis, filariasis, and kala-azar. On the basis of the government's policy on integration of all health services, the new organogram of the MOH, and WHO's revised Global Malaria Control Strategy, malaria courses should be revised. The following recommendations are made to facilitate sustainability, institutional capability, and community participation.

1. Malaria training should be job specific, with separate training courses designed to cover:
 - Management
 - Supervision
 - Service delivery
 - Training
 - Community participation
 - Surveillance
 - Research
2. VBC has developed the *Malaria Training Module*, a comprehensive malaria prevention and control training package for over 20 weeks of training. This package should be used to prepare training materials for malaria-specific workers and multifunctional health personnel, i.e., technical managers, supervisors, trainers, and medical and paramedical staff.

The VBC malaria training package consists of five units. Each unit has a TOT section and a suggested schedule for training. For each unit, the level of audience for whom the material is applicable is identified (policy makers, service providers, CHWs, vector control personnel). For each session the type of trainer expertise required is specified, and types of teaching methods and activities are suggested. This is a comprehensive training package that is field oriented and uses participatory learning approaches. The package is designed to be flexible.

3. It is recommended that a national team of experts on malaria and training review this package and put together a module for each level of health personnel to correspond with his/her job description. As an example, a tentative outline for technical managers and supervising officers has been prepared. The team of trainers should use this outline to identify required training materials from the VBC Malaria Training Module, sort out the resources needed, and put them in separate packages for each level of personnel.

To plan a training program on malaria control for each level of worker the following activities and discussions are required:

- a. Develop job descriptions (including malaria control activities) for general health staff and obtain approval:
 - Regional Director
 - Regional Malaria Officer
 - Regional Planning Officer
 - District Public Health Officer
 - District Health Officer
 - Supervising Officers at regional and district levels
 - Medical Officers at Primary Health Care Centres
 - Health Post In-Charge
 - Health Assistant
 - Auxiliary Health Worker, Assistant Nurse Midwife
 - Village Health Worker
 - Maternal and Child Health Worker
 - Laboratory Technician
 - Laboratory Assistant
- b. Develop job descriptions for malaria specialists and obtain approval:
 - Malaria Inspector
 - Entomologist
 - Assistant Entomologist
 - Malaria Supervisor
 - Parasitologist
 - Vector Control Assistant

- c. Develop a district supervisory team and supervision plan.
 - d. Agree on whether to provide malaria training by itself or to integrate it with training for other priority health concerns.
 - e. Agree on the training content for each level of personnel.
 - f. Agree on the number of days of training for each level of worker for integrated training and/or for malaria.
4. To the VBC package, additional training materials (see Annex B.5) should be added to cover leishmaniasis.
 5. The following activities are recommended to make the Malaria Training Center at Hetauda operational:
 - a. Approve additional positions and/or assign persons on deputation until these positions are approved.
 - b. Appoint staff for all sanctioned posts.
 - c. Conduct a one week team-building orientation course for the staff. Annex B.1 contains a suggested program.
 - d. Select a pool of trainers from the Hetauda Centre, the District Malaria Unit, and the National Training Centre and have them go through the 3-month TOT course prepared by VBC. During this course, as they are prepared as a core group of trainers, they can also review the material, identify sections to use later, and add other relevant materials to complete training packages for:
 - technical managers
 - district level supervisors
 - multipurpose and malaria specific health workers.

[Note: If a three month TOT is not possible, a minimum of four weeks of TOT is absolutely essential.]

- e. Conduct a workshop for technical managers. The suggested program is attached as Annex B.2.
- f. Conduct a training course on supportive supervision. The suggested program is attached as Annex B.3.
- g. Develop a TOT course for the training of health service providers from PHC to community level for use by the Regional Training Centres.
- h. Have the Hetauda Centre staff develop a plan of action for their institute as well as a monitoring and evaluation mechanism to track their activities and the impact of training provided.

Physical Facilities Recommendations

New construction at the Hetauda Centre is almost complete, and renovation of the existing facilities is nearing completion except for the existing office building (future research building). However, there are a number of deficiencies and changes that must be addressed to ensure the health, safety, effectiveness, and proper functioning of this research and training facility. These deficiencies and changes have been noted in the blueprints by Mr. B.N. Pradhan, USAID engineer.

1. The team recommends that rapid completion (by May 18, 1994) of the Hetauda Centre be fully supported by USAID/Nepal, including the additional improvements and changes not specified in the original contract and blueprints.
2. A detailed list of recommendations for the physical facilities is provided in Annex C. Also, see the Mr. B.N. Pradhan's set of modified blueprints.

Materials and Equipment Recommendations

The operational research laboratory will be essential to the successful operation of the Hetauda Research and Training Centre. It will serve as a nucleus around which a world-class vector-borne disease research program can be developed to investigate existing and new control methodologies most appropriate for use in Nepal.

The team recommends:

1. The laboratory should be fully supported with the necessary staff and that the recurrent financial requirements be met by the Nepal Ministry of Health.
2. The laboratory should be properly furnished, equipped, and initially supplied by USAID/Nepal. This initial staffing and financial support will be essential to permit the writing and submission of grant proposals to international funding agencies to support operational Nepalese research in vector-borne diseases. Annex D gives a detailed list of the recommended equipment and supplies for the laboratory.
3. Additional specialized equipment (e.g., for leishmania culture, polymerase chain reaction amplification of parasite nucleic acid, etc.) will be purchased from grants supporting specific operational research projects.

Insectarium Recommendations

The Insectarium at the Hetauda center will be essential to the operation of an integrated training and research program. It will also support national and international efforts to assess the effectiveness of various control and prevention strategies for malaria, kala azar, Japanese encephalitis, and filariasis.

The team recommends:

1. The Insectarium should be fully supported with the necessary staff and recurrent financial resources from the Nepal Ministry of Health.
3. It should be properly furnished, equipped and initially supplied by USAID/Nepal.
3. Annex E.1 provides a detailed list of recommendations for the insectarium.
4. Annex E.2 provides a diagram of the insectarium, a design for walk-in screened rooms and racks, placement of air conditioners and humidifiers, and the arrangement of racks and furniture.
5. Annex E.3 provides standard operating procedures for rearing mosquitoes.
6. Annex E.4 is a scientific reprint detailing the procedures for rearing sand flies.

4. Summary

The new buildings at the Hetauda Research and Training Centre constitute a handsome physical facility that will support an array of activities focusing on vector-borne disease control. Trainings, workshops, and conferences can be accommodated, and the laboratories and research facilities will permit top quality field research to be carried out. In short, the team considers the new Hetauda facility to be a tremendous additional resource to the health system infrastructure of Nepal.

The picture is clouded by a constellation of uncertainties. One is the decentralization and reorganization of the Ministry of Health that will shift VBD control responsibilities. A second is the elimination of the developmental staff cadre, expected to result, when implemented, in the wholesale loss of almost all experienced malaria control personnel in the country. A third, related to the reorganization, is the planned integration of many heretofore vertical services such as the Malaria Control Programme. Fourth is a probable revision of Nepal's malaria control strategy which will alter job descriptions and change the skills to be imparted through training. Fifth, it is not clear where the external support upon which the Malaria Control Programme has long depended will come from in the future. Finally, there is the growing recognition that other vector-borne disease pose significant health risks in Nepal. Measuring the nature of those risks, devising strategies to monitor them, and implementing measures for their control are generally agreed to be added responsibilities for the new, strengthened Hetauda Centre. All of these factors will necessitate changes in the functioning of the Hetauda facility, but their exact dimensions are difficult to ascertain at this moment.

The VBC Team could not evaluate all these issues and cannot predict how they will be resolved. The best we can do is to offer observations and suggestions, recommend furnishings and equipment that will provide maximum flexibility while at the same time preserving the Centre's mission to support vector-borne disease control. The following comments are presented in the spirit of a vision to preserve and advance the potential of the institution. We cannot go further in the light of current uncertainties, but we trust that

our Nepalese colleagues will consider our suggestions and make wise use of the facility.

The team feels strongly that the Centre is much stronger as an institution that combines research and training than if it simply focused on one or the other. For this reason we believe it is wise to continue to manage the Centre as part of the MoH's Epidemiology and Communicable Diseases Division and not permit it to become just another part of its training system. Links with other training centers — most obviously those providing basic training to the multipurpose health workers who will be at the forefront of malaria control efforts for the foreseeable future — must be developed and strengthened. The Hetauda Centre will only have credible expertise to offer, however, if it maintains the technical competence that has characterized the Malaria Control Programme in the past.

The laboratory and research functions of the new facility are not a luxury. They are essential for assessing the risks and dynamics of vector-borne diseases in Nepal and for testing and adapting the most appropriate strategies for disease control within the resource limitations of the country. The research facilities of the new Centre will permit credible research that can contribute to the general public health knowledge and thus attract international funding and support.

In order to achieve the bright future we envision for the Centre, several principles must be kept in mind and reinforced by timely and judicious actions on the part of the MoH.

One basic principle is that the Hetauda Centre must remain relevant to the health needs of Nepal. It must have the capability to identify health problems promptly, assess their dimensions, and identify effective and affordable control measures. The capability is the essence of epidemiology and is the reason we have recommended that the projected staffing be expanded to include an epidemiologist and a statistician. Without them the Centre runs the risk of becoming irrelevant to the changing needs of Nepal.

Once strategies and policies have been elaborated, they must be communicated to those who are able to take action. This is accomplished through a combination of training of health personnel

and the focused disseminating of health information. Staff positions for a training officer and a health educator are strongly recommended to permit this communication function to occur.

We concur with the architects of the new MoH structure that one of the major functions of the Hetauda Centre should be the dissemination of important and timely information to the health workers and citizens of Nepal to enable them to take action.

We consider it important to bear in mind that a minority of the persons responsible for the control of malaria and other vector-borne diseases will be trained at Hetauda. The others, if they are to perform effectively, will probably be trained by trainers and supervisors who were themselves trained at Hetauda. For this reason the training of trainers function will be extremely crucial, and expertise in effective training needs assessment, training methodologies, and follow up monitoring and supervision must be fostered energetically as the Centre grows.

The team shares the current view of the MoH that the Hetauda Centre should no longer be restricted to malaria. Other vector-borne diseases that require similar approaches include visceral leishmaniasis (kala-azar), Japanese encephalitis, dengue, and filariasis. The Centre must expand its mission to include the investigation and control of all VBDs as a priority. Other health problems can be addressed if adequate capacity remains.

One symbol of the expanded focus of the new center will be a new name. The team was asked for suggestions and suggests several options:

1. Malaria and Insect borne Disease Study Centre
Aulo Tatha Kit Rog Adhayan Kendra (KPRAK)
2. National Insect Borne Disease Centre
Rastriya Kit Rog Kendra (RKRK)
3. Centre for Disease Control and Epidemiology
Rog Nientran Tatha [Epidemiology] Kendra (RNT_K)

4. Insect Borne Disease Research and Training Centre
Kit Rog Anusandhan Tatha Talim Kendra (KRATK)
5. Insect Borne Disease Study Centre
Kit Rog Anusandhan Kendra (KRAK)
6. Centre for Research and Training in Malaria and other
Insect Borne Diseases
Aulo Ra Aru Kit Rog Anusandhan Ra Talim Kendra (ARAKRARTK)

We feel, however, that it is the right and duty of those whose institution this is — the health system of Nepal — to select an appropriate name to capture the new significance of the Hetauda Centre. We suggest that they keep in mind the multiple functions a name can serve — institutional identity, types of service, location, people served, objectives, etc.

Increased integration is clearly the current priority in the reorganization of the MoH and in VBD control world-wide. The latest WHO Global Strategy for Malaria Control makes that abundantly clear. The implication for the Centre will be a need to rethink malaria control strategies in Nepal and to retrain workers accordingly, a need to integrate with other training programs, and a need to collaborate with other portions of the health system to solve common problems. As an example, an urgent problem for the malaria program is to ensure the use of properly sterilized blood-drawing equipment. Lancets are currently simply wiped with alcohol before reuse, a practice providing inadequate protection from HIV and other pathogens. Boiling or soaking the used lancets in chlorine solution must be taught. Other parts of the health system — such as the EPI — face a similar problem. A collaborative solution that teaches, provides the needed equipment for, and monitors sterilization would have widespread utility.

Another example of an integrated function is the H/MIS currently undergoing revision. Considering the effort currently devoted to data collection, and its potential usefulness to guide the management of the control of malaria and other vector-borne diseases, the team was disappointed to see how poorly the management needs of malaria control will be served by the general information system now being

proposed. The malaria program has not produced very appropriate indicators; perhaps collaboration with other programs would facilitate the process of doing so. As the Hetauda Centre develops proficiency in operational research, it will be forced to select appropriate indicators to measure its results.

Perhaps the most critical action that must be taken by the MoH in the short term, if the Centre is to realize its potential, is the prompt identification of essential technical staff. The selection of the Chief is of first importance because his unifying vision must guide the transition to a new, more responsive institution. His importance cannot be over-emphasized.

Secondly, the selection of a full complement of staff to arrive at roughly the same time is extremely important if the Centre is to be able to work as a team and to develop shared approaches to research and training. The retention of the experienced current trainer at Hetauda would, in the view of the team, be extremely valuable. The orientation workshop we have proposed will help the team to coalesce, and the TOT on vector-borne diseases will introduce a variety of effective and complementary training methods. The availability of technical experts who can ensure that the Centre staff can use the new training and research equipment effectively and appropriately should be pursued at approximately the same time as the ToT.

Finally, the team is concerned that the MoH provide adequate resources to ensure that the new facility is maintained in excellent condition. It is too useful a facility and has far too important a mission to be permitted to deteriorate.

Scope of Work

WORK STATEMENT OF CONTRACTOR

1. Objectives

Work to be performed under the buy-in will provide the following:

- a) an estimate of required laboratory equipment and supplies (i.e., chemicals and glassware, furnishings, etc., including detailed specifications and estimated costs) for equipping the MRTC laboratories and insectorium. The required equipment and supplies will be used to carry out routine laboratory work during training sessions and to conduct research on vector borne diseases (VBD) (applied research on vector borne diseases);
- b) a review of the present staff situation and recommendations on total manpower required (number, skills) to run the Malaria Research and Training Center; and
- c) a proposed revision of the existing curriculum at the MRTC (i.e., basic epidemiology of VBD, entomology, parasitology, and health education) to include newly developed techniques/technologies to control vector borne diseases and provide enhanced epidemiological skills.

2. Scope of Work

In order to achieve the above mentioned objectives, the contractor shall provide a 4-person team of experts on vector borne diseases (i.e., Epidemiologist, Medical Entomologist, Parasitologist/Virologist) and a VBD Training Expert which will perform the following activities:

1. Review and make recommendations on the total human resource (number, skills) required to run the Malaria Research and Training Center, Hetauda.
2. Estimate requirements for supplies and equipment for the parasitological and entomological laboratories to enable the conduct of research work in vector borne diseases.
3. Assess the insectorium and make recommendations on an appropriate methodology to maintain the insect population in the insectorium; estimate necessary supplies and equipment.
4. Review and recommend revision to the curriculum for the training of various levels of health workers.

3. Reports

Upon completion of the scope of work tasks, the team will submit a final report to the Chief, Office of Health and Family Planning, USAID/Nepal, containing the following:

1. Basic project/program identification sheet.
2. Executive summary of the report. This summary shall include a review of major findings, conclusions, and recommendations of the team, based on terms of reference of the scope of work.
3. The main report, which shall include detailed discussions on questions raised, conclusions established, and recommendations made. It shall also include the detailed scope of work, a list of individual contacted and a bibliography.

Soon after the completion of the field work and before departure from Kathmandu, the draft report will be submitted to the Mission Director and Chief, Office of Health and Family Planning for review. The final report shall be submitted for formal presentation to MCD/MOH within 30 days after the receipt of Mission comments on draft. Five copies of the final report shall be submitted to USAID/Nepal.

ITINERARY AND PERSONS CONTACTED

WEEK ONE

Sunday 13 Feb.

Arrive Kathmandu 1050. Meet Mr. Shreedhar Pradhan
Check into Soaltee Oberoi Hotel
Meet with Mr. Shreedhar Pradhan, noting schedule change due to local holiday on 15 Feb.

Monday 14 Feb.

Meet with Health Office at USAID/Nepal - 0900
Meet with Dr. B. L. Shrestha, Director, Epidemiology and Disease Control Division - 1030
Meet with Dr. Ramanandan Sinha, Director General, Ministry of Health - 1115
Meet Mrs. Vijaya K.C., Director, National Training Centre
Meet with Dr. Manas Bannerjee, Chief, Epidemiology Section, and Dr. Gangol of UNFPA - 1400
Meet with Ms. Theodora Wood-Stervinou, Deputy Mission Director, USAID - 1600

Tuesday 15 Feb.

(Nepali holiday)
Work at USAID - 0815
Meet with Mr. Santosh Gewali, USAID computer unit - 1330
Meet with Dr. Neal Cohen, USAID economist - 1430
Meet with Mr. Lawrence M. Pradhan and Mr. Ningma Yolmo, USAID training office - 1600

Wednesday 16 Feb.

Meet with Mr. David Oot and Mr. Shreedhar Pradhan - 0815
Meet with Dr. Mathura P. Shrestha, Professor of Community Medicine - 1100
Meet with Dr. Kokila Vayieda, Planning Section and with Mr. Jagadiswore Upadhya, Secretary, Ministry of Health - 1300

Thursday 17 Feb.

Meet with Dr. Ottar T. Christiansen, WHO Representative - 0930
Meet with Dr. B.D. Chataut, Chief of Planning and Foreign Aid - 1030
Telephone call with Dr. Charles Oliver - 2015-2100

Friday 18 Feb.

Meet with Dr. Bhoj Raj Joshi, President, Nepal Medical Association,
Dr. Panday, President, Nepal Health Research Council, and with
Dr. V.L. Gurubacharya - 1400

Saturday 19 Feb.

Day off

WEEK TWO

Sunday 20 Feb.

Fly to Biratnagar - 1000

Drive to Dharan Bazar - 1100

Visit B.P. Koirala Institute of Health Sciences and meet with Dr. Shekhar Koirala, Rector, and Dr. Madan Upadhyay to discuss possible collaboration with the Hetauda Centre on training and research, particularly in the area of leishmaniasis - 1130

Drive to Hetauda - 1500

Monday 21 Feb.

Visit and tour new facility at Hetauda Research and Training Centre, noting work to be completed or added. Persons contacted include Mr. B.N. Pradhan, USAID engineer, the contractor Mr. M.L. Kayasta and his staff, the construction contractor Mr. Mohan Shrestha and his staff, Mr. Sambhu Raj Shrestha, entomologist from Kathmandu, Mr. Shambhu Nath Jha, Parasitologist and In-Charge and other staff - 0930

Visit District Malaria Unit and personnel in Hetauda - 1430

Persons contacted include Mr. Murari Lal Das, District Entomologist, Mr. Gangadhar Misra, Accountant, Mr. Pitambar Jha, Storekeeper, Mr. Bijaya Kamar Baral, Administrative Assistant, Mr. Ram Danesh Gupta, Senior Malaira Inspector, Ms. Sulochana Shahi, Laboratory Assistant, Mr. K. Man Manandhar, Supervising Recorder, and other staff.

Tuesday 22 Feb.

Visit Pathalaya Regional Training Centre. Meet with Mr. Nand Kishor Shah, Training Chief, Mr. V.P. Gautam, trainer for epidemiology, pharmacology, and surgery, and other training staff. Meet AHW students Mr. Narayan Prakash Koirala and Mr. Satya Luxmi Karmacharya. Review AHW curriculum. Meet with MCHW trainers and students.

Wednesday 23 Feb.

Visit with Hetauda Centre and malaria unit staff. Plan for the equipping and furnishing of the center. Review MCH and TBA training with a view to linkages with malaria control. Review training courses presented at the MRTC in recent years. Define levels, training, and institutional linkages between various positions of personnel. Discuss job descriptions of proposed Hetauda staff with current staff. Discuss with current AHWs being trained their training and its relevance to their job responsibilities.

Visit District Health Office to discuss malaria control and other PHC services from their perspective with Mr. Singh, Malaria Inspector, Dr. Girish, MO/District Hospital, Dr. Shyam Kumar Shrestha, MO/FP, and Mr. Gobinda Man Shrestha, District EPI Supervisor - 1400

Meet Dr. Martha Lovett of Redd Barna and a British Volunteer involved with public health nursing and TBA training.

Thursday 24 Feb.

Visit health facilities in Hetauda District: Manahari Health Post (Ganesh Man Shrestha, AHW, Asarfi Chauhan, Malaria Inspector), Handi Khola Sub Health Post (Danesh Kumar Patak, acting AHW), PCD(V) at _____ Measure rooms at Hetauda for furniture.

Friday 25 Feb.

Measure insectory and plan its furnishing
Review and revise plans with Hetauda Centre staff
Depart for Pokhara and for return to Kathmandu

Saturday 26 Feb.

Mosquito larval collection.
Shopping for insect collecting materials
(Day Off)

WEEK THREE

Sunday 27 Feb.

Meet Dr. H.N. Acharya, Western Region Director, Pokhara - 1000

Meet with national health training centre personnel in Kathmandu. Discuss training programs with Mrs. Vijaya K.C., Director, and Dr. Neena Khadka - 1100

Visit Western Regional Training Centre, Pokhara. Meet with Mr. Jagat Man Shrestha, Training Officer, Mr. Ram Bhandari, National Training Centre Training Officer, and Mr. Sher Bahadur Chaudhary of UNFPA - 1130

Meet with Dr. Badri L. Shrestha, Dr. M. Bannerjee, and Mr. Jitendra Shrestha to review training findings - 1530

Monday 28 Feb.

Meeting on training and curriculum with Dr. N. Sinha (Director General, Department of Health Services), Dr. B. Chataut (Planning and Foreign Aid), Dr. Tirtha Rana (Health Institution and Manpower Development), Dr. Bhattarai (IE&C), Dr. K.R. Panday (Family Health), Dr. K.B. Singh (Logistic Management), Dr. B.L. Shrestha (Epidemiology and Disease Control), Mrs. Vijaya K.C. (Training) - 1100 (Canceled)

Meeting with Dr. Tirtha Rana, Health Institution and Manpower Development - 1400

Meet with Dr. B.L. Shrestha, Dr. M. Bannerjee, and Mr. Jitendra Prakash Shrestha on additional findings from Hetauda and the research focus in particular - 1500

Tuesday 1 March

Work on draft report

Meeting with Mr. B.N. Pradhan and Mr. M.L. Kayasta (architecture and engineering contractor) - 1600

Wednesday 2 March

Continue work on draft report

Meet with Dr. Ghana Man Bajracharya, Deputy Director, National Public Health Laboratory - 1400

Dr. Charles Oliver arrives

Thursday 3 March

Meet with Mr. David Oot and Dr. Charles Oliver. Discuss proposed staffing pattern for Hetauda Centre - 1100

Continue work on draft report

Friday 4 March

Meet at JSI with Mr. Brice Atkinson and Mr. Kumar Thapa on procurement for Hetauda - 0915

Continue to work on draft report

Saturday 5 March

(Day Off)

WEEK FOUR

Sunday 6 March

Work on draft report at hotel

Monday 7 March

Work on draft report at hotel and AID
Complete draft report

Tuesday 8 March

Polish draft report
Prepare for debriefings
Meet with USAID engineering office - 1600

Wednesday 9 March

Debrief with Mr. David Oot and Mr. S.P. Pradhan at USAID - 0845
Debrief for Ministry of Health accompanied by Mr. Oot and Mr. S.P. Pradhan:
Dr. B.L. Shrestha, Director, Epidemiology & Disease Control Division - 1030
Dr. Ramanandan Sinha, Director General - 1130
Dr. Wirtz departs

Thursday 10 March

Edit report in response to debriefing suggestions
Meet briefly with Mr. David Oot

Friday 11 March

Drs. Upreti and Sonnemann depart
Drs. Andre and Oliver remain to participate in External Assessment of
the Malaria Control Programme

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Annex A.1

**MoH Staff with Malaria-Related Responsibilities
According to New MoH Organization, by Region**

LEVEL Position	Civil Service Grade	Region					Totals
		E	C	W	MW	FW	
REGIONAL TEAM:							
Medical Officer, regular	G-III	1	1	1	1	1	5
Malaria Off.	G-III	1	1	1	1	1	5
Supervision Off.	G-III	1	1	1	-	-	3
Health Assistant	NG-I	1	1	1	1	1	5
Malaria Assistant	NG-I	1	1	1	1	1	5
Training Chief	NG-I	1	1	1	1	1	5
Training Officer	NG-II	2	3	2	2	2	11
Health Ed. (Training) Technician	NG-I	1	2	1	1	1	6
HA / PHN / Sr.AHW	NG-I	3	4	2	2	2	13
DISTRICT TEAM:							
District Health Chief or Public Health Officer	G-II	15	14	14	13	9	65
Sr. Public Health Nurse	G-III	1	2	2	1	1	7
HA/ Sr.AHW / PHN	NG-I	16	16	14	14	9	69
Health Ed. (Training) Technician	NG-I	15	14	14	13	9	65
Statistical Assistant	NG-I	17	18	16	14	11	76
Entomologist	G-III	1	1	2	1	1	6
Assistant Entomologist	NG-I	1	1	1	1	1	5
Vector Control Assistant	NG-I	3	8	3	3	3	20
Malaria Inspector	NG-II	23	24	18	17	15	97
Laboratory Technician	NG-I	14	7	12	12	10	55
Laboratory Assistant	NG-II	17	18	13	9	9	66
Microscopist	NG-II	1	1	1	1	1	5
Pump Mechanic	NG-III	1	1	1	1	1	5
Laboratory Aid	none	1	1	1	1	1	5
PRIMARY HEALTH CARE CENTRES:							
		<i>Existing Health Centres at time of reorganization</i>					
Medical Officer	G-III	3	4	1	-	1	9
HA / Sr.AHW	NG-I	3	4	1	-	1	9
Laboratory Assistant	NG-II	3	4	1	-	1	9
Auxiliary Health Worker	NG-II	6	8	2	-	2	18
Village Health Worker	NG-III	3	4	1	-	1	9
HEALTH POST (Ilaka level):							
		<i>Estimated on the basis of 9 HPs per District</i>					
HA / Sr.AHW	NG-I	144	171	153	126	81	675
AHW	NG-II	189	234	180	153	99	855
SUB-HEALTH POST (VDC level):							
		<i>Targets for the entire country, end of current 5-year plan</i>					
Auxiliary Health Worker	NG-II						3199
Rural Health Worker (VHW)	NG-III						3199
MCH Worker	NG-III						3199
WARD / VILLAGE:							
		<i>Estimated for the entire country, end of current 5-year plan</i>					
Woman Health Volunteer	none						36000
Malaria PCD Volunteer	none	1391	1826	589	488	397	4691

**District Leadership and Malaria Personnel
According to New MoH Organograms**

REGIONS and Districts	DHO Chief	Public Health Section Head	Lab	Malaria	Mat. Unit
EASTERN REGION					
Bhojpur	Chief (AS G-II)	HI (G-III)	LT		
Dhankuta	Chief (GHS) AS G-II	SrPHO (GHS) (AS G-II)	LT, LA3		
Ilam	Chief (GHS) AS G-II	SrPHO (GHS) (AS G-II)	LT, LA3		
Jhapa	Chief G-I	SrPHO (AS G-II)	LT, LA3	VC1, MI2	
Khotang	Chief (AS G-II)	HI (G-III)	LT		
Morang	Chief G-I	SrPHO (US G-II)	LT, LA3	VC1, MI2	X
Okhaldhunga	Chief (AS G-II)	HI (G-III)	LT		
Panchthar	Chief (AS G-II)	HI (G-III)	LT		
Sangkhuwasabha	Chief (AS G-II)	HI (G-III)	LT		
Saptari	Chief G-I	SrPHO (AS G-II)	LT, LA3	VC1, MI2	
Siraha	Chief US G-II	SrPHO (AS G-II)	LT, LA2	VC1, MI2	
Solukhumbu	Chief (GHS) AS G-II	HI (G-III)	LA		
Sunsari	<i>Amalgamated District</i>				
Taplejung	Chief (AS G-II)	HI (G-III)	LT		
Terhathum	Chief (AS G-II)	HI (G-III)	LT		
Udayapur	Chief (AS G-II)	HI (G-III)	LT	VC1, MI1	
CENTRAL REGION					
Bara	<i>Amalgamated District</i>				
Bhaktapur	<i>Amalgamated District</i>				
Chitawan	Chief (G-I)	SrPHO (AS G-II)	LT, LA3	VC1, MI2	
Dhading	Chief (GHS) (AS G-II)	SrPHO (GHS) (AS G-II)	LT, LA3		
Dhanusha	Chief (G-I)	SrPHO (US G-II)	LT, LA3	VC1, MI2	
Dolakha	Chief (AS G-II)	HI (G-III)	LT		
Kathmandu	Chief (G-I)	SrPHO (US G-II)	LT, LA3	VC1, MI2	
Kavre	Chief (AS G-II)	HI (G-III)	LT	VC1, MI1	
Lalitpur	<i>Amalgamated District</i>				
Mahottari	<i>Amalgamated District</i>				
Makwanpur	Chief (GHS) (AS G-II)	SrPHO (GHS) (AS G-II)	LT, LA3	VC1, MI1	X
Nuwakot	Chief (GHS) (AS G-II)	SrPHO (GHS) (AS G-II)	LT, LA3		
Parsa	Chief (G-I)	SrPHO (US G-II)	LT, LA3	VC1, MI2	
Ramechhap	Chief (AS G-II)	HI (G-III)	LT		
Rasuwa	Chief (GHS) (AS G-II)	HI (G-III)	LA		
Rautahat	Chief (US G-II)	SrPHO (AS G-II)	LT, LA2	VC1, MI2	
Sarlahi	Chief (US G-II)	SrPHO (AS G-II)	LT, LA2	VC1, MI2	
Sindhuli	Chief (AS G-II)	HI (G-III)	LT	VC1, MI1	
Sindhupalchowk	Chief (AS G-II)	HI (G-III)	LT		
WESTERN REGION					
Arghakhanchi	Chief (AS G-II)	HI (G-III)	LT		
Baglung	Chief (GHS) (AS G-II)	SrPHO (GHS) (AS G-II)	LT, LA3		
Dolpa	Chief (GHS) (AS G-II)	HI (G-III)	LA		
Gorkha	Chief (GHS) (AS G-II)	SrPHO (GHS) (AS G-II)	LT, LA3		
Gulmi	Chief (AS G-II)	HI (G-III)	LT		
Kapilvastu	Chief (US G-II)	SrPHO (AS G-II)	LT, LA2	VC1, MI2	
Kaski	Chief (G-I)	SrPHO (AS G-II)	LT, LA3	VC1, MI2	
Lamjung	Chief (AS G-II)	HI (G-III)	LT		
Manang	Chief (GHS) (AS G-II)	HI (G-III)	LA		
Mustang	Chief (GHS) (AS G-II)	HI (G-III)	LA		
Myagdi	Chief (AS G-II)	HI (G-III)	LT		
Nawalparasi	<i>Amalgamated District</i>				
Palpa	Chief (GHS) (AS G-II)	SrPHO (GHS) (AS G-II)	LT, LA3		
Parbat	Chief (AS G-II)	HI (G-III)	LT		
Rupandehi	Chief (G-I)	SrPHO (US G-II)	LT, LA3	VC1, MI2	X
Syangja	Chief (AS G-II)	HI (G-III)	LT		
Tanahu	Chief (AS G-II)	HI (G-III)	LT		

MID-WESTERN REGION Banke Bardiya Dailekh Dang Humla Jajarkot Jumla Kalikot Mugu Pyuthan Rolpa Rukum Salyan Surkhet	Chief (G-I) <i>Amalgamated District</i>	SrPHO (L'S G-II)	LT, LA3	VC1, MI2	X
	Chief (AS G-II)	HI (G-III)	LT		
	Chief (US G-II)	SrPHO (AS G-II)	LT, LA2	VC1, MI2	
	Chief (GHS) (AS G-II)	HI (G-III)	LA		
	Chief (AS G-II)	HI (G-III)	LT		
	Chief (AS G-II)	HI (G-III)	LT		
	Chief (AS G-II)	HI (G-III)	LT		
	Chief (GHS) (AS G-II)	HI (G-III)	LA		
	Chief (AS G-II)	HI (G-III)	LT		
	Chief (AS G-II)	HI (G-III)	LT		
	Chief (AS G-II)	HI (G-III)	LT		
	Chief (AS G-II)	HI (G-III)	LT		
	Chief (GHS) (AS G-II)	SrPHO (GHS) (AS G-II)	LT, LA3	VC1, MI1	
FAR WESTERN REGION Achham Baitadi Bajhang Bajura Dadeldhura Darchula Doti Kailali Kanchanpur	Chief (AS G-II)	HI (G-III)	LT		X
	Chief (AS G-II)	HI (G-III)	LT		
	Chief (AS G-II)	HI (G-III)	LT		
	Chief (GHS) (AS G-II)	HI (G-III)	LA		
	Chief (GHS) (AS G-II)	SrPHO (GHS) (AS G-II)	LT, LA3	VC1, MI1	
	Chief (AS G-II)	HI (G-III)	LT		
	Chief (GHS) (AS G-II)	SrPHO (GHS) (AS G-II)	LT, LA3		
	Chief (G-I)	SrPHO (AS G-II)	LT, LA3	VC1, MI2	
	Chief (G-I)	SrPHO (AS G-II)	LT, LA3	VC1, MI2	

Totals:		DHOs	Malaria Units
Chiefs:	G-I	12	
	US G-II	5	
	(GHS) US G-II	11	
	AS G-II	32	
	(GHS) AS G-II	8	
Public Health Section:	SrPHO (US G-II)	6	
	SrPHO (AS G-II)	11	
	SrPHO (GHS) (AS G-II)	11	
	Health Inspector (G-III)	40	
Laboratory personnel:	Laboratory Technician	60	5
	Laboratory Assistant	87	10
	Microscopist		5
	Laboratory Aid		5
Malaria personnel:	Entomologist		5
	Assistant Entomologist		5
	Vector Control Asst.	21	
	Malaria Inspector	36	20
	Pump Mechanic		5

HETAUDA RESEARCH AND TRAINING CENTRE
Proposed Staffing Pattern by Level and Functional Responsibility

Annex A.3

No.	Position Title	Civil Service Level	Responsibility:		Remarks	Current Staff	Status
			T = Training	R = Research			
1.	Chief	G-II	T	R A	<i>Medical Epidemiologist, Malaria- logist, or Infectious diseases</i>	_____	_____
2.	Parasitologist	G-III	T	R	<i>Research coordinator; malaria and leishmaniasis expertise</i>	_____	_____
3.	Entomologist	G-III	T	R	<i>With arbovirology expertise</i>	_____	_____
4.	Vector Control Officer	G-III	T	R	<i>With toxicology expertise</i>	_____	_____
5.	*Epidemiologist	G-III	T	R		_____	_____
6.	*Statistical Asst.	NG-I	T	R	<i>To assist Epidemiologist</i>	_____	_____
7.	*Training Officer	G-III	T		<i>Training coordinator</i>	_____	_____
8.	*Health Educator	G-III	T		<i>For information dissemination function</i>	_____	_____
9.	Asst. Entomologist	NG-I		R	<i>Already assigned to Hetauda RTC</i>	_____	_____
10.	Laboratory Technician	NG-I		R		Mr. Shishir K. Pant	R
11.	Vector Control Asst.	NG-I	T	R		_____	_____
12.	Junior Entomol. Tech.	NG-II		R	<i>Insectarium</i>	_____	_____
13.	Junior Entomol. Tech.	NG-II		R	<i>Field</i>	_____	_____
14.	Microscopist	NG-II	T	R		_____	_____
15.	Nayab Subba	NG-I		A		_____	_____
16.	Accountant	NG-I		A	<i>Already assigned to Hetauda RTC</i>	_____	_____
17.	Typist/computer spec.	NG-I		A		Mr. Basudeo Pandit	R
18.	*Storekeeper	NG-II		A		_____	_____
19.	*Warden	none		A	<i>Newly proposed</i>	_____	_____
20.	*Driver	none		A	<i>Newly proposed</i>	_____	_____
21.	*Driver	none		A	<i>Newly proposed</i>	_____	_____
22.	Peon	none		A	<i>Cook</i>	_____	_____
23.	Peon	none		R	<i>Insectarium</i>	_____	_____
24.	Peon	none		A		_____	_____
25.	Gardener	none		A		_____	_____
26.	Watchman	none		A		_____	_____
27.	Watchman	none		A		_____	_____
28.	Sweeper	none		A		_____	_____

* Indicates additional position recommended by USAID/VBC Team

Additional support skills and services required:

Maintenance and repair of building and equipment
Maintenance and repair of laboratory and training equipment
Computer maintenance

Outside technical assistance expected to be required:

Facilitator(s) for Orientation Workshop
Master trainer and technical experts for TOT in malaria and VBD control
Research advisors (various) to provide training in research methodology and to establish research procedures
Installation of medical laboratory and insectarium equipment
Possible assistance from Peace Corps or VSO (Ideally, a volunteer couple with one person having an MPH in epidemiology, the other with administrative and possibly training skills.)

Additional training off-site that may be required by Hetauda staff:

Training in arbovirology
Training in outbreak investigation (EIS-type) for epidemiology staff
Training in computer literacy as required
Training in community-based health education for Health communications staff member (Health Educator)
Training in library technology
Other training as determined in the future

FUNCTIONS OF MALARIA TRAINING & RESEARCH CENTRE

- I. **Organize and Conduct Quality Training on Malaria and Other Vector-Borne Diseases.**
 - A. Prepare training plans for the following and forward them to the Epidemiology and Disease Control Division at the MoH:
 1. the newly recruited Hetauda Research and Training Centre Team;
 2. the HRTC Training Team;
 3. the technical managers at district and regional levels;
 4. the district level supervising teams;
 5. entomologists and parasitologists.
 - B. Participate in the development of job specific integrated case management training packages for:
 1. Medical Officers;
 2. Health Post In-Charges;
 3. Assistant Nurse Midwives (ANM);
 4. Auxiliary Health Workers (AHW);
 5. Village Health Workers (VHW);
 6. Maternal and Child Health Workers (MCHW); and
 7. the former malaria-specific workers.
 - C. Coordinate training activities with the Regional Training Centre at Pathalaya through participating in each other activities and through regularly scheduled meetings to share training experiences.
 - D. Prepare annual budget requirement for training and other activities by the month of _____ and forward to the Division of Epidemiology and Disease Control.
- II. **Provide strategic plans for recognizing and responding to any Epidemic.** Provide instructions for controlling epidemics when indicated.
- III. **Provide periodic updates of research findings.** Disseminate findings from this institute. Also, prepare summaries of published reports in a form that can be disseminated to health and development workers in Nepal.
- IV. **Conduct operational research on vector-borne diseases of importance to Nepal.** This will include malaria, kala-azar (leishmaniasis), Japanese encephalitis, and filariasis. The goal of this research will be to make optimal use of the limited personnel and financial resources in Nepal to reduce or eliminate the transmission of these diseases or to minimize their effects.

**Orientation Workshop for MRT Centre Staff
Hetauda**

Objectives:

To review the structure and functions of MRTC, to review each team member's job description, to arrive at a consensus on implementing training and research activities, and to finalize the operations manual for the center.

Day One:

1. Introduce participants and resource persons.
2. Brain storming: Obtain each participant's view of objective(s) and content of workshop. List two points from each participant.
3. Review participants' lists of objectives and content for the workshop. Hand out proposed objectives and schedule for the workshop. Compare with participants' list.
4. Go over scheduled activities for the day.
5. Present and discuss MRTC structure and functions.
6. Present and discuss job descriptions of administrative and management personnel.
 - Chief
 - Training Coordinator
 - Research Coordinator (epidemiologist)
 - Nayab Subba
 - Accountant
7. Evaluate Day One activities.
8. Evening assignment.

Evening:

Trainers and Resource Persons meeting:

- Review the Day One activities.
- Finalize plan for next day's activities.

Day Two:

1. Present and discuss participants' evaluations of Day One activities.
2. Summarize previous day's activities.
3. Outline activities scheduled for Day Two.
4. Present and discuss the following job descriptions:
 - Entomologist
 - Parasitologist
 - Assistant Entomologist
 - Vector Control Officer
 - Lab Technician
 - Jr. Entomology Technician
 - Microscopist
 - Typist/Computer Assistant
5. Describe and discuss center's physical facilities and their utilization.
 - The classroom and office building
 - Laboratory and research building
 - Residential quarters
 - Hostel
 - Toilets
 - Grounds
6. Evaluate Day Two activities.
7. Evening assignment.

Evening:

Trainers and Resource Persons meeting:

- Review Day Two activities
- Finalize plan for Day Three

Day Three:

1. Presentation and discussion of participant's evaluation of Day Two activities.
2. Presentation (Review) of Day Two activities.

3. Outline activities scheduled for Day Three.
4. Present and discuss the following job descriptions:

- Peon
- Gardener
- Warden
- Cook
- Watchman
- Sweeper
- Drivers

5. Discuss resource management:

- Budget
- Training materials
- Lab equipment and supplies
- Staff
- Building and grounds

6. Evaluate Day Three.
7. Evening assignment.

Evening:

Trainers and Resource Persons meeting:

- Review Day Three activities.
- Finalize activities for Day Four.

Day Four:

1. Present and discuss Day Three evaluations.
2. Summarize Day Three activities.
3. Outline activities scheduled for Day Four.
4. Ask MRTC team to develop an organogram based on the job descriptions and channels/methods of communication.
5. Present and discuss the importance of interpersonal communication and health service delivery.

6. Evaluate of Day Four activities.
7. Evening assignment.

Evening:

Trainers and Resource Persons meeting:

- Review activities of Day Four.
- Finalize activities for Day Five.

Day Five:

1. Present and discuss the evaluation of Day Four.
2. Review Day Four activities.
3. Outline activities scheduled for Day Five.
4. Discuss methods of communication:
 - Between supervisor and supervisee - upward and downward in the administrative unit;
 - Among team members;
 - Between trainers and trainees; and
 - Between patients and service providers.

Day Five afternoon/evening and Day Six morning:

Group Work:

1. Develop an organogram for MRTC.
2. Put together the first draft of an operations manual for the MRTC.

Day Six Afternoon:

CLOSING SESSION

- Invite a prominent official.
- One or two representatives from the participants describe what they learned and explain the output of the Workshop.

**Training of Trainers
Preparing the Hetauda Training Team**

Audience: Training Coordinator HTRC
Trainers
Training Officers of National & Regional Training Centres
Trainers from Regional & District Health Offices
Trainers from other Government and NGO organizations in the area

Venue: Hetauda Research and Training Centre

Facilitators: Representative from National Training Centre
A number of National Trainers who have received ToT Training
Short term consultant in training (national or expatriate)

Pre-Workshop Activities:

1. Approve following job descriptions:
 - Training Coordinator
 - Trainer/Facilitator
2. Obtain budget for the workshop;
3. Define objectives, content, and methodology for the workshop;
4. Prepare a list of trainers and trainees;
5. Send letters of invitation to trainees and trainers; and
6. Have all training material, aids, and hand-outs ready and available.

Workshop Activities:

Workshop activities are to be carried out by the training coordinator, trainers and participants of the ToT Course.

Post-Workshop Activities:

Maintain linkage/coordination among all training center staff.

Objectives:

At the end of the workshop each prospective trainer will be able to:

1. Explain the difference between basic training and in-service training and explain the methods appropriate for adult and child learning;
2. Demonstrate good training skills using interactive and participatory approaches;
3. Demonstrate how and explain when to use the following aids:
 - Flip charts
 - Black board
 - Microscope
 - Overhead projector
 - Slide projector
 - Video equipment
 - Readily available local relevant items, i.e., food, mosquitoes
4. Utilize effectively case studies, role play, stories, games, discussions, lectures, and field visits; and
5. Evaluate their own and their colleagues' training skills so that measures can be taken to further strengthen training skills on a continuous basis.

Schedule

DAY ONE:

Morning

1. Introduction of participants, trainers, and resource persons.
2. Brain storming to obtain participants' views on the objectives of the workshop. Use flip chart to list their comments.
3. Presentation of Workshop objectives and planned schedule.
4. Introduction to the ToT course:
 - Overview of objectives, expectations, and schedule,
 - Methods to be utilized,
 - Roles and responsibilities of trainer/facilitators and trainees.

5. Comparison of participants' views with workshop objectives and content.

Afternoon

6. Roles and responsibilities of a Training Coordinator and Trainers in a training centre.
7. Differences between basic and in-service training, between pedagogy and androgogy.
8. Evaluation of Day One.

Evening Assignment

Readings on strengthening of training skills.

Evening Meeting of Trainer/Facilitators:

- Review Day One activities.
- Finalize plan for Day Two activities.

DAY TWO:

Morning

1. Present and discuss Day One evaluation.
2. Review completed tasks of Day One and relate to planned activities of Day Two.
3. Presentation and discussion of skills necessary for effective training:
 - Presentation and facilitation skills,
 - Active listening,
 - Observation skills,
 - Giving and receiving feed-back.

Afternoon

4. Discussion on effective use of available teaching aids:
 - Books
 - Flip charts
 - Projectors, videos
 - Black board
 - Household items, etc.
 - Microscopes

5. Complete evaluation of Day Two.

Evening Assignment

Review teaching and learning methods.

Evening Trainers Meeting:

- Review Day One and Day Two activities.
- Finalize Day Three activities.

DAY THREE:

1. Present and discuss Day Two evaluation.
2. Review Day One and Day Two activities completed and relate them to Day Three activities.
3. Discussion and clarification of when and how to use:
 - Brainstorming
 - Lectures
 - Discussion
 - Role play
 - Story telling
 - Games
 - Exercise
 - Readings
 - Demonstration of a procedure
 - Case study method
4. Discussions and consensus on combining a number of training aids and methods.
5. Evaluation of Day Three.

Evening assignment

Form small groups of four each. Give each group one of these assignments:

- Group I. Select a topic in malaria control from VBC's Malaria Control Module and prepare a presentation for the next morning. Select one representative from each group to present it.

- Group II. Review the observation guide and be ready to use to assess your colleagues' presentation skills.

Evening Trainers' Meeting:

- Review Day Three activities.
- Finalize Day Four activities.

DAY FOUR:

1. Present and discuss Day Three evaluation.
2. Review Day One through Day Three activities completed and relate them to Day Four activities.
3. Small group presentations and assessment of presentation skills.
4. Discussion on findings from presentation skills.
5. Presentation of selected topics from VBC Malaria Training Module.
6. Observation and assessment of presentation skills.

Note: This approach for developing training programs can be used for any of the target groups. The schedule of activities will depend on the course content corresponding to the job descriptions and number of days available for training.

**Workshop on Planning and Management
for Technical Managers on Malaria and other Vector-Borne Disease Control**

Audience: Regional Directors, Planning Officers, and Supervision Officers
Regional Malaria Officers of 5 districts have Malaria Units

Venue: MRTC (Hetauda)

Facilitators/

Resource Persons: Representative from Epidemiology and Disease Control
Short term consultants - national or expatriate

Pre-Workshop Activities:

1. Training Needs Assessment - Send two sets of self-administered questionnaires with instructions to complete and bring these to the workshop.

Set 1 to identify participant's skills and priorities on planning and management topics.

Set 2 to identify participant's existing plans for malaria and other vector-borne disease control
2. Trainers and Resource Persons team planning meeting to organize the workshop. (Planning time must be allowed 1-2 weeks prior to workshop. May need a brief ToT.)

Workshop Objective:

At the end of the workshop, a Regional Implementation Plan for Malaria Control will be developed for each of the five regions.

Post Workshop Activities:

1. Complete a progress assessment questionnaire (self-administered) six months after the workshop.
2. Progress assessment site visits by Division of Epidemiology and Diseases Control Officer plus the short-term consultant involved in the workshop.

DAY ONE:

Morning and afternoon

1. Introduction of participants and resource persons.
2. Brain storming to obtain participants' views on workshop objectives. Use flip chart to list their comments.
3. Workshop objectives and schedule.
4. Group works using guidelines provided for summarizing and presenting self-administered questionnaire:
 - Group I - summarize questionnaire on participants' skills and priorities in planning and management topics.
 - Group II - summarize plans for malaria and other vector-borne disease control.
5. Presentation and discussion of group work, Groups I and II.
6. Presentation and discussion of 1993 Revised Malaria Control Strategy and its implications for concerned regional managers in Nepal. (by rep. of Epid. and Disease Control)

Evening facilitators' meeting:

- Review participants' training needs assessment based on group I presentation:
 - describe how these identified needs will be met during the workshop; and
 - define participant's and resource persons responsibilities in meeting these needs.
- Prepare feedback for group II presentation. Explain that the objective of the workshop is to have each participant, at the end of the workshop:
 - develop a plan for their own region (modifying the plan they came to the workshop with); and
 - revise this plan in accordance with the revised Malaria Control Strategy.
- Finalize plans for Day Two activities.

DAY TWO:

Morning

1. Provide feedback on participants' needs assessment summary.

2. Provide feedback on plans for malaria and other vector-borne diseases.
3. Review schedule for Day Two.
4. Review and discuss job descriptions of Regional Level Managers and skills required in:
 - Technical/clinical area (priority diseases/conditions),
 - Communications,
 - Planning and management,
 - Problem identification and solution.

Afternoon

5. Review and discuss technical knowledge and skills in malaria and vector-borne disease control.
 - Malaria and vector-borne disease control programmes in the context of the integrated primary health care approach.
 - Epidemiological and operational indicators for disease management.
 - Capacity for early diagnosis and prompt treatment within general health services (transferring responsibilities from malaria specific workers to general health workers).
 - Drugs, insecticides, and environmental treatment and control measures.
 - Drug resistance to malaria.
6. Evaluation of Day Two activities.

Evening Assignment

Evening facilitators' meeting:

- Review Day Two Activities.
- Finalize Day Three Activities.

DAY THREE:

1. Presentation and discussion - summary of participants' evaluation of Day Two activities.
2. Summary of Day One and Day Two activities.
3. Review schedule for Day Three.

4. Discussion on importance of establishing and maintaining an adequate system of two-way communications upward to the central level and outward to health care teams regarding:
 - Policy
 - Action plans
 - Resources
 - Assistance in identification and/solution of problems.

5. Review of planning and management knowledge and skills required at Regional Level specifically for Malaria Control:
 - Stratification of malarious areas.
 - Population of epidemic prone areas and number of clinical and confirmed cases.
 - Proportion of *P. falciparum* cases among total number of malaria cases confirmed by laboratory.
 - Proportion of *P. falciparum* drug failures.
 - Population in areas with vector resistance to insecticides.

6. Discussion and agreement on strategies for:
 - Adequate arrangement at district hospitals to care for severe and complicated malaria cases.
 - Management of cases of malaria treatment failure.
 - Promotion of insecticide-treated bed nets.
 - Use of insecticides on a selective basis.
 - Strengthening of the management information system.
 - Supporting clinical and operational research.
 - Conducting training needs assessments and planning for appropriate and updated courses for health personnel.
 - Monitoring and evaluating training and supervisory activities within the region.
 - Coordination with other sectors.

DAY FOUR:

Morning

1. Presentation and discussion of Day Three evaluation.
2. Summary of three days of activities.
3. Review of Day Four scheduled activities.

4. Continued discussion on planning and management skills required at Regional Level.

Afternoon

5. Discussion of systematic approaches to problem solving.

Five Basic Steps to problem solving:

- Identifying the problem.
- Understanding the cause of the problem.
- Generating a solution responding to the cause of the problem.
- Implementing the solution.
- Monitoring the results of implementation of solution.

6. Selecting a case and applying the problem solving approach - individual exercise.

7. Evaluation of Day Four activities.

Evening Assignment

Evening Facilitators' Meeting:

- Review Day Four activities.
- Finalize plan for Day Five activities.

DAYS FIVE AND SIX:

1. Presentation and discussion of Day Four evaluation.
2. Summary of activities completed to date.
3. Review schedule for Days Five and Six.

Activity: Take the plan for malaria and other vector-borne disease control written before coming to the workshop and revise it. Prepare a final implementation plan for each of the regions. Follow these steps to develop the implementation plan.

Steps in Developing a Regional Malaria Control Plan:

1. Identify Existing:

- Malaria specific workers and supervisors;

- Other health department personnel providing malaria services and their supervisors;
 - Malaria drugs, supplies, logistics;
 - Budget;
 - Target populations and areas for Malaria and other vector-borne disease control.
2. Consider:
- New Ministry of Health organogram;
 - Loss of personnel on development side;
 - Integration of malaria control with general health services.
3. Identify:
- Problems you face;
 - Additional resources you may have access to;
 - Additional resources you will require.
4. Develop an implementation plan for Malaria Control Activities (including research where applicable) in your region. Include the following activities:
- Case management of ordinary malaria cases;
 - Management of complicated and severe malaria cases;
 - Management of malaria treatment failures;
 - Community awareness and participation in malaria control activities;
 - Collection, analysis, and feedback of malaria HIS data;
 - Training of health personnel;
 - Environmental and biological management in vector control;
 - Provision of essential resources;
 - Supervision of health personnel.

DAY SIX:

Closing Session

Ask one or two participants to summarize the new knowledge and skills gained during this workshop which will help them in carrying out their activities.

Present this at the closing session.

**Training on Supportive Supervision
for Regional and District Level Supervisors**

Audience:

Regional Directorate:

Supervision Officer
Health Inspector/Public Health Nurse from Public Health Section

Disease Control Sub-Section:

Supervising Officer
Malaria Assistant
Tuberculosis/Leprosy Assistant

Maternal and Child Health Sub-Section:

Family Planning Officer
Sr. Public Health Nurse
Family Planning Assistant
Supervising Assistant

Indent and Supply Coordinator Sub-Section:

Health Inspector

Expanded Programme on Immunization and Natural Disaster Sub-Section:

Medical Officer
Health Assistant

District Health Office:

District Public Health Officer and/or District Health Officer

Venue: Malaria Research Training Centre or a Research Training Centre

Facilitators:

Representatives from Epidemiology and Disease Control (national and regional levels)
Trainers from Hetauda Research and Training Centre, National Training Centre, and
Regional Training Centres plus national/expatriate short term consultant.

Pre-Training Activities:

1. Development/approval of malaria case management guidelines along with the management guidelines for six other priority areas.

2. Job description for supervisors.
3. Development/approval of supervisory visit forms.

Objectives:

By the end of this course, participants will be able to:

1. List District level supervisors' essential supervision activities;
2. Describe the process of supportive supervision;
3. Use the supervisory tool(s) after a number of supervisory visits to nearby facilities;
4. Use the supervisory tool(s) in assessing quality and quantity of malaria services provided and in identifying support needed by staff;
5. Make a realistic supervisory visit plan.

Schedule

DAY ONE: Introduction to the Supervisor's Training Course

Morning

1. Introduction of participants, trainers, and resource persons.
2. Brain storming to obtain each participant's view of objective(s) and content of this course. List two points from each participant.
3. Review participants' list of objectives and content of the course.
 - Hand out tentative objectives and schedule of the course.
 - Discuss comparison between the participant's thinking and the planned course.
 - Summarize the content and objectives of the course.
4. Presentation and discussion of District Level Supervisor's job description.

Afternoon

5. Explanation of the MoH New Organogram: an integrated approach to health care delivery utilizing teamwork.
6. Evaluation of Day One activities.

Evening Assignment:

Review integrated case management guidelines.

Evening trainers' meeting:

- Review Day One activities.
- Finalize plans for Day Two sessions.

DAY TWO: Introduction to Integrated Case Management Guidelines

Morning

1. Summary Day One evaluation.
2. Review of Day One activities.
3. Review of Day Two activities.
4. Presentation: Discuss common clinical problems in Nepal including diarrhoea, acute respiratory infections, malnutrition, malaria, tuberculosis, vaccine preventable diseases, and leprosy. Everyone is at risk from these conditions. Therefore, each person should be screened for possible conditions to identify and address their needs appropriately. This results in early intervention and minimizes the seriousness of the problem(s).

Afternoon

5. Review malaria transmission, diagnosis, case management, and control:
Review, explain, and discuss the following:
 - What is malaria ?
 - How is malaria transmitted ?
 - Life cycle of malaria parasites
 - Signs and symptoms of malaria
 - Diagnostic procedure - blood smears and microscopy
 - Treatment and follow up care of malaria patients
 - Presumptive treatment
 - Radical treatment
 - Chloroquine resistant cases
 - Treatment and follow up of severe and complicated malaria.
 - How malaria transmission can be controlled/minimized.
 - Personal protective measures
 - Environmental measures.
6. Evaluate Day Two activities.

Evening Assignment

Review malaria case management guidelines and supervisors' responsibilities in malaria control.

Evening trainers' meeting:

- Review Day Two activities.
- Finalize plan for Day Three.

DAY THREE:

Morning

1. Summary of the evaluation of Day Two.
2. Review of activities completed on Days One and Two.
3. Review of Day Three planned activities.
4. Discuss and review the three broad areas of responsibilities of District Level Supervisors
 - Management and coordination;
 - Supervision;
 - Monitoring and evaluation;

Afternoon

5. Present and discuss essential knowledge and skills for effective supervision:
 - Technical/clinical.
 - Communication.
 - Management and supervision.
 - Problem identification and solution.
6. Introduction to supervision tool "Supervisory Visit Form"
 - Review the supervisory visit form and discuss its use.
7. Evaluate Day Three activities.

Evening Assignment

Review materials on Communication and Supervision

Evening trainers' meeting:

- Review Day Three activities.
- Finalize Day Four activities.

DAY FOUR:

Morning

1. Presentation and discussion of Day Three evaluation summary.
2. Review of activities completed on Days 1 through 3.
3. Review of Day Four planned activities
4. Communications for malaria control:
 - Explain and discuss the importance of establishing and maintaining an adequate system of communication with the staff you supervise.
 - Explain and discuss the three types of activities in communication.
 - Observing, including listening,
 - Giving and/or receiving feed back,
 - Reporting.

Afternoon

1. Discuss the essential points in communications for the malaria control programme:
 - Case management, including
 - Assessment and diagnosis
 - Classification
 - Treatment
 - Counselling and follow-up
 - Preventive measures;
 - Surveillance measures;
 - Reporting - use of malaria forms;
 - Supervisory visits, their frequency and style.
2. Barriers to effective communication and ways to overcome them.
 - Discuss barriers to effective communication. List them with suggestion on ways to overcome each barrier.
3. Evaluate Day Four activities.

Evening Assignment

Review the material on management, coordination, and supervision

Evening trainers' meeting:

- Review Day Four activities.
- Finalize Day Five activities.

DAY FIVE:

Morning

1. Presentation and discussion of Day Four evaluation.
2. Review of Days 1 through 4 activities completed.
3. Review of Day Five planned activities.
4. Supervision, management, and coordination at District level.
 - Compile, through discussion, a list of persons supervised at PHC, HP, and SHP levels.
 - Review job description of persons supervised.
 - Identify the tasks to be supervised, i.e., case management, supervision, and training for malaria control.

Afternoon

1. Review and discuss the following:
 - Definitions of supervision, management, and coordination;
 - Styles of supervision;
 - Methods of supervision;
 - Coordination between health facilities and with communities to improve service delivery;
 - Management of available resources in the District.
2. Monitoring and evaluation of primary health care activities in malaria control.
 - Discuss what is meant by monitoring and evaluation.
 - Discuss methods of monitoring
 - Agree on reports to be used and how to monitor the progress of health service delivery in the periphery for malaria control.
3. Complete Day Five evaluation.

Evening Assignment

Review problem identification and solution.

Evening trainers' meeting:

- Review Day Five activities.
- Finalize plans for Day Six.

DAY SIX:

Morning

1. Present and discuss Day Five evaluation.
2. Review Days 1 through 5 activities completed.
3. Review Day Six activities.
4. Utilization of the process of problem-solving in supervision.
 - Review and discuss the steps involved in problem solving process:
 - Defining the problem,
 - Understanding the cause
 - Generating a solution
 - Implementing the solution
 - Assessing the effectiveness of solution.

Afternoon

1. Use of supervisory visit forms for malaria control activities.
 - Review the content of the supervisory visit forms.
 - Select health posts to visit for observation (case study).
 - Discuss how to use this forms for:
 - Identification of achievements in malaria control,
 - Identification of problems/needs in malaria control,
 - What feedback to give to the staff and how.
 - Discuss plans for action and how the facility staff will be involved in planning and implementing activities to solve some of the identified problems.
2. Evaluation of Day Six.

Evening Assignment

Each person should make a plan for supervisory visits to each type of facility to be supervised and a district supervision plan. Plan to spend a full day at the facility visited.

Decide (realistically) how frequently each supervisor is able to visit a facility per month or per quarter.

Make a list of resources available to facilitate supervisory visits.

Make a list of problems to be faced in carrying out supervisory responsibilities.

Evening trainers' meeting:

- Review Days 1-6 activities completed.
- Finalize plans for Day Seven including awarding of certificates.

DAY SEVEN:

Morning

1. Present and discuss Day Six evaluation.
2. Review Days 1 through 6 activities completed.
3. Review Day Seven activities.
4. Review plans for supervisory visits.
 - The group reviews individual plans and comes up with a plan for a one day supervisory visit to a Health Post or Sub-Health Post. Include all activities to be carried out.
5. Development of a district supervisory plan.
 - The group reviews individual district supervisory visit plans and arrives at a realistic and workable district supervisory plan and well as the frequency of visits per month or quarter.
6. Development of a plan to initiate the new supervisory visit schedule.
 - Review the list of problems and resources in carrying out supervisory activities and suggest what changes are required to implement the supervisory visit plans.

7. Complete Evaluation for Day Seven.

Evening Assignment

Group I of participants will prepare a list of changes and resources required to implement the new supervisory visit protocol. An individual should be selected to present the group's findings.

Group II will make a list of new knowledge and skills that were acquired in this course and explain they will use them in their work.

Evening trainers' meeting:

- Review and finalize plans for closing ceremony including awarding of certificates.

DAY EIGHT:

1. Present and discuss Day Seven evaluation.
2. Review Days 1 through 7 activities.
3. Review last day's activities.
4. Prepare for closing ceremony.
5. Complete administrative formalities and distribute travel and per diem payments.

CLOSING CEREMONY

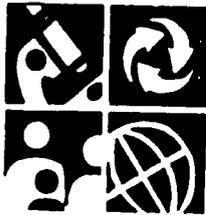
Address by a VIP.

Address by a participant on new knowledge and skill acquired in the workshop.

Presentation of supervisory plans by participants.

Presentation of required changes and resources in implementing the new supervisory visit protocol.

**VECTOR BIOLOGY
AND
CONTROL PROJECT**



**A TRAINING-OF-
TRAINERS MODULE
ON THE PREVENTION
AND CONTROL
OF MALARIA**

Address:

Vector Biology and Control Project
1901 North Fort Myer Drive, Suite 400
Arlington, Virginia 22209
USA
Telephone (703) 527-6500 Telefax: (703) 243-0013

Managed by Medical Service Corporation
International, Arlington, Virginia
Sponsored by the Agency for International
Development, Washington, D.C.

INTRODUCTION

Every year malaria is responsible for over 100 million clinical cases and 1 to 2 million deaths, mostly in young children. In addition to the health impact of this parasitic disease, the economic impact in developing countries is considerable.

Malaria is increasing throughout many parts of the world for a variety of reasons, such as parasite and vector resistance to treatment chemicals, human migration to newly opened lands, and increased irrigation of agricultural areas.

Unfortunately, the human, technical, and financial resources necessary to combat this serious problem are dwindling rapidly. Countries and donor organizations are no longer able to promote large, vertical control programs. Therefore, ministries of health need to develop a pool of trained personnel that can delineate potential malaria outbreak sites and effectively use limited resources to reduce morbidity and mortality in affected communities.

The development of this pool of well-trained individuals depends upon the availability of skilled trainers and country-specific malaria training materials. A.I.D.'s VBC Project has developed a comprehensive malaria prevention and control module with resource material for over 20 weeks of training to assist countries in building the skills needed to combat malaria.

THE VBC TRAINING MODULE

The VBC malaria training module has five units. Each unit provides resource material, including session guides, references, 35mm slides or video tapes, for three to seven weeks of instruction on various aspects of malaria as well as training-of-trainers methods appropriate to the local situation. The five units are as follows:

Unit 1

Planning, Organizing, Monitoring, and Evaluating Malaria Control Programs

Unit 2

Collecting Basic Planning Data on Malaria Parasites and Anopheline Mosquitoes

Unit 3

Curative Services (Chemotherapy and Case Management)

Unit 4

Preventive Services

Unit 5

Epidemiological Monitoring and Evaluation of Malaria

FLEXIBILITY

The module gives program managers and trainers the flexibility to design courses that meet a country's specific training needs. Materials will be available in English, French, or Spanish.

WHAT CAN THE MODULE DO?

This comprehensive malaria training module is designed to:

- * Facilitate the structuring or restructuring of national malaria control programs
- * Provide up-to-date and practical training in the prevention and control of malaria country-wide
- * Demonstrate and reinforce the methods used to train others in the skills needed to carry out national malaria control programs
- * Expand the training resources available to national health ministries for sustainable training programs in malaria prevention and control.

AUDIENCE

The resource material in this module was developed for individuals who have had some experience or education in the prevention and control of malaria. Examples of personnel who might participate in one or more of the units of the module are as follows: National program headquarters staff, district health officers, entomologists, epidemiologists, parasitologists, physicians, nurses and microscopists.

TRAINING RESULTS

A major learning objective of all units is that participants will be able to train others in malaria prevention and control skills. Each of the five units also has specific learning objectives. For example:

By the end of Unit 1, participants will be able to set control program goals, relate malaria organization with other elements of the health system, and estimate training requirements.

By the end of Unit 2, participants will be able to describe the biology of local malaria vectors, identify the local vectors and parasites, and conduct baseline surveys to determine the prevalence of malaria.

By the end of Unit 3, participants will be able to recognize the various presentations of malaria, select the appropriate drug, and manage cases of severe malaria.

By the end of Unit 4, participants will be able to select appropriate biological or chemical agents to control local vectors, to formulate an integrated control program, and evaluate community control actions.

By the end of Unit 5, participants will be able to determine necessary data for monitoring a malaria control program, collect accurate data, and analyze and present data to malaria control staff.

USING THE MODULE

The malaria training module is a comprehensive resource for developing a sustainable training program in the control and prevention of malaria. To most effectively transfer this module to participating countries, the Vector Biology and Control Project suggests the following implementation plan:

1. A two-person team, one malaria expert and one training expert, conducts a detailed needs assessment of the country's vector-borne disease program in concert with ministry of health counterparts.
2. This joint team determines specific malaria training needs in the country and recommends possible curricula and training audiences.
3. Units within the module are tailored to the team's recommendations.
4. Trainers conduct the course.
5. Six months later, trained MOH staff teach a follow-up course with support from a VBC team.
6. Specific parts of module are duplicated and left with trained MOH staff.

Training on Sand Fly and *Leishmania* Surveillance

1. Population dynamics (2 hours; classroom/laboratory)
 - a. Assessing the population densities and age structure of adult female and male sand fly populations.
 - b. Effects of extrinsic factors (rain, temperature, photoperiod).
2. Factors affecting transmission rates (2 hours; classroom;laboratory)
 - a. Vectorial capacity
 - b. Transmission season
 - c. Transmission site
 - d. Human biting index (HBI)
 - e. Entomological inoculation rate (EIR)
3. Criteria for incriminating a vector (1 hours; classroom/laboratory)
4. Sand Fly Surveillance Techniques (for 8-day period; field)
 - a. Species diversity — sticky papers
 - b. Adult dispersion behavior and flight range — mark-release-recapture.
 - c. Breeding sites — emergence traps
5. Sand Fly Taxonomy (for 8-day period; classroom/laboratory)
 - a. Preparing and mounting specimens;
 - b. Structural terminology/male
 - (1) external morphology
 - (2) internal morphology
 - c. Structural terminology/female
 - (1) external morphology
 - (2) internal morphology

- d. Using a dichotomous key
6. *Leishmania* surveillance (for 8-day period; classroom/laboratory)
- a. Dissecting and examining sand flies
 - b. Recognizing *Leishmania* amastigote and promastigote forms (examining stained slides)
 - c. Characterization/identification of sand fly isolates (review of previous results)
7. Host preference studies (for 8-day period; field and laboratory)
- a. Host bloodmeal analysis (include review of previous results)
 - b. Human biting index

Physical Facilities: Detailed Recommendations

The following are detailed recommendations for the physical facilities at Hetauda. Many of these have been noted on the blueprints by Mr. B.N. Pradhan.

1. To facilitate training and research activities at the MRTC, electrical outlets should be positioned close to the point of use, and special outlets should be provided for air conditioners and refrigerators. (Exact placement of the outlets is noted in the modified blueprints which are available from Mr. B.N. Pradhan, USAID engineer).
2. To guard against electrical shock, electrical outlets placed directly below wash basins and water faucets should be removed. Also, all electrical outlets should be checked for proper grounding and polarity.
3. To provide emergency power to the research and training buildings, a 30 KV, diesel generator and appropriate transformer for the building complex should be provided and housed in a new building (2 x 3 meters) behind the research building.
4. To provide additional security measures, outside lighting should be placed in front and behind all major buildings.
5. To allow washing of lab glassware and equipment, the faucets above the wash basins should be raised 25 cm.
6. To allow washing and drying of clothes by the students, sinks and clothes drying racks should be placed on the roof of the dormitory.
7. To provide hot water for cage cleaning and for guest faculty, geyser (hot water) tanks should be placed in the work room of the research building and the guest faculty bathrooms.
8. To ensure the health of staff and students, the potability of the water from both the Hetauda town water system and the new 3-meter well at the center should be routinely checked. If the water in the well is unsafe, the well should be dug to a depth of 9 meters. Staff and students should be appraised of water potability, and no water fountains should be installed if the water quality cannot be assured or maintained.
9. To provide constant water pressure to the research laboratory and insectarium, a rooftop tank water should be installed.
10. To prevent mosquito breeding in the water holding tanks, all rooftop tanks should be screened around the top entrance hole.

11. To prevent contamination of environment and to prevent escape of larval mosquitoes from the insectarium, all waste (grey) water from wash basins in the research building should be routed through the soak pits.
12. To detect leaks in the rooftop tanks, water pipes and faucets throughout the center, all tanks should be filled and water pipes and faucets used over a 2-week period.
13. To ensure the privacy and security of female students, a partition on the second floor of the dormitory should be constructed at the entrance of the south wing. Also, a common room should be established for the female students in the bedroom (#20) located across from the staircase.
14. To provide cross ventilation of dormitory rooms and the guest faculty quarters, the glass partition above the door transom should be hinged and a separate screened partition installed.
15. To prevent disease transmission and annoyance by mosquitoes and flies, all windows, doors, exhaust fans, and vents should be screened throughout all the buildings of the center. This is particularly important for the research building and the dormitory dining area.
16. To prevent erosion and excessive dust, turf should be planted throughout the dirt areas of the center, and a low brick retaining wall constructed around the central grounds. Also, trees and bushes should be planted to provide shade and landscaping.
17. To prevent excessive fly breeding, odor, and pollution, an high-temperature incinerator for dry waste and a compost pit for wet kitchen waste should be established and properly maintained in the northwest corner of the center grounds. No other dumping site should be established and used by staff and students.
18. To reduce health and safety risks at the center, the two old latrines and the old, rusty storage shed should be totally removed and the holes covered over.
19. To allow better access to the small room in the isolation laboratory on the second floor of the research building, the door should be replaced with a standard-sized door.
20. To ensure the separation of mosquito adults by species in the insectarium, four, walk-in, screened rooms (1.2 m wide x 3 m long x 2.5 m high) should be built. For the mosquito larvae, three, walk-in, screened rooms (1 m wide x 3 m long x 2.5 m high) should be built.
21. To supplement maintenance and repair costs of the center, a method of reimbursement for the use of the dormitory and classroom facilities by other organizations should be developed.

ANNEX D

Detailed Recommendations for Equipment and Supplies

ANNEXES D.1 - D.4 are tentative¹ recommendations based on a projected US\$150K budget for equipment/supplies and library materials for the Hetauda center.

ANNEX	DESCRIPTION	SOURCE	TOTAL (est.)	SHIPPING (15% total)
D.1	Teaching Materials:			
1.1	Equipment - Projectors, 15 dissection microscopes	Local purchase Olympus	20,556.00	3,084.00
1.2	Supplies	Local purchase	2,000.00	na
1.3	Library books & journals	See ANNEX G	10,000.00	1,500.00
D.2	Communication/Data Processing:			
2.1	Computers and printers	Local purchase	22,882.00	3,432.00
2.2	Fax machine	GSA	425.00	60.00
D.3	Laboratory Equipment:			
3.1	Refrigerators/freezers	Local purchase	2,070.00	na
3.2	Air conditioners/heaters	Local purchase	5,720.00	na
3.3	Humidifier	Sears	420.00	63.00
3.4	Microscopes	Olympus-GSA	16,500.00	2,475.00
3.5	Equipment	Thomas Scientific	4,536.00	680.00
3.6	Equipment	Cole-Parmer	3,220.00	485.00
3.7	Equipment	Sigma	1,973.00	300.00
3.8	Equipment	Collection - ento	4,000.00	600.00
3.9	Micropipettes	Rainin	3,300.00	495.00
3.10	Microtiter plate reader	Molecular Devices	9,780.00	1,476.00
3.11	Equipment	Foredam	412.00	60.00
3.12	Equipment	Collection - camping	1,000.00	150.00
3.13	Dry shipper system	Cole-Parmer	2,352.00	350.00
3.14	Autoclave	USA	5,000.00	750.00
3.15	Liquid nitrogen freezer	Cole-Parmer	5,600.00	840.00
D.4	Expendable Supplies:			
4.1	Supplies	Local purchase		
4.2	Supplies	Cole-Parmer	841.00	126.00
4.3	Supplies	Thomas Scientific	4,877.00	732.00
4.4	Supplies	WHO	600.00	90.00
4.5	Supplies	Bio-Rad	757.00	114.00
4.6	Supplies	Kontes	500.00	75.00
4.7	Supplies	Dynatech	533.00	80.00
4.8	Supplies	Sigma	162.00	25.00
4.9	Supplies	Kirkegaard & Perry	2,390.00	359.00
		Subtotals:	\$132,405.00	\$19,861.00
		TOTAL:		\$152,266.00

¹ Details will continue to be updated and communicated to USAID/Nepal.

Teaching Materials

1.1	Teaching Equipment (<i>estimated costs</i>)		
	a. Projection, etc		
	Projector, 35-mm slide, Kodak carousel	3	250.00 750.00
	Kodak projector bulb	12	4.00 48.00
	Slide carousel, Kodak	6	15.00 90.00
	Projector, overhead	3	250.00 750.00
	Overhead projector bulb	12	4.00 48.00
	Projector cart (see C-P order # G-47351-00)		
	Video player, Hitachi (Rs23,500)	2	470.00 940.00
	TV, Sanyo, 21-inch, color (Rs37,500)	2	750.00 1,500.00
	Video cart	2	250.00 500.00
	Microscopes, dissection, Olympus model xxx	15	1,000.00 15,000.00
	Microscopes lights, 240 V	15	100.00 1,500.00
			Subtotal: \$20,555.60
1.2	Teaching Supplies (<i>local purchase</i>)		
	Telephones	10	
	Extension cord, 10 socket, 2 m cord, for use microscopes	5	
	Blackboard erasures	10	
	Chalk, white & colored		
	Glass slides, microscope, 1x3"		
	Marking pencils		
	Clocks, classroom		
	Methanol		
	Ethanol		
1.3	Library books and journals		
	(<i>See list of titles in ANNEX G</i>)		
			Subtotal \$1,500.00

ANNEX D.2

Communication and Data Processing Equipment and Supplies

2.1 Computers, printers, UPSs, etc. (estimated costs² only) Local purchase required.

1) Computer , MS-DOS, 486DX2, 50 MHZ, 8 MB RAM, 270 MB HD, 1.44MB 3.5" FD, 1.2MB 5.25" FD, 2 serial/1 parallel ports, mini tower, fax/data modem, 101 Kbrd, 14" Super VGA color monitor, 220 volts/50-60 Htz, MS-DOS 6.2, Windows 3.1, mouse (e.g. Compaq Presario 850DX2)	4	3,000.00	12,000.00
2) Printer , laser, 4 ppm, 600 dpi resolution, 16 RISC processor 2 MB standard memory, serial/parallel interface, 220 volts, 50-60 Htz (e.g., Hewlett-Packard 4P).	2	1,250.00	2,500.00
3) Cable , laser printer-computer	2	25.00	50.00
4) Toner cartridge for laser printer	4	125.00	500.00
5) Printer , dot matrix, 24-pin, 250 cps draft speed 90 cps letter quality speed, 360x360 dpi resolution, 8K buffer, parallel interface, 220 volts/50-60 Htz (e.g., Epson LQ-570)	2	300.00	600.00
6) Cable , dot matrix printer-computer	2	25.00	50.00
7) Ribbons , dot matrix printer	6	8.00	24.00
8) Power stabilizers , 220 volts, 50-60 Htz, 1800 watts, 6 outlets	4	300.00	1,200.00
9) Battery back-up systems , 220V, 50-60 Htz, 1250 VA, 4 outlets	4	750.00	3,000.00
10) Disks , 3.5" DS/HD (10 disks/pkg)	6	8.00	64.00
11) Disks , 5.25" DS/HD (10 disks/pkg)	6	8.00	64.00
12) Disk case , 3.5", 50 disk capacity	4	10.00	40.00
13) Disk case , 5.25", 50 disk capacity	4	10.00	40.00

² Items to be purchased with 3 year maintenance/repair contracts.

14) **Software:**

a) WordPerfect 5.2 for windows	2	300.00	600.00
b) WordPerfect 5.2 for DOS	2	300.00	600.00
c) Lotus 1-2-3 for Windows, Rel. 4	1	350.00	350.00
d) dBase IV, v. 2.0 for DOS	1	600.00	600.00
e) Harvard Graphics for Windows	1	300.00	300.00
f) Epimap	1	50.00	50.00
g) Nortontivirus 3.0	1	50.00	50.00
h) Modem software	1	250.00	250.00
		Total:	\$22,882.00

2.2 Fax machine

Fax machine with automatic paper cutter	1	400.00	400.00
Surge suppressor for phone line	1	25.00	25.00
		Total:	\$425.00

Laboratory Equipment

3.1 Refrigerators/freezers (-20 C) <i>Local purchase</i>			
Kelvinator, 165L (India-Rs18,500)	3	370.00	1,110.00
Freezer White Westing-House, 250L (-17 C) (USA Rs 48,000)	1	960.00	960.00
		Total:	\$2,070.00
<hr/>			
3.2 Air conditioners/heaters (2 cycle) <i>Local purchase</i>			
Westing-House (USA) 6,000 BTU (Rs ?)	1	800.00	800.00 est
Westing-House (USA) 12,000 BTU (Rs58,000)	2	1,160.00	2,320.00
Westing-House (USA) 18,000 BTU (Rs65,000)	2	1,300.00	2,600.00
		Total:	\$5,720.00
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3.3 Humidifier			
Sears, Roebuck & Co.			
Humidifier, belt type	2	200.00	400.00
Replacement belt	2	10.00	20.00
		Total:	\$420.00
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3.4 Microscopes			
Olympus Corporation			
IFA	1	8,000.00	8,000.00
Compound (phase)	1	3,000.00	3,000.00
Dissection	2	2,500.00	5,000.00
Fiber optic lamps	2	250.00	500.00
		Total:	\$16,500.00
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3.5 Equipment			
Thomas Scientific			
P. O. Box 99; Swedesboro, NJ 08085-6099			
Phone: 609-467-2000; Fax: 609-467-307			
1333-A01	Balance, Acculab Pocket Pro C/50, 0.002 g graduation	1	425.00
2517-H15	Centrifuge, micro hematocrit, IEC Model MB, 240V, 50/60 Hz	1	1,360.00
5994-C40	Hot plate, 7x7 in, 240V	6	143.00
6106-Z03	ELISA plate washer, 8 channel	1	315.98
8614-M50	Stirrer-hot plate, 7x7 in Cimarec top, 240V	2	271.00
9842-A28	Immersion circulator, Lauda Model B, 230V	1	1,035.00
		Total:	\$4,535.98

3.6 Equipment

Cole-Parmer Instrument Company
7425 North Oak Park Ave.; Niles, IL 60714 USA
Ph: 708-647-7600 (800-323-4340); Fax: 708-647-9660

G-79200-05	Pump, teflon-coated diaphragm, with gauges & controls, 220V	1	265.00	265.00
G-07061-02	Pump, diaphragm, with regulators, 230 V/50 Hz	1	415.00	415.00
G-59100-00	pH meter, ISFET transistor with electrode (battery operated)	1	595.00	595.00
G-09376-04	pH meter batteries, 4/pk	1	9.00	9.00
G-01325-10	Balance, dial-O-gram	1	155.00	155.00
G-01014-00	Attachment weight, 500 g	1	7.40	7.40
G-17250-10	Centrifuge, compact, 60-minute timer, 3,500 rpm	1	340.00	340.00
G-17250-50	Adapters, 10 ml tubes, 4/set	3	1.00	3.00
G-01578-05	Transformer, 230 to 115V, 250W	3	51.75	155.25
G-47351-00	Cart, 2 shelves	3	223.20	975.15
G-94351-05	Timer, corrosion resistant, 240 V	4	75.00	300.00
	Total:			3,219.80

3.7 Equipment

Sigma Chemical Company
P.O. Box 14508; St. Louis, MO USA 63178-9916
Ph: 314-771-5750 (800-325-3010); Fax: 314-771-5757 (800-325-5052)

C4548	Calculator, Model TI-1775, solar	2	15.95	31.90
C7177	Chemical spill kit, 5 gal	2	38.00	76.00
G9025	Goggles, splashgard	2	8.15	16.30
I7763	Ice tub, mini	2	20.50	41.00
M0537	Microcentrifuge, Costar Model 10 MVSS, 220V	1	595.00	595.00
P3424	Pipet, 12-channel, 5-50 ul	1	689.00	689.00
P3549	Pipet, 12-channel, 50-300 ul	1	689.00	689.00
R0891	Rack, 1.5 ml tube, 8x12 array	2	11.95	23.90
S0268	Stirring bar assortment	1	23.00	23.00
T6039	Timer, Model T-7	4	10.00	40.00
T4287	Tweezers, Style #3C	10	16.80	168.00
T4537	Tweezers, Style #5	10	17.50	175.00
Z12,100-2	Vortex mixer, 240V	2	231.00	231.00
	Total:			\$1,973.00

3.8 Equipment, entomological collection:

Light traps (with bags, batteries, etc.)

Storage system - insect collection

Collection equipment (aspirators)

Mounting supplies (pins, minutens)

Vials, glass, screw cap

Vials, plastic

Cages

Emergence traps

Dissection kits

Slide labels

Flash lights

Total: \$4,000.00

3.9 Micropipettes

Rainin Instrument Co., Inc.

Mack Road, Woburn, MA 01801

Phone: 617-935-3050/800-472-4646

P-20	Pipetman P-20	2	229.50	459.00
P-100	Pipetman P-100	2	229.50	459.00
P-200	Pipetman P-200	2	229.50	459.00
P-1000	Pipetman P-1000	2	229.50	459.00
P-10ML	Pipetman P-10ML	2	269.50	459.00
RT-96	Tips, 200 ul, 960/pk	10	43.50	435.00
RT-200	Tips, 1000 ul, 960/pk	5	45.00	225.00
RC-10ML	Tips, 10 ml, 200/pk	5	45.00	225.00
R-100	Pipette stand	2	60.00	120.00
			Total:	\$3,300.00

(Open market prices given. GSA GS00F2546A expires Sept 30 1994).

3.10 Microtiter plate reader

Molecular Devices Corporation

4700 Bohannon Dr.; Menlo Park, CA 94025

Phone: 415-322-4700; Fax:

0200-0300	Emax reader, 405, 450, 490 & 650 nm filters installed, etc., 240V	1	8,200.00	8,200.00
?	Extra bulbs for Emax	2	100.00	200.00
9000-0043	Universal cable set	1	85.00	85.00
0200-0104	SOFTmax 2.2 for DOS	1	1,295.00	1,295.00
			Total:	\$9,780.00

3.11 Equipment

Foredom Electric Company
16 Stony Hill Rd.; Bethel, Connecticut 06801
Phone: 203-792-8622; Fax: 203-790-9832

GG-SC-30	GG machine, bench mounted, SCT speed control (\$295), No. 30 handpiece (\$59), 220/240 volt, 50/60 Hz	1	344.00	344.00
MK-2/7	Kit MK for above	2	17.00	34.00
Kit-20	Accessory kit, 35 piece	1	34.00	34.00
			Total:	\$412.00

3.12 Equipment - collection - camping

	Tents, 4 person, 2 each	2	300.00	600.00
			Total:	\$600.00

3.13 Dry shipper system

Cole-Parmer Instrument Company
7425 North Oak Park Ave.; Niles, IL 60714 USA
Ph: 708-647-7600 (800-323-4340); Fax: 708-647-9660

G-44300-02	Cryogenic dry shipper, 5 L	2	642.00	1,284.00
G-44300-62	Dry shipper carrying case, 5 L	2	228.00	456.00
G-03773-56	Storage dewar, 25 L	1	595.00	595.00
G-03755-60	Storage canes, 12/cs	3	5.50	16.50
			Total:	2,351.50

3.14 Autoclave (US manufacture)

	Autoclave, manual	1	4,000.00	4,000.00
			Total:	\$4,000.00

3.15 Liquid nitrogen freezer system

Cole-Parmer Instrument Company
7425 North Oak Park Ave.; Niles, IL 60714 USA
Ph: 708-647-7600 (800-323-4340); Fax: 708-647-9660

G-05094-4	Locator 4 freezer	1	2,536.00	2,536.00
G-05094-85	Locator 4 alarm, 240V	1	796.40	796.40
G-05094-52	Locator 4 roller cart	1	147.00	147.00
G-06754-55	Freezer box, Nalgene, 2", 4/pk	10	23.00	230.00
G-03755-10	Cryotubes, Nalgene, 2 ml, 450/cs	10	24.50	245.00
G-03778-30	Cryogenic refrigerator, 18 L	1	775.00	775.00
G-03773-56	Storage dewar, 25 L	1	595.00	595.00
G-03773-65	Roller base for 25 L dewar/18 L refrig.	1	123.00	123.00
G-03755-60	Storage canes, 12/cs	8	5.50	44.00
G-09113-02	Cryogloves, pr, medium	1	79.00	79.00
G-09964-40	Cryomarkers, 4/pk	2	9.10	18.20
			Total:	\$5,599.60

Expendable Supplies

4.1 Supplies - Local purchase

Carboys for insectary, 15-20 L	4	
Clocks for lab/lecture rooms	10	
Microscope slides, 1x3", 144/pk	10	
Microscope slide, 1x3", frosted end, 144/pk		
Cover slip, round, small		
Cover slip, round, large		
Cover slip, 22 x 22 mm, No. 1		
Cover slip, 18 x 18 mm, No. 1		
Cover slip, 24 x 40 mm, No. 1		
Cover slip, 24 x 60 mm, No. 1		
Dissecting forceps, straight	50	
Larval pans, 28 (W) x 50 (L) x 10 cm (D) (custom)	300	
Adult cages, metal stand, 40 x 40 x 40 cm	100	
Cloth mesh for adult cages	150	
Sodium hydroxide, 500 gm	1	
HCl, concentrated, 1 L	1	
Giemsa stain		
Giemsa staining buffer		
Water, drinking, for buffers, 12 L/cs	5	
Office supplies - scissors, stapler, tape, paperclips, pencils/pens, etc.		
	Total:	\$

4.2 Supplies

Cole-Palmer Instrument Company
7425 North Oak Park Ave.; Niles, IL 60714 USA
Ph: 708-647-7600 (800-323-4340); Fax: 708-647-9660

G-24450-10	Dessicant, 5 lb	1	35.00	35.00
G-37101-00	Thermohygrometer, digital	5	58.00	290.00
G-09376-00	Replacement batteries, AAA, 12/pk	2	10.00	20.00
G-03322-10	Psychrometer, sling, C, pocket	3	48.20	144.60
G-03322-60	Replacement thermometer, C, mercury	2	20.20	40.40
G-03322-82	Replacement wick, 200 mm x 6/pk	3	7.00	21.00
G-06499-70	Whirl-Pak, 3x7", 1000/cs	1	43.75	43.75
G-08612-00	Timer, 120 min, spring drive	4	40.00	160.00
G-086449-00	Clock/timer, two-channel	4	19.00	76.00
G-09376-16	Replacement battery	8	1.25	10.00
	Total:			\$840.75

4.3 Supplies

Thomas Scientific; P. O. Box 99
 Swedesboro, NJ 08085-6099
 Phone: 609-467-2000; Fax: 609-467-307

1530-L76	Beaker, 100 ml, 12/pk	1	33.60	33.60
1530-M31	Beaker, Kimax, 600 ml, 6/pk	1	23.76	23.76
1542-E48	Beaker, PP, 250 ml, 36/cs	1	101.70	101.70
1720-R20	Bottle, Nalgene, 1 L, 24/cs	1	108.80	108.80
1951-B11	Bulb, latex, 24/pk	1	9.50	9.50
1951-F20	Bulb, rubber, 2 ml, 36/pk	1	15.95	15.95
2412-B52	Capillary tube, heparinized, 12 vials/pk (200/vial)	1	52.59	52.59
2412-B62	Capillary tube, uncoated, 12 vials/pk (200/vial)	1	42.07	42.07
2412-F07	Critoseal, 6 boxes/cs	1	61.50	61.50
2415-D50	Blood lancets, 1,000/box	1	79.45	79.45
2591-F30	Tubes, 250 ul, 1000/box Eppendorf#22 36 440-5	1	69.00	69.00
2591-E60	Tubes, 1.5 ml, 500/box Eppendorf #22 36 380-8	2	18.00	36.00
2591-F72	Microtube rack, 1.5 ml, 4/cs	1	47.80	47.80
2610-L46	Tube, 15 ml, racked, sterile, 500/cs	1	146.30	146.30
2610-L54	Tube, 50 ml, racked, sterile, 500/cs	1	195.60	195.60
3110-J40	pH 4-9 Comparator paper, roll	2	3.75	7.50
3571-A15	Graduated cylinder, Nalgene, 25 ml	5	3.80	19.00
3571-A27	Graduated cylinder, 100 ml, 12/cs	1	63.60	63.60
3571-A35	Graduated cylinder, 500 ml	4	10.00	10.00
4120-M65	Buffer asst, pH 4, 7 & 10 (6 bt)	1	55.20	55.20
4890-A15	Erlenmeyer flask, 1 L, 6/cs	1	26.34	26.34
4949-J28	Flask, filter, 1 L, 6/cs	1	84.60	84.60
5762-C15	Gloves, small, 1000/cs	1	96.00	96.00
5762-C25	Gloves, medium, 1000/cs	1	96.00	96.00
5762-C30	Gloves, large, 100/box	2	12.00	24.00
6258-L70	Tape asst., 6 rolls/pkg	1	29.40	29.40
6672-A16	Cover glasses, No.1, 22x22mm, 10oz/cs	1	72.20	72.20
6686-S80	Micro slides, 3x1", frosted end, moisture barrier, 144/cs	5	16.29	81.45
6708-G08	Micro slide box, 25 slide, 12/box	2	28.00	56.00
6708-G28	Micro slide box, 100 slide, 12/box	1	65.77	65.77
6709-B50	Slide cabinet, 5,000 slides	1	134.00	134.00
7315-D45	Parafilm, 4 in. x 250 ft.	1	24.75	24.75
7320-A22	Pen, felt-tip, black, 12/box	2	24.60	49.20
7543-Q43	Pipet, 2 ml, sterile, 1000/pk	1	163.95	163.95
7543-Q56	Pipet, 10 ml, sterile, 250/pk	1	81.10	81.10

7683-T10	Pipet, repeater	2	350.00	700.00
7683-T27	Combtip, 1.25 ml, 100/box	1	89.95	89.95
7683-T29	Combtip, 2.5 ml, 100/box	1	89.95	89.95
7683-T47	Combtip, assortment, 100/box	1	89.95	89.95
7760-A62	Pipets, Pasteur, 9", 1000/cs	1	31.86	31.86
7775-B10	Pipet filler, Flip	4	15.00	60.00
7761-A51	Pipet, polyethylene, 500/pk	1	27.00	27.00
8333-N80	Spatula, semi-micro	4	5.00	20.00
8744-F82	Stopper, No. 8, 20/bag	1	16.65	16.65
8744-H10	Stopper assortment, 33/bag	1	19.35	16.65
8939-D20	Syringe, 3 ml, sterile, 100/bx	2	12.05	24.10
8939-D28	Syringe, 5 ml, sterile, 100/bx	2	22.70	45.40
8939-F12	Syringe, 1 ml, sterile, 100/bx	2	16.55	33.10
8945-D30	Destructclip	2	25.00	50.00
8956-B56	Needle, 26g x 1/2", 100/bx	2	10.15	20.30
8956-B84	Needle, 25g x 1", 100/bx	2	10.15	20.30
8956-C84	Needle, 22g x 1-1/2", 100/bx	2	10.15	20.30
9219-G42	Tube, sterile, 75x12, 500/cs	1	81.80	81.80
9296-N10	Thermometer, -15 to 100 C	5	6.30	31.50
9561-C85	Tubing, Tygon, 1/4x3/32 in, 50 ft/bx	1	79.65	79.65
9765-M55	Wash bottle, 250 ml, 6/pkg	1	11.65	11.65
9765-N22	Wash bottle, 500 ml, 6/pkg	1	14.10	14.10
			Total:	\$3,837.89

4.4 Supplies - World Health Organization

Insecticide kit, larval	2	150.00	300.00
Insecticide kit, adult	2	150.00	300.00
			Total: \$600.00

4.5 Supplies

Bio-Rad Laboratory
P.O. Box 1229; Melville, NY 11747
Phone: 516-756-2575 (800-424-6723); Fax: 516-756-2594

223-9312	MTP-34, racked pipet tips, 200 ul large orifice, 960 tips/box	10	33.15	330.15
223-9390	Titertubes, non-sterile, 960/box	10	29.05	290.50
223-9392	Titertube plugs, sterile, 960/box	5	15.55	77.75
223-9393	Titertube plugs, non-sterile, 960/box	5	11.65	58.25
			Total:	\$756.65

4.6 Supplies

Kontes Life Sciences Products

Spruce Street, P.O. Box 729; Vineland, NJ 08360

Phone: 609-692-8500 (800-223-7150); Fax: 609-692-3242

749520-0000	Pellet pestle with 1.5 ml tubes, 100/pk	5	50.00	250.00
749560-1500	Microtubes, 1.5 ml, 500/pkg	10	25.00	250.00
			Total:	\$500.00

4.7 Supplies

Dynatech Laboratories, Inc.

14340 Sullyfield Circle; Chantilly, VA 22021

Phone: (800) 336-4543; Fax: 703-631-7816

(GSA contract # GS00F4617A)

011-010-3650	Immulon 2, "U" well, 100/box	2	123.24	246.48
001-010-2401	PVC, "U" well, 100/box	2	99.84	199.68
001-010-5701	Sealers, plate, 100/box	2	43.35	86.70
			Total:	\$532.86

4.8 Supplies

Sigma Chemical Co.

P.O. Box 14508; St. Louis, MO 63178

Ph: 314-771-5750 (800-325-3010) Fax: 314-771-5757 (800-325-5052)

C0376	Casein, 500 gm	1	12.30	12.30
G7893	Glycerol, 500 ml	1	18.10	18.10
P1379	Polyoxyethylenesorbitan, mono-laurate (Tween 20), 500 ml	1	12.60	12.60
P4758	Phenol red, Na salt, 1 gm	5	4.65	23.25
P5379	Potassium phosphate, monobasic KH ₂ PO ₄ , 500 gm	1	22.55	22.55
S9888	NaCl, 1 kg	1	22.70	22.70
S0876	Sodium phosphate, dibasic, anhydrous Na ₂ HPO ₄ , 500 gm	1	19.95	19.95
Z11,840-0	Syringe, 50 ml, 30/pkg	1	29.60	29.60
			Total:	\$161.05

4.9 Supplies

Kirkegaard & Perry Laboratories, Inc.

2 Cessna Court, Gaithersburg, MD 20879

Ph: 301- 948-7755 or (800-638-3167); Fax: 301-948-0169

(Check on government discount.)

074-1006	HRP anti-human IgG (H+L), 1 mg	2	98.00	196.00
14-12-06	HRP anti-bovine IgG (H+L), 0.5 mg	2	110.00	220.00
14-19-06	HRP anti-dog IgG (H+L), 0.5 mg	2	110.00	220.00
14-24-06	HRP anti-chicken IgG (H+L), 0.5 mg	2	105.00	210.00
14-13-06	HRP anti-goat IgG (H+L), 0.5 mg	2	105.00	210.00
14-21-06	HRP anti-horse IgG (H+L), 0.5 mg	2	110.00	220.00
14-23-06	HRP anti-sheep IgG (H+L), 0.5 mg	2	110.00	220.00
14-14-06	HRP anti-swine IgG (H+L), 0.5 mg	2	110.00	220.00
02-10-06	FITC anti-human IgG (H+L), 0.5 mg	2	50.00	100.00
02-12-06	FITC anti-bovine IgG (H+L), 0.5 mg	2	50.00	100.00
02-19-06	FITC anti-dog IgG (H+L), 0.5 mg	2	50.00	50.00
50-62-01	Peroxidase Substrate, 2.7 L	2	212.00	424.00
		Total:		\$2,390.00

Not requested:

Entomological collection equipment (light traps, sand fly/mosquito aspirators, pint/gallon ice cream cartons, dental dams, etc.);

Tents & camping supplies;

Incubators;

CO₂ tanks and regulators;

Culture hood;

Inverted scope;

Water purification system;

Spectrophotometer;

Drying oven.

Vehicles

It is recommended that the following be purchased:

- 1 four-wheel drive vehicle
- 1 double-cab pick-up with camper cover
- 2 motor cycles
- 2 bicycles

Because of the limited funds available (US\$ 30K projected), consideration should be given to purchase of Indian-manufactured TATA vehicles.

D.5	5.1	Vehicles	Local purchase	Total:	\$30,000.00
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Furniture

Summary of total quantities required:

<u>Item</u>	<u>Measurements</u> (in centimeters)	<u>Number</u>
Bed	50 h x 195 l x 95 w	77
Blackboard A	122 h x 122 l x 5 w	4
Blackboard B	122 h x 183 l x 5 w	2
Book shelves	183 h x 152 l x 25 w	3
Cabinet	186 h x 100 l x 60 w	12
Chair	45 l x 45 w (seat)	273
Chair, adjustable		64
Curtains	152 h x 198 l	30
Curtains, other	measurements vary	47
Desk	76 h x 118 l x 64 w	85
Desk lamp		2
File cabinet	4-drawer	14
Special bench A	100 h x 175 l x 50 w	4
Special bench B	30 h x 80 l x 80 w	1
Special metal rack A	175 h x 200 l x 60 w	4
Special metal rack B	180 h x 180 l x 45 w	5
Special metal rack C	180 h x 90 l x 45 w	3
Special metal rack D	180 h x 180 l x 45 w	4
Special metal rack E	180 h x 90 l x 45 w	4
Sota	3-seat	9
Tea table	small wood one	9
Table A	76 h x 244 l x 61 w	38
Table B	76 h x 213 l x 76 w	37
Wardrobe	180 h x 90 l x 40 w	83
White screen	122 h x 183 l x 0 w	4

Distribution of furniture:

<u>Item</u>	<u>Quantity</u>	<u>Total</u>
Dormitory		
Student bedroom		30 rooms
Bed	2	60
Wardrobe	2	60
Desk	2	60
Chair	2	60
Curtains	1	30
Small common room (2nd floor)		1 room
Table A	2	2
Chair	8	8
Large common room (1st floor)		1 room
Table A	4	4
Chair	12	12
Servant's room		1 room
Bed	1	1
Wardrobe	1	1
Desk	1	1
Chair	1	1
Curtains	1	1
Dining room (student)		1 room
Table A	8	8
Chair	40	40
Warden's Quarters		
Bedroom		1 room
Bed	2	2
Wardrobe	2	2
Desk	1	1
Chair	2	2
Curtains	1	1

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Kitchen 1 room

Table B 1 1

Sitting room 1 room

Table B 1 1

Sofa 1 1

Tea table 1 1

Chair 3 3

Curtains 1 1

Office 1 room

Table B 1 1

Desk 1 1

Chair 6 6

File cabinet 1 1

Curtains 1 1

Visiting Faculty Quarters

Bedroom 2 rooms

Bed 2 4

Desk 1 2

Wardrobe 2 4

Desk Lamp 1 2

File cabinet 1 2

Chair 1 2

Curtains 1 2

Sitting room 2 rooms

Table B 1 2

Sofa 1 2

Tea table 1 2

Chair 4 8

Curtains 1 2

Kitchen 2 rooms

Chair 1 2

Chief's Quarters

Large bedroom 1 room

Bed	2	2
Wardrobe	2	2
Desk	1	1
Chair	2	2
Curtains	1	1

Small bedroom 1 room

Bed	2	2
Wardrobe	2	2
Desk	1	1
Chair	1	1
Curtains	1	1

Sitting room 1 room

Table B	1	1
Sofa	2	2
Tea table	2	2
Chair	4	4
Curtains	1	1

Kitchen 1 room

Table B	1	1
Chair	4	4

Staff Quarters

Large bedroom 2 rooms

Bed	2	4
Wardrobe	1	2
Desk	1	2
Chair	1	2
Curtains	1	2

Small bedroom 2 rooms

Bed	1	2
Wardrobe	1	2
Chair	1	2
Curtains	1	2

Sitting room 2 rooms

Sofa	1	2
Tea table	1	2
Chair	2	4
Curtains	1	2

Kitchen 2 rooms

Table B	1	2
Chair	4	8

Laboratory/Training Building

Inner office (2 on ground floor; 1 on first floor)

Table B	1	3
Wardrobe	1	3
Desk	1	3
Chair	1	3
File cabinet	1	3
Curtains	1	3

Corner office (2 on first floor)

Table B	1	2
Wardrobe	1	2
Desk	1	2
Chair	1	2
File cabinet	1	2
Curtains	1	2

Chief's office (1 on first floor)

Desk (large wood one)	1	1
Desk arm chair (wood one) 1	1	1
Chair (wood one)	2	2
Tea table	1	1
Sofa	1	1
Curtains	1	1

Store room (2 on first floor; next to corner offices)

Cabinets (wooden with doors)	6	12
File cabinet	1	2
Curtains	1	2

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Conference room (1 on ground floor)

Oval wood table	1	1
Chair (wood one)	12	12
Tea table	1	1
Sofa	1	1
Curtains	1	1

Library (1 on ground floor)

Table B	4	4
Book shelves (wood)	3	3
Desk	2	2
Chair	8	8
Curtains	1	1

Classroom (2 on ground floor)

Table A	9	18
Chair	34	68
Table top podium	1	2
Blackboard (on sliding track)	2	4
Screen (painted white wall) 1	2	2
Curtains	4	8

Training laboratory (2 on first floor)

Table A	1	2
Table B	8	16
Chair (adjustable with wheels)32	64	64
Blackboard (on sliding track)	1	2
Screen (painted white wall) 1	2	2
Curtains	3	6

Existing Office Building (New Research Lab and Insectarium)

Office (near stairs on first floor)

Table A	1	1
Desk	1	1
Chair	1	1
File cabinet	2	2
Curtains	1	1

Office (near ladder on first floor)

Table A	1	1
Desk	1	1
Chair	1	1
File cabinet	2	2
Curtains	1	1

Day room (on first floor between offices)

Table B	1	1
Wardrobe	2	2
Chair	4	4
Curtains	1	1

Hall (on first floor by ladder)

Wardrobe	1	1
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Infective room (very small lab on first floor)

Desk	2	2
Special bench B	1	1
Chair	3	3
Curtains	1	1

Isolation room (next to small lab on first floor)

Table B	1	1
Desk	1	1
Chair	4	4
Special bench A	1	1
Curtains	1	1

General lab (on first floor next to stairs)

Table A	2	2
Desk	1	1
Special bench A	2	2
Chair	5	5
Curtains	1	1

Animal room (on ground floor)

Table B	1	1
Special metal rack A	2	2

Work room (on ground floor)

Desk	1	1
Chair	1	1
Special metal rack A	2	2

Insectarium (on ground floor next to work room)

Desk	1	1
Chair	1	1
Special bench A	1	1
Special metal rack B	5	5
Special metal rack C	3	3

Insectarium (on ground floor next to animal room)

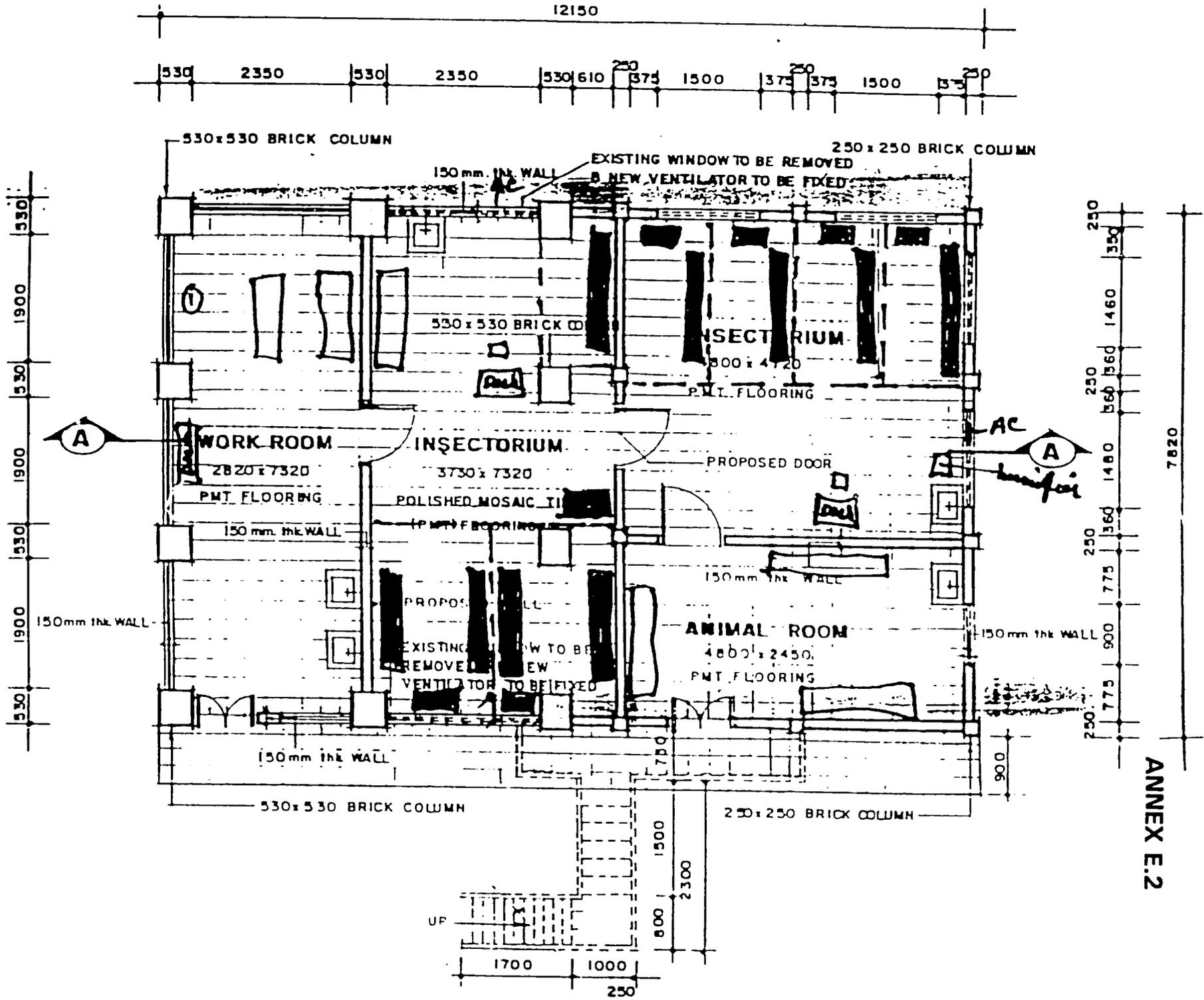
Desk	1	1
Chair	1	1
Special metal rack D	4	4
Special metal rack E	4	4

Insectarium Recommendations

The following is a detailed list of recommendations for the insectarium at the Hetauda center.

1. To maintain the necessary constant temperature environment for the mosquito colonies, 2-cycle (heating and cooling), air conditioning units should be installed in the two large rooms.
2. To maintain the necessary humid environment in the adult mosquito room, a humidifier should be used.
3. To maintain proper lighting for the mosquito colonies, incandescent lighting should be controlled by a timer.
4. To ensure continuous functioning of the air conditioners, humidifiers, and lights, a large capacity (i.e., 30 KV) generator should be installed as a backup to the normal electrical supply. This large generator will also backup the electrical systems of the two research rooms in the research building and the four training rooms in the training building.
5. To keep mosquito species separate, walk-in, screened rooms should be constructed (see III. C. Recommendations, number 20).
6. To provide ready access to a water source for larval pan filling, making sugar water for adult mosquitoes, watering animals, and cleaning cages and pans, sinks should be installed in both insectarium rooms, the animal room, the work room, and animal room.
7. To provide a source of blood protein for the adult mosquito and sand fly egg production, an animal colony containing hamsters and guinea pigs should be established and maintained in accordance with accepted animal use procedures.
8. To support mosquito larval breeding, five large racks (180 cm long x 45 cm wide x 180 cm high) and three small racks (90 cm long x 45 cm wide x 180 cm high) should be built with six shelves each (25 cm apart). The eight racks will hold up to 234 pans which measure 28 cm wide x 50 cm long x 10 cm high, giving a rearing capacity for approximately 50,000 larvae and pupae.
9. To support adult mosquito and sandfly containment, four large racks (180 cm long x 45 cm wide x 180 cm high) and four small racks (90 cm long x 45 cm wide x 180 cm high) should be built with three shelves each (50 cm apart). The eight racks will hold up to 96 screened cages which measure 40 cm x 40 cm x 40 cm, giving a holding capacity for approximately 48,000 adults.
10. To ensure that the standard operating procedures for the insectarium are consistently carried out, a Junior Entomology Technician should be working full time in the insectarium and should be in charge of the Peon assigned to the insectarium.

E-3



ANNEX E.2

Insectarium Procedures — Mosquitoes

Rearing Procedures for Mosquitoes (Modified WRAIR Insectary SOP):

Note: The temperature of the insectarium (both the larval and adult room) should be kept at a constant 25 degrees Celsius. In addition, the adult room should be kept at a constant 80% relative humidity. The light and dark cycle should be set at 14 hours daylight and 10 hours darkness in both rooms. If mosquito mating problems occur, this light-dark cycle may have to be adjusted, or a simulated crepuscular period may have to be used by rheostat control of the incandescent lights.

1. Anopheles

a. Eggs

1) Egg collecting

Eggs are collected using small cardboard cups with filter paper (11 to 15 cm in diameter, medium grade filter paper). The paper is shaped into a cone by slitting the paper 2.5 cm to center. Fill cup half full with water. Place filter paper into cup with pointed end in water. Fold edges of filter paper over the edge of cup. Leave a little water in the center of the cone deep enough to encourage female mosquitoes to oviposit.

2) Egg hatching

Fill pans (28 cm wide x 50 cm long x 10 cm high) half full of water and let sit for four hours. Label and date pans. Remove eggs from adult stock cages after a 24-hour period. Place a soda straw which has been bent into a triangular shape in the center of the water surface. Straws will float on the water and keep eggs from collecting on the walls of the pan.

Pick out all dead adult mosquitoes from each egg collection cup. Carefully lift each filter paper out of the collection cup and rinse the 2-300 eggs onto the surface of the water into the center of the triangle (straw). Sprinkle about 1.7 grams of Tetramin or other suitable larval food onto the surface of the water after the eggs begin to hatch.

b. Larvae

The pans of larvae are fed daily with Tetramin or some other suitable larval food. The amount of food will depend on the species, the number of larvae, and the type of food. It is important to only put a small amount of food in with the early larval instars so that a scum due to excess food does not form on the surface of the water. Do not place food in pans that contain excess food. The scum should be removed from the surface of the water with an untreated (chemically) paper towel.

c. Pupae

After pupation has begun, separate pupae from the larvae by the use of a small bent screen or an eye dropper. Place the pupae in small cups containing clean water. The cups containing 2-500 pupae are then placed in the adult cages with proper labels stating species and date of pupation.

d. Adults

1) Sugar Feeding

A 10% sugar solution (100 mg of sugar to 1000 ml of water) is used to maintain adults. Extra sugar solution should be stored in a refrigerator to prevent mold and bacterial contamination. Cotton balls are used to provide sugar solution to the adult mosquitoes. When putting cotton balls on the top of adult cages, the excess sugar solution should be squeezed out. Place four cotton balls on the top of each cage.

2) Blood Feeding

Stock adult mosquitoes are kept in 40 cm x 40 cm x 40 cm screened cages. Mosquitoes should be 3 to 6 days old for the first blood meal. Hamsters or guinea pigs are used for a source of blood for the adult female mosquitoes. The host animal should be anesthetized with an appropriate anesthetic like 1 cc of Rompum/Vetalar/water solution (3 ml Rompum to 15 ml Vetalar to 48 ml of distilled sterile water). Keep in refrigerator, and use sterile syringes and needles. Each animal receives 1 cc IP.

After the animal has been anesthetized, shave the abdomen with electric clippers. Place the animal down on the stock adult cage for 30 minutes. Once mosquitoes have fed to repletion, remove the animal and place back into the animal room. Make sure the animal recovers from the anesthesia. Blood fed mosquitoes may be given a water (not sugar) pad after feeding. Eggs will develop in about 48 hours, depending upon the species ovarian cycle.

2. Aedes

a. Eggs

1) Egg collection

Eggs are collected using a waxed cardboard cup with filter paper. the paper is shaped into a cone by slitting the paper 2.5 cm to the center. Fill the cup half full of water. Place filter paper into cup with pointed end in water. Fold edges of filter paper over the edge of the cup. Leave a little water in the center of the cone deep enough to encourage mosquitoes to oviposit. Aedes will lay eggs right on the water line. The cups can be left in the cages for 3-5 days as long as the water level is checked.

When ready to remove the egg cups, lower the water level so that the eggs are not in direct contact with the water. Allow the eggs to sit for 24 hours like this to condition them. After this time period drain all of the water from the eggs and air dry for 24 hours. The eggs can be stored for approximately 3 months in a sealed plastic bag. Label bag by species and oviposition date.

2) Egg hatching

Fill the larval pans half full of water and let sit for 4 hours. Label and date the pans. Obtain a batch of dried eggs. Using a soft artists brush, gently brush eggs into a glass container with a screw top. Add warm water almost to the top and close container with a screw top. Shake the container for about 30 seconds. Allow the container to sit for 30 minutes. Once the eggs begin to hatch, place the larvae and eggs into the prepared larval pans. Place 2-300 1st instar larvae in each larval pan. Label pans and add a small amount of larval food to each pan.

b. Larvae

Feed the larvae with Tetramin or other suitable larval food, increasing the amount of food as the larvae go from 2nd to 3rd and 4th instars. If the water becomes cloudy, do not add more food until the excess food is consumed. Wipe the surface of the water with an untreated (chemically) paper towel to remove the scum.

c. Pupae

Once pupae have started to appear, remove the pupae using a small bent screen or eye dropper. Place pupae in paper cups containing clean water. Cups of pupae are placed in the stock adult mosquito cages (3-500 adults per cage). Label cages by species and date of pupation.

d. Adults

Use a 10% sugar solution (see above; Anopheles)

Mosquitoes should be 3 to 6 days old for the first blood meal. Hamsters or guinea pigs can be used as a source of blood. Follow the same procedures as above (Anopheles).

3. Culex

Rearing methodology of Culex will depend upon the species. For example, Culex quinquefasciatus females usually oviposit in more organic water than Culex tritaeniorhynchus. However, both species lay egg rafts on the surface of water. Therefore, there is no need to use filter paper cones as used with the Anopheles and Aedes colonies. Simply place a small paper cup containing either organic water or clean water in the stock cage. Approximately two to three egg rafts from the small cup should be placed in each larval pan. Other rearing procedures are the same as for the Anopheles and Aedes colonies.

4. Schedule for Insectarium

- a. Sunday
 - 1) Change sugar pads.
 - 2) Place egg collecting cups into adult cages.
 - 3) Separate pupae and record data.
 - 4) Fill humidifier.
 - 5) Feed larvae.
 - 6) Feed adult female mosquitoes on animals.

- b. Monday
 - 1) Collect eggs from adult cages.
 - 2) Set up eggs in pans.
 - 3) Change sugar pads.
 - 4) Feed larvae.
 - 5) Separate pupae.
 - 6) Fill humidifier.

- c. Tuesday
 - 1) Change sugar pads.
 - 2) Separate pupae.
 - 3) Feed larvae.
 - 4) Fill humidifier.

- d. Wednesday
 - 1) Change sugar pads.
 - 2) Separate pupae.
 - 3) Set up pans of Aedes eggs.
 - 4) Fill humidifier.
 - 5) Feed larvae.
 - 6) Set up egg cups.

- e. Thursday
 - 1) Change sugar pads.
 - 2) Separate pupae.
 - 3) Feed mosquitoes on animals.
 - 4) Feed larvae.
 - 5) Fill humidifier.
 - 6) Set up eggs in larval pans.

- f. Friday/Saturday
 - 1) Separate pupae.
 - 2) Feed larvae.
 - 3) Fill humidifier.
 - 4) Record data.

Insectarium Procedures — Sand Flies

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RECENT ADVANCES IN LABORATORY MASS REARING OF PHLEBOTOMINE SAND FLIES*

P.G. Lawyer (1), E.D. Rowton (1), P.V. Perkins (1), R.N. Johnson (2),
D.G. Young (3).

(1) Department of Entomology, Division of Communicable Diseases and Immunology, Walter Reed Army Institute of Research, Washington, D.C. 20307-5100; (2) US Army Medical Research Unit- Kenya, Nairobi, Kenya; (3) Department of Entomology & Nematology, University of Florida, Gainesville, Florida.

Abstract - Recent technical and procedural advances in mass rearing of sand flies have resulted in larger, healthier, and less labor-intensive colonies. We now maintain closed colonies of *Phlebotomus papatasi*, *P. duboscqi*, *P. argentipes*, and *Lutzomyia longipalpis* which produce up to 1,000 females per week, in excess of colony-maintenance requirements, for use in research. Advances include larval food preparation in acrylic-plastic incubator cabinets, strict regulation of food quantity and moisture in 500-ml plaster-lined rearing jars, use of large plaster-lined adult holding/mating cages and vacuum-powered aspirators for trauma-free handling of adults.

INTRODUCTION - Laboratory sand fly colonies - are essential for studies on vector potential, *Leishmania* life-cycles and transmission dynamics, as well as for studies on vaccine development, vector biology, physiology and behavior, repellent testing, and insecticide and attractant screening. Until the early 1980s, less than a dozen closed colonies of about six species were available (Hertig & Johnson, 1961; Johnson & Hertig, 1961; Chantotis, 1975; Gemetchu, 1976; Killick-Kendrick et al., 1977; Ward, 1977; Ready and Croset, 1980). Labor-intensive maintenance and low productivity limited their usefulness for leishmaniasis research.

Over the past decade we have successfully mass-reared 7 neotropical and 6 paleotropical sand fly species. Some colonies were started from existing ones maintained by other researchers, while others were started from field-collected material. We currently maintain 4 working colonies (*Phlebotomus papatasi*, *P. argentipes*, *P. duboscqi*, *Lutzomyia longipalpis*), and have initiated 4 others (*Sergentomyia clydei*, *S. schwetzi*, *Lu. flaviscutellata*, and *Lu. ovallesi*). In this report we emphasize advancements that enable production of sand flies in excess of colony maintenance requirements to accommodate experiments requiring up to 1,000 females per week of similar age.

COLONIZATION PROCEDURES - Colony-maintenance procedures currently used are based largely upon the methods of Endris et al. (1982).

Rearing conditions - Colonies are maintained in reach-in incubators (Forma Scientific, Marietta, Ohio, USA) at 24°C and 80% relative humidity (RH). Except when the incubator doors are open during daily colony maintenance activities, the flies are kept in the dark.

* The views of the authors do not purport to reflect the position of the U.S. Department of the Army or Department of Defense. Research was conducted in compliance with the Animal Welfare Act and other Federal statutes and regulations relating to animals and experiments involving animals and adheres to principles stated in the "Guide for the Care and Use of Laboratory Animals", NIH publication 85-23.

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Operational Research Topics

The following is a brief list of operation research topics which could be pursued by the MRTC staff. Some of these could be developed into grant proposals for submission to international funding agencies.

- Topic: Comparative evaluation of methods for the identification and monitoring of kala-azar infections in humans.
- Topic: Identification of kala-azar vector habitat for development of selective sand fly control methods.
- Topic: Comparative evaluation of the traditional "hand" method, use of a thermometer and case history methods for identification of malaria and kala-azar infections.
- Topic: Studies of kala-azar and malaria transmission in ecological disturbed areas associate with population migration and building of the Arun III Hydroelectric Project. (Asia Development Bank).
- Topic: WHO reference laboratory for identification and monitoring of drug resistance in malaria and leishmania parasites and insecticide resistance in the vectors of these diseases.
- Topic: Studies on vector bionomics for use in development and application of selective methods for the control of kala-azar and malaria.
- Topic: Plasmodium vivax circumsporozoite polymorphs: distribution, vectors and recrudescence.
- Topic: The bionomics of high altitude Plasmodium vivax: vectors and molecular biology.
- Topic: Malaria prevention and treatment options at household level, including the use of insecticide impregnated bed nets.
- Topic: Improved methods for clinical differentiation of malaria from other causes of fever.
- Topic: Traditional practices for vector-borne disease prevention and treatment.

Library Book List

JOURNALS:

The Team recommends that each journal be prepaid for a five year subscription. The approximate total cost for the five-year subscriptions is \$3000.00. The following journals are recommended:

- American Journal of Tropical Medicine and Hygiene.* American Society of Tropical Medicine and Hygiene, 60 Wayne Avenue, Suite 500, Northbrook, IL 60063 (\$170/yr; price subject to increase in 1994; \$170 x 5 yr = \$850.00).
- Indian Journal of Malariology.* Indian Council of Medical Research, Malaria Research Centre, 22 Sham Nath Marg, Delhi 1110 054 India (Rs 75/yr or \$20; \$20 x 5 = \$100.00).
- Journal of the American Mosquito Control Association.* American Mosquito Control Association, P.O. Box 5416, Lake Charles, LA 70606 (\$85.00/yr plus \$30.00 overseas airmail; \$115 x 5 = \$575.00).
- Journal of Medical Entomology.* Entomological Society of America, P.O. Box 177, Hyattsville, MD 20781 (\$150.00/year plus \$20.00 for overseas shipping; \$170 x 5 = \$850.00).
- Nepal Medical Association Journal.* Siddhi Sadan Exhibitor Road, GPO 189, Kathmandu, Nepal. (\$24.00/yr; \$24 x 5 = \$120.00).
- Southeast Asian Journal of Tropical Medicine.* SEAMEO Regional Tropical Medicine and Public Health Network, 420/6 Rajvithi Road, Bangkok 10400 Thailand. (\$50/yr; \$50.00 x 5 = \$250.00).
- Transactions of the Royal Society of Tropical Medicine and Hygiene.* Royal Society of Tropical Medicine, 26 Portland Place, London W1N 4EY, Great Britain (£96.00/yr or about \$144.00/yr; \$144 x 5 = \$720).

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(Sigma W-0627: \$25.00)

Suggested sources:

Cole-Parmer (C-P) Instrument Co., 7425 North Oak Park Ave., Niles, IL 60714; Ph: 708-647-7600(800-323-4340); Fax:708-647-9660

Sigma Chemical Co., P.O. Box 14508, St. Louis, MO 63178
Ph: 314-771-5750 (800-325-3010); Fax: 314-771-5757 (800-325-5052)

World Health Organization, Distribution and Sales, 1211 Geneva 27, Switzerland.