

# ANNUAL REPORT 1999 - 2000



**REGIONAL MEDICAL RESEARCH CENTRE, NE REGION**  
(INDIAN COUNCIL OF MEDICAL RESEARCH)  
DIBRUGARH - 786 001  
ASSAM (INDIA)

**MISSION**

**Develop Bio-medical Research in North-Eastern States of India and Buildup Scientific Man Power**

**AIM**

To carry out bio-medical research in priority areas based on following guidelines :

- ▷ Diseases having priority in National Health Programme**
- ▷ Diseases common in two or more states of the northeastern region**
- ▷ Diseases unique to the northeastern region**
- ▷ Exploration of traditional knowledge**

**OBJECTIVES**

**To promote bio-medical research in priority areas, which are of immediate relevance and importance to the people of northeastern region**

**To train and build up technical manpower in health sector in northeastern region**

**To liaison with local health authorities in finding solution to regional health problems**

**To collate information for effective traditional system of medicine among the local tribal population and provide suitable guidance regarding manufacture of efficacious drugs**

## **CURRENT FOCUS OF RESEARCH**

### **(a) Primary focus**

**Mosquito Borne Diseases**

**HIV and Drug Abuse**

**Trematode infections**

**Haemoglobinopathies**

### **(b) Secondary focus**

**Cancers (Nasopharynx, Oesophagus, Stomach)**

**Cardiovascular diseases and Hypertension**

**Medicinal plants of NE India**

**Iodine Deficiency Disorders / Nutrition**

## **FUTURE FOCUS**

- 1. Networking of health facilities of 8 NE states**
- 2. Building of data bank in biomedical research of NE region**
- 3. Establishment of Public Health/Operational Research cell**
- 4. Establishment of high technology research set up**

**For HIV and Drug Abuse research**

**For molecular epidemiology in diseases having significance for the region**

**For Medicinal Chemistry section**

- 5. To develop Regional animal Facility**
- 6. To develop international collaboration on identified areas**

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## **STAFF POSITION**

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#### **1.DIVISION OF VIROLOGY**

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**SUPPORTING STAFF :**

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Sri P.C.Gogoi	Sri A.K.Das
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# RESEARCH WORKS (1999-2000)

## I) NON COMMUNICABLE DISEASES

### 1. STUDIES ON PREVALENCE AND PATTERN OF TOBACCO AND OTHER SUBSTANCE USE IN NE STATES

The study on prevalence and pattern of substance use was continued in the remaining three PHC areas of Changlang district of Arunachal Pradesh during this year. Survey was carried out in the 10 randomly selected villages of the three PHC areas. Total 258 households were selected by using the method of systematic sampling and head of the household or a senior person was interviewed to collect general information, whereas habits of substance use (like sada, bidi, cigarette, alcohol, opium etc.) were recorded from all the family members (age 10 year and above).

Distribution of substance users across various categories are presented in Table-1. Of the 1112 respondents, prevalence of substance use was 27.9% tobacco (21.9% chewers and 10.2% smokers), 26.0% alcohol and 3.9% opium. Tobacco use was high in Khersang (40.6%) followed by Khimiyong (35.5%) and Vijaynagar(5.9%) whereas alcohol use was high in Khimiyong (40.4%) followed by Khersang (33.7%) and Vijaynagar (6.2%). Prevalence of opium use was also high in Khimiyong (15.5%) followed by Khersang (1.0%). It appears that substance use in Vijaynagar was comparatively low as compared to other areas. Vijaynagar, situated close to Myanmar and China border, has no motorable link road. Transportation and movement of people mainly depend on Army sorties. Unique geographical settings and distinct cultural practices of Lisu tribe may have some impact to restrict substance use in this region.

Over all, substance use among males was higher (40.1% tobacco, 33.8% alcohol and 7.2% opium) than females (15.1% tobacco, 17.8% alcohol and 0.4% opium). Between tribal communities, substance use was higher (38.9% tobacco, 36.0% alcohol and 5.8% opium) in Tangsas than Lisus (5.9% tobacco and 6.2% alcohol) which were confined in Vijaynagar. Religion wise, substance use was high (38.0% tobacco, 59.2% alcohol and 16.9% opium) among followers of Indigenous faith (confined to Khimiyong close to Myanmar) followed by Hindus (38.5% tobacco, 40.9% alcohol and 5.4% opium) and Christians (16.2% tobacco, 7.4% alcohol and 0.6% opium). It appears that substance use pattern varies widely by sex, ethnicity and religion.

Pattern of substance use across various levels of education revealed that it was high in graduate and above (47.6% tobacco, 57.1% alcohol and 4.8% opium) followed by illiterates (32% tobacco, 28.2% alcohol and 4.3% opium) and matriculates (24.7% tobacco, 30.1% alcohol and 5.5% opium). Among various occupational groups, it was high among self-employed (53.7% tobacco, 42.7% alcohol and 9.9% opium) followed by employed (41.3% tobacco, 52.4% alcohol and 6.4% opium) and housewives (23.4% tobacco, 25.5% alcohol and 0.6% opium). Prevalence was low among students and unemployed. In different age groups of respondents, prevalence was high in 50 and above age (46.0% tobacco, 38.1% alcohol and 9.9% opium) and 30-49 years age group (41.2% tobacco, 38.2% alcohol and 3.7% opium). In younger and adolescents (10-29 years) the prevalence was low.



**Table-1: Distribution of substance users across various categories**

Categories	Percentage of Tobacco users			Alcohol users (%)	Opium Users (%)
	Chewer	Smoker	Total		
<b>Location</b>					
Khersang	36.6	11.1	40.6	33.7	1.0
Khimiyong	22.9	16.7	35.5	40.4	15.5
Vijohnagar	1.9	4.6	5.9	6.2	-
<b>SEX</b>					
Male	31.7	15.7	40.1	33.8	7.2
Female	11.8	4.4	15.1	17.8	0.4
<b>Tribe</b>					
Tangsa	32.0	13.0	38.9	36.0	5.8
Lisu	1.9	4.6	5.9	6.2	-
<b>Religion</b>					
Christian	12.6	7.4	16.2	7.4	0.6
Hindu	32.0	11.5	38.5	40.9	5.4
Indigenous	19.7	19.7	38.0	59.2	16.9
<b>Education</b>					
Illiterate	25.8	11.0	32.0	28.2	4.3
Primary	17.2	6.5	21.9	18.6	2.5
Middle	18.0	9.4	20.9	24.5	3.6
Metric	15.1	15.1	24.7	30.1	5.5
Degree +	23.8	23.8	47.6	57.1	4.8
<b>Occupation</b>					
Student	1.6	1.6	2.8	3.2	0.8
Unemployed	6.5	2.8	7.4	10.2	-
Housewife	18.4	6.5	23.4	25.5	0.6
Self-employed	42.4	20.9	53.7	42.7	9.9
Service	33.3	15.9	41.3	52.4	6.4
<b>AGE</b>					
10- 29 Year	13.0	6.1	16.5	16.9	2.0
30-49	33.5	13.2	41.2	38.2	3.7
50 +	34.6	18.8	46.0	38.1	9.9
<b>Total</b>	<b>21.9</b>	<b>10.2</b>	<b>27.9</b>	<b>26.0</b>	<b>3.9</b>

## **2. SOCIO-DEMOGRAPHIC AND BEHAVIOUR STUDY OF DRUG ADDICTS WITH PARTICULAR REFERENCE TO IDUs ALONG THE NATIONAL HIGHWAY OF ASSAM AND ARUNACHAL PRADESH**

The extent of drug abuse is very high in the north-eastern region of India. Although the number of drug addicts, particularly injecting drug users (IDUs), is continuously increasing due to the easy availability of drugs via

the golden triangle, not much is known about socio-demography of drug addicts. In view of its importance, a study was initiated to know the morbidity pattern of drug addicts; type of drugs or substances used by IDUs; socio-cultural, socio-economic background; psycho-social behaviour of the drug addicts along the National Highway no. 37 connecting Assam to Arunachal Pradesh. So far, surveys have been completed between Jagiroad and Doomdooma (~ 450 kms). Available information on drug addicts from various primary health centres, government hospitals, private nursing homes, leading private practicionors, NGOs and key informants i.e. ex drug addicts were collected. With the help of ex drug addicts, present drug addicts were identified from different places. A total of 29 drugs addicts were contacted and interviewed. Most of the drug addicts were in the age group of 20-35 years and 73.3% of them are married. Mostly they were illiterate or educated upto middle standard only and 26.6% of them were drop outs from school. 66.6% of the drug addicts were addicted to heroin and frequency of intake was several times a day. Chasing was the most preferred route of administration. However, some of them preferred intravenous route of administration.

### **3. A PILOT STUDY ON HYPERTENSION IN MIZORAM, ASSAM AND TEA GARDEN OF UPPER ASSAM**

To explore the magnitude of the problem of hypertension in tribal population of Mizoram, tea garden communities and indigenous Assamese population of upper Assam, a pilot study was carried out on two hundred and ninety four subjects aged 30 years and above. One hundred and fifty households were selected randomly representing 50 households from each locality inhabited exclusively by Mizos, indigenous Assamese and tea garden workers respectively in the north eastern region of India.

Some characteristics of the study population are presented in Table-2. Sample comprised of 33.3% Mizos, 31.6% Assamese and 35% tea garden workers. Illiterates were more among tea garden workers (78.6%) as compared to Mizos (8.2%) and rural Assamese community (41.9%). Alcohol consumption pattern also varied significantly among the communities. About 94.9% of Mizos did not take alcohol. On the other hand, 87.4% of tea garden workers indulged in alcohol consumption with 33% of them being heavy alcohol consumers. Mean body mass index (BMI) was higher in Mizos ( $21.7 \pm 3.8$  SD) and lowest in the tea garden workers ( $17.8 \pm 2.1$  SD). There were no obese persons in tea garden workers community whereas 14.3% of person were obese in Mizo community and 8.6% in Assamese community. Smoking was very common in Mizoram (prevalence 48%) and tea garden sample and Assamese community prevalence were 16.5% and 19.5% respectively.

For both systolic (SBP) and diastolic blood pressure (DBP) the variance ratio (F) for different ethnic groups was highly significant ( $p < 0.001$ ) (Table-3). This indicated that mean blood pressure level differed significantly among different ethnic groups. However, there was no statistically significant difference between male and female subjects. There was also no interaction between ethnicity and sex ( $p = 0.574$ ) of the subjects. Among the communities, mean SBP levels were significantly lower ( $p < 0.05$ ) in Mizos (SBP 110.7mm of Hg; 95% CI 107.0 to 114.3) than in rural Assamese community (SBP 123.5 mm of Hg; 95% CI 118.7 to 128.4) and tea garden community (SBP 130.1; 95% CI 124.4 to 135.9). Similarly, DBP levels were lowest in Mizo community (DBP 69.1 mm of Hg; 95% CI 67.0 to 71.1) and highest in tea garden workers (DBP 76.8 mm of Hg; 95% CI 74.5 to 79.1). Multiple comparison using Scheffe procedures showed that there was no significant difference in SBP ( $p=0.166$ ) or DBP ( $p=0.340$ ) between Tea garden workers and rural Assamese community.

The prevalence of hypertension was found to be 30.1% in tea garden community, 11.8% in Assamese community and 2.04% in Mizo community. After adjustment for age, anthropometric covariates (BMI, W-H ratio) and other risk factors like alcohol intake, smoking, salt consumption etc. the differences in mean SBP and DBP persisted in all the three ethnic groups (ANCOVA). However, after including physical exercise and hill climbing in

addition to the above covariates the significance of differences disappeared in males for both SBP and DBP. However, in the females and in the overall analysis, the differences in mean blood pressure level in the three communities persisted.

**Table-2: Characteristics of the study sample**

Variable	Mizo community (n=98)	Assamese Community (n=93)	Tea-garden labourer Community (n=103)
<b>Age-group :</b>	<b>%</b>	<b>%</b>	<b>%</b>
30 to 39	27.6	45.2	47.6
40 to 49	19.4	19.4	21.4
50 to 59	32.7	17.2	10.7
60 & above	20.4	18.3	20.4
<b>Occupation :</b>			
Service	30.6	18.3	1
Farmer	6.1	1.1(?)	0
Bussiness	5.1	5.4	1
Labourer	0	0	56.3
Others	58.2		41.7
% of illiteracy	8.2	41.9	78.6
<b>Alcohol consumption :</b>			
No	94.9	53.8	12.6
Ocassional	1	30.1	27.2
Moderate	4.1	5.4	27.2
Heavy	0	10.8	33
% of smokers	48	19.4	16.5
<b>Extra salt intake :</b>			
(Prevalence)	25.5	66.7	47.6
<b>BMI :</b>			
Under weight (BMI< 19.9)	38.8	60.2	88.5
Normal (BMI 20-24.9)	46.9	31.2	11.7
Obese (BMI > 25)	14.3	8.6	0

**Table-3 : Results of unbalanced ANOVA with two fixed effects applied to blood pressure levels in three ethnic groups of northeastern region of India**

B.P. Effect		df effect	df error	F	p-value
<b>Systolic BP</b>	Community	2	288	15.8	<0.0001
	Sex	1	288	0.922	0.338
	Community x Sex	2	288	0.555	0.574
<b>Diastolic BP</b>	Community	2	288	14.3	<0.0001
	Sex	1	288	3.7	0.06
	Community x Sex	2	288	0.17	0.08

#### **4. STUDIES ON HbE WITH SPECIAL REFERENCE TO MOLECULAR CHARACTERISATION OF HbE $\beta$ THALASSAEMIA IN SELECTED ETHNIC GROUPS OF NORTH-EAST INDIA**

One hundred and sixty two blood samples (77 male and 85 female) representing children and adolescent Mishings (n=52), Deoris (n=29) of Assam and Deb Barma (n=63), Bengali (n=16) and others (n=2) from Tripura were screened for haemoglobinopathies and thalassaemia. The overall gene frequency for  $\beta$ -E globin gene was 0.435, representing half the samples screened with HbE-heterozygous and 18.5% were with HbE-homozygous. None of the subjects was found with thalassaemia syndromes. Significantly lower ( $P<0.001$ ) level of haemoglobin was encountered in subjects with HbE-homozygous ( $9.24\pm 1.35$ g/dl) in comparison to subjects with normal haemoglobin pattern. Haemoglobin level in subjects with normal and HbE-heterozygous were  $11.48\pm 1.28$  and  $11.27\pm 1.27$  g/dl respectively.

The gene frequency for  $\beta$ -E globin gene among Mishings, Deori and Deb Barmah (of Tripura) were 0.404, 0.569 and 0.524 respectively. However, HbE was not found among the remaining ethnic groups of Tripura.

Studies were also conducted among Youbins (Lisu) of Arunachal Pradesh. This ethnic group was said to have migrated from China via Myanmar to a land lock area of Arunachal Pradesh called Vijoynagar Circle. The population of Youbins in Vijoynagar Circle is about three thousand. In screening for haemoglobinopathy only 1 Hb-E heterozygous subject was detected out of 78 samples screened. Remaining were with normal haemoglobin pattern.

Molecular characterization of blood samples representing a sample with HbE- homozygous with severe crisis, two subjects with HbE-heterozygous with various degree of complications, a sample with asymptomatic HbE-homozygous and two cases of HbE-homozygous with higher levels of HbF, were analysed in collaboration with Institute of Immunohaematology (ICMR), Mumbai. Reverse dot blot analysis indicated 4 cases with HbE homozygous and two with HbE heterozygous.

## **II) COMMUNICABLE DISEASES**

### **5. STUDIES ON FILARIASIS**

#### **5.1 Tea garden in Central Assam**

In continuation to earlier studies, filariasis survey was conducted in a tea garden of Bokakhat area located in Central Assam. A total of 656 finger pricked thick smears of night blood samples were collected between 20 00 and 24 00 hours and examined for the presence of microfilaria after processing and staining with 10% giemsa stain. A total of 31 subjects (males-24, females-7) were found mf positive (Table-4). Overall mf prevalence rate was 4.7% with mean mf count of 12.2 (range 1-60). Chronoc disease rare was found to be 4.7% which was comparatively higher in males. In morning indoor day resting collections per man hour density of *Culex quinquefasciatus* mosquito was 19.1 with infection and infectivity rates of 2.9%. However, in CDC light trap collection four species of mosquitoes viz. *Mansonia uniformis*, *Culex quinquefasciatus*, *Armigeres kuchigensis* and *An. hyrcanus gp.* Were recorded.

**Table-4 : Age and sex wise mf rate in Bokakhat tea garden in Central Assam**

Age Groups	Males				Females				Total			
	No Examined	+ve	Mf rate	Mf Density	No Examined	+ve	Mf rate	Mf Density	No. Examined	+ve	Mf Rate	Mf density
<=10	72	0	0	0	79	0	0	0	151	0	0	0
11-20	94	10	10.6	14.2	107	3	2.8	3.6	201	13	6.4	11.7
21-30	47	2	4.2	7.0	46	1	2.1	12.0	93	3	3.2	8.6
31-40	46	3	6.5	10.0	69	1	1.4	3.0	115	4	3.4	8.2
41-50	55	5	9.1	5.2	18	0	0	0	73	5	6.8	5.2
>50	11	4	36.3	17.7	12	2	16.6	33.3	23	6	26.1	23.0
Total	325	24	7.3	11.8	331	7	2.1	13.2	656	31	4.7	12.2

### 5.2 Tea garden in Lower Assam

A filariasis survey was conducted in Birjhora tea estate of lower Assam. A total of 254 finger pricked thick smears were collected between 20 00 and 24 00 hours and examined. The age profile of the screened population was <= 10 years : males 29 and females 44 ; 11-20 years : males 24 and females 25 ; >20 years : males 63 and females 69. Of these 254 subjects (male=116 ; female=138) screened, only one subject, a female aged 35 years, was found microfilaraemic. Two male subjects, aged 35 and 50 years, were found having hydrocoel. One male subject of 50 years age reported intermittent swelling of lower part of his legs. However, no permanent elephantiasis case was recorded.

In day resting morning collections mosquitoes belonging to 3 species viz. *Cx.quinquefasciatus*, *An.vagus* and *An.hyrcanus* gp. were collected with per man hour density of 29.1. Per man hour density of *Cx.quinquefasciatus* alone was 19. All female mosquitoes collected were dissected for larval stages of filarial parasite. However, none was found positive.

## 6. MOSQUITO FAUNA OF NE INDIA WITH SPECIAL REFERENCE TO THE MEDICALLY IMPORTANT VECTORS

This study has been completed in the states of Assam, Arunachal Pradesh, Meghalaya and Nagaland. In this year the surveys were carried out during monsoon season in Mizoram which is completely a hilly state with altitude ranging from 700 to 6000 ft above mean sea level. Among the mosquito borne diseases, malaria is a major health problem in foothills and forest areas of the state. The occurrence of other arboviral diseases like dengue and Japanese encephalitis is not reported from Mizoram.

Mosquito faunistic surveys were conducted in three different places having different altitudes.

**Aizawl:** It is the head quarter of the state of Mizoram, situated at the altitude of 3715 ft above mean sea level. Temperature generally does not exceed 26<sup>0</sup>C. During the survey period, the temperature recorded was 18-23<sup>0</sup>C and humidity 45-50%.The environment is not much mosquitogenic. Due to steep hills, the stagnant water sources are minimum. A total of 9 species of mosquitoes under 5 genera were detected in adult and larval survey. In adult collection by CDC light traps, 5 species and in larval survey 6 species were collected (Table-5). No indigenous malaria cases were reported from Aizawl town area.

**West Phaileng :** It is 105 km away from Aizawl town and situated about 1290 ft above mean sea level. It is surrounded by forest areas (plantation forest of teak and other forests). The temperature is moderate to warm with high humidity. During survey period, the temperature recorded was 22-25<sup>0</sup>C and relative humidity about 70%. Twenty two species of mosquitoes in 8 genera were detected. In adult survey, 17 species and in larval survey, 11 species were collected (Table-5).The recognized malaria vector, *Anopheles dirus* was collected by CDC light traps operated near forest areas corroborating the indigenous malaria transmission in this area.

**Thenzawl:** It is 93 km away from Aizawl, situated at about 735 ft above mean sea level. The Tropic of Cancer passes through this township which is a valley surrounded by hills, broken forests and traversed by different types of streams. The climate is warm and humid. The temperature recorded during the survey was 25-27<sup>0</sup>C and humidity more than 75%. The area is highly mosquitogenic. A total of 31 species of mosquitoes under 7 genera were collected during the survey. In adult survey, 28 species and in larval survey, 12 species could be collected (Table-5). The recognized malaria vector, *Anopheles minimus* was collected in this area which is conducive for breeding of this vector mosquito. Most of the potential vectors of JE transmission were also collected from this area.

From this faunistic survey during monsoon season from three different areas in Mizoram, a total of 48 species of mosquitoes under 9 genera were detected. *Anopheles* was the predominant genus comprising of 19 species followed by *Culex* with 12 species and *Aedes* with 9 species. The number of species recorded in other 6 genera were low. Two major vectors of malaria, *An dirus* and *An minimus* were collected from two different areas having two different ecosystems, former in West Phaileng area and the latter in Thenzawl area. Most of the potential vectors of JE transmission were collected but density was low. Among the dengue vectors, *Aedes albopictus* was collected in most of the container habitat types but the invasion of *Ae aegypti* was not observed in the present survey..*Anopheles maculatus* var. *willmori*, *Aedes caecus*, *Ae vittatus*, *Ae nigrostriatus*, *Tripteroides aranoides* and *Toxorhynchites gravellyi* were recorded for the first time from this state.

**Table-5: Mosquitoes collected in Mizoram**

**(a) Aizawal (Altitude- 3715 ft); Temp 18 - 24<sup>0</sup>C**

<i>Anopheles</i> - 2 sp.	<i>Armigeres</i> - 2 sp.
An. maculatus (A)	Ar. subalbatus (A,L)
An. barbirostris (A)	Ar. kuchingensis (A)
<i>Aedes</i> - 2 sp.	<i>Culex</i> - 2 sp.
Ae. pseudotaeniatus (L)	Cx. mimulus (L)
Ae. albopictus (L)	Cx. quinquefasciatus (A,L)

Malaya- 1 sp.

Ml. genurostris (L)

**(b) Thenzawl (Altitude- 735 ft; Temp 18 - 24°C)**

*Anopheles* -10 sp.

*Culex*- 9 sp.

An. aconitus (A)  
An. minimus (A)  
An. annularis(A)  
An. jeyporiensis(A)  
An. jamesi(A)  
An. karwari (A,L)  
An. kochi (A,L)  
An. splendidus (A)  
An. vagus (A,L)  
An. tessellatus (A)

Cx. bitaeniorhynchus(L,A)  
Cx. fuscocephala (L,A)  
Cx. gelidus (A)  
Cx. whitmorei(A)  
Cx. mimulus (L)  
Cx. quinquefasciatus (L,A)  
Cx. tritaeniorhynchus (A)  
Cx. pseudovishnui (L,A)  
Cx. vishnui (L,A)

*Mansonia*- 3 sp.

*Coquillettidia* - 1 sp.

Mn. annulifera (A)  
Mn. uniformis (A)  
Mn. indiana (A)

Cq. crassipes (A)

*Toxorhynchites* - 1 sp.

*Aedes* - 5 sp.

Ae. albopictus (A,L)  
Ae. annandalei (L)  
Ae. vexans (A)  
Ae. chrysolineatus(A)  
Ae. Nigrostriatus (A)

Tx. splendens (L)

*Armigeres*- 2 sp.

Ar. kuchingensis (A)  
Ar. subalbatus (A)

**(c) West Phaileng (Altitude -1290 ft : Temp. 22-25°C)**

*Anopheles* - 8 sp.

*Culex* - 4 sp.

An. maculatus (A,L)  
An. dirus (A)  
An. annularis (A)  
An.  
Cx.mimulus(L,A)An.peditaeniatus(A,L)  
An. barbirostris (A,L)  
An. gigas (A,L)  
An. vagus (A,L)

Cx. mimeticus (L,A)  
Cx. quinquefasciatus (L,A)  
Cx. fuscus (L,A)

philippinensis (A)

*Toxorhynchitis* - 1 sp.

	<i>Tx. graveryi</i> (L)
<i>Aedes</i> - 4 sp.	<i>Mansonia</i> - 1 sp.
<i>Ae. caecus</i> (L)	<i>Ma. uniformis</i> (A)
<i>Ae. albopictus</i> (A,L)	<i>Malaya</i> - 1 sp.
<i>Ae. pseudotaeniatus</i> (L)	
<i>Ae. lineatopenis</i> (A)	<i>Ml. genurostris</i> (L)
<i>Armigeres</i> - 2 sp.	
	<i>Tripteroides</i> - 1 sp.
<i>Ar. kuchingensis</i> (A)	
<i>Ar. subalbatus</i> (A)	<i>Tp. aranoides</i>

(A = Adult , L = Larva)

## 7. STUDIES ON ECOLOGY OF ANOPHELES DIRUS AND ITS ROLE IN MALARIA TRANSMISSION IN A BROKEN FOREST BIOTYPE OF NORTH-EAST INDIA

*An. dirus* is the major vector of malaria in the forested and forest fringe areas of the north-eastern region of India. In view of the importance of this mosquito in malaria transmission and inadequate information on its bio-ecology in North-east India, a study was taken up in a malaria endemic tropical rain forest fringed village of Dibrugarh district covering both adult and immature ecology of *An. dirus*. The study village had a population of 380 marginal farmers and tea garden labourers living in 55 mud plastered and thatched/tin roofed houses having exclusively indoor sleeping habits.

### 7.1 Adult ecology :

The adult ecology of *An. dirus* was studied with reference to the estimation of its vectorial capacity and its correlation with malaria prevalence. For this, longitudinal entomological data at fort nightly interval, related to *An. dirus*, were generated on man-vector contact, parity, duration of gonotrophic cycle, probability of survival for one day, human blood index and extrinsic incubation period. The malaria incidence in the study village was monitored through fort-nightly active fever survey and passive case detection throughout the study period. Vectorial capacity of *An. dirus* (Table-6) remained high through out the monsoon (May-August) period, came down gradually in post monsoon period (September-November) before attaining the zero value during cool dry period (December-February). The highest vectorial capacity was recorded in the month of June (1.060 for *P. vivax* and 0.916 for *P. falciparum*). The pattern of malaria incidence correlated well ( $r=0.8$ ) with that of the vectorial capacity of *An. dirus*, the only vector mosquito present in the study area.

**Table-6 : Vectorial capacity of *An. dirus* through study period**

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Vectorial capacity during the month

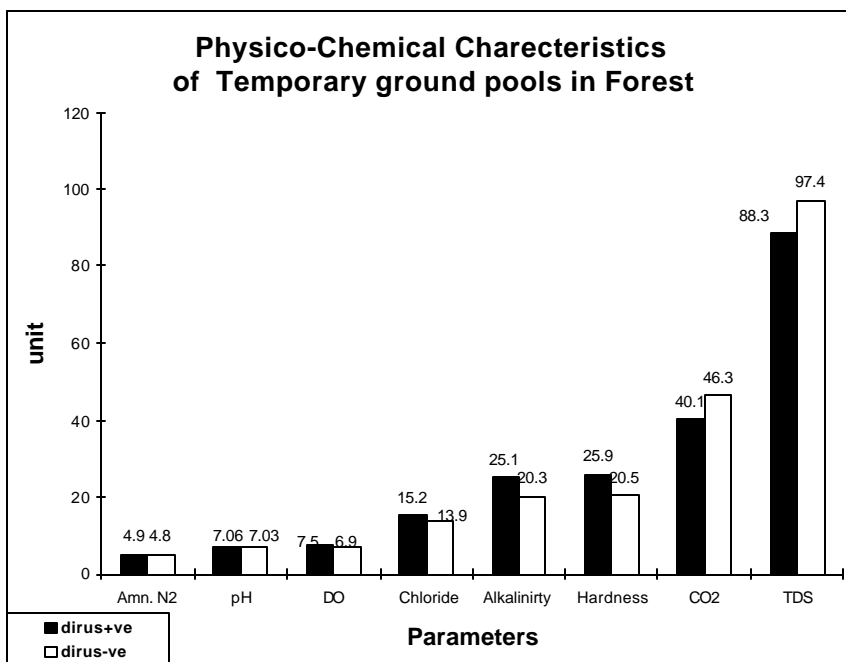


Species	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr
<b>P. vivax</b>	0.437	1.060	0.831	0.528	0.410	0.184	0.008	0.0	0.0	0.0	0.01	0.007
<b>P. falciparum</b>	0.333	0.916	0.800	0.379	0.358	0.175	0.002	0.0	0.0	0.0	0.006	0.003

## 7.2 Larval ecology :

The larval ecology of *An. dirus* was studied with reference to physico-chemical characterisation of water of favourable breeding habitats of this mosquito in different months of the year. *An. dirus* always bred in the forest area where the temporary, ground rain water pools during the hot-monsoon period (May-October) and stream side pools during the cool-dry period (November-March) were its favourite breeding habitats. These habitats were surveyed regularly (1-2 times a month) during which water samples were collected from *dirus* positive as well as *dirus* negative habitats. These water samples were analysed for pH, conductivity, total dissolved solids, dissolved oxygen, free CO<sub>2</sub>, phenolphthene and total alkalinity, hardness, salinity and ammoniacal N<sub>2</sub> content. *Dirus* positive temporary ground pools, in general, tended to have relatively higher dissolved oxygen, higher conductivity, low total dissolved solids, low acidity and higher hardness as compared to *dirus* negative pools. In contrast, *dirus* positive stream side pools, in general, recorded lower dissolved oxygen, higher total dissolved solids, higher acidity, higher alkalinity, higher hardness and higher ammoniacal nitrogen as compared to *dirus* negative stream side pools (Figure 1 & 2). However, this difference was significant (p=0.024) only for hardness.

**Figure-1 :**



**Figure-2 :**

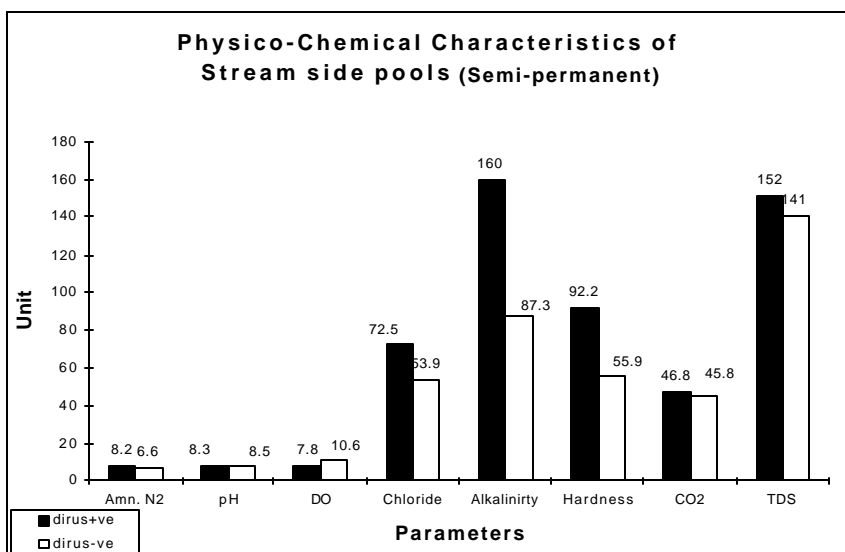
## **8. STUDIES ON PADDY FIELD DERMATITIS**

### **8.1 Stability evaluation of an indigenous plant (family Rubiaceae) for molluscicidal activity**

Aqueous extract of the fruits of an indigenous plant belonging to family Rubiaceae after storage at 4° C was tested for stability of molluscicidal activity against the snail *Indoplanorbis exustus*. No change in the molluscicidal activity of the stored extract compared to fresh aqueous extract was found.

### **8.2 Demonstration of the eggs of *Schistosoma spindale***

During the period under report, sexually mature male and female worms in the intestinal mesentery and hepatic portal system of the experimental animals (Swiss albino mice) were grown successfully. Characteristic eggs of *Schistosoma spindale* were recovered from the infected animals confirming validity of our earlier observation about species identity based on adult male flukes only. The liver of the infected animals has shown histopathological



changes such as granuloma formation, fibrosis of portal tract etc. induced by the eggs.

### **8.3 Experimental studies to develop adults from oculate furcocercous cercariae**

In some dermatitis affected paddy fields a unique oculate furcocercous cercariae causing severe dermatitis were detected in addition to the cercariae of *S. spindale*. Therefore, attempts were made to infect laboratory animals with the above cercariae to develop adult flukes for species identification. For this, the oculate furcocercous cercariae were harvested from field collected snails. These cercariae were used for experimental infection of Swiss albino mice. The adult flukes were developed successfully and species identification is being done.

## **9. STUDIES ON ACUTE ROTAVIRAL DIARRHOEA IN HOSPITALIZED CHILDREN BELOW 5 YEARS IN DIBRUGARH DISTRICT**

This study started with the objectives of detecting rotaviral antigen in the stool sample of hospitalised children below five years with acute diarrhoea and to observe electrophoretic mobility pattern of rota viral genome. Stool samples of selected patients with acute diarrhoea admitted in the paediatrics ward of Assam Medical College & Hospital, Dibrugarh were collected along with detailed history and physical findings. One part of each sample was processed and subjected to detection of rotaviral antigen using polyclonal group A indirect ELISA kit indigenously developed by NIV, Pune. The ELISA positive samples were again processed and subjected to SDS PAGE. The mobility pattern of each of the genome segments were observed and recorded accordingly. One hundred and ninety seven diarrhoeal stool samples were examined. A total of 45 samples showed association of rota virus in acute childhood diarrhoea with higher incidence in the winter season, mainly in January 2000. Of the ELISA positive samples (n=29) 17 were of long type and 12 were of short type.

## **10. A FOLLOW UP STUDY OF JAPANESE ENCEPHALITIS CASES FOR NEUROLOGICAL SEQUELAE AND CLINICAL OUTCOME IN CHILDREN UPTO 12 YEARS OF ASSAM**

During the first year, 37 clinical JE patients of paediatric age group with HI and MAC ELISA positives were registered for follow up as per the selection criteria. Follow up was done up to 420 days from the day of hospitalisation. During the study period, 7 patients expired in the hospital, 22 were followed up to 420 days and 8 could not be followed due to operational problems. In each follow up the subjects were physically examined for their mental status and observations were recorded on nutritional, anthropometric status. In most of the subjects the recovery was found to be very slow and neurological deficits persisted in 18% subjects at the end of follow up period.

### III) MISCELLANEOUS STUDIES

#### 1. Study on therapeutic response to antimalarial drugs

##### 1.1 In uncomplicated *P. falciparum* malaria

A part of this *in vivo* study was conducted during the transmission season of 1998 in Jairampur area of PHC Nompong of Changlang district, Arunachal Pradesh when 22 Pf cases were investigated. The study continued at the same site during August-September, 1999 and another 31 subjects of uncomplicated Pf malaria were followed up after treating with chloroquine and primaquine as per the standard protocol of National Anti Malaria Programme. Overall (n=53) results showed that 43 (81.1%) cases were resistant to chloroquine (RII 54.7%, RIII 24.5%). Of these, 42 cases were treated with sulphadoxine + pyrimethamine combination. A total of 18 cases (33.9%) showed resistance to this combination also (RII 18.9%, RIII 11.3%). These 18 cases, resistant to both chloroquine as well as sulphadoxine + pyrimethamine combination, were treated with oral quinine. Three cases (16.7%) showed resistance of RIII level to quinine as well.

##### 1.2 In *P. vivax* malaria

A total of 15 cases of *P. vivax* were also followed after treating them 25 mg/kg body wt of chloroquine on days 0,1 and 2. All cases were found sensitive to chloroquine.

#### 2. Malaria outbreak investigations

##### 2.1 PHC Titabor, district Jorhat, Assam

In response to a request from State Health Authorities an investigation on malaria outbreak was undertaken during May-June, 1999 in PHC Titabor of district Jorhat, hitherto an hypoendemic area, which recorded many fever deaths during the outbreak. The cumulative fever rate in the study area, since March 1999, was 43.9% with average case load (fever) of 1.8 per family. The fever cases in the community peaked in the third week of May. Slide positive and slide falciparum rates in study population were found to be 15.7 and 13.2% respectively in the mass blood survey. About 83% of infections were that of *Plasmodium falciparum* and there were 10.8% asymptomatic carriers. Male population (slide positive rate 17.0%) suffered relatively more than that of females (SPR 14.7%). Overall, malaria prevalence was less in people above 15 years of age (SPR 10.8) as compared to those below 15 years of age (SPR 23.0%). Population residing within 100 meters from forested Naga hills (SPR 33.3%) suffered more during the outbreak. In the area prevalence of malaria in people was inversely related to the distance from forested Naga hills. It was found that majority of fever cases (57%) took initial treatment from village level indigenous practicionors and only 11.3% reported to government institutions for the treatment. *Anopheles minimus* and *Anopheles dirus*, two well established vectors of malaria in the north-eastern region, were collected in good numbers. However, relatively higher densities of the former species were noted. Indoor man biting rates of *An. minimus* and *An. dirus* were 7.5 and 3.0 per man per night. Interplay of several factors like unusual climatic conditions, poor laboratory services,

inadequate indoor residual insecticide spray and long distances to medical facilities was identified as the reason behind the genesis of the present outbreak and deaths.

## **2.2 North Lakhimpur district, Assam**

Outbreak of malaria in some parts of North Lakhimpur district, Assam was investigated on receiving a request from State Health Authorities during the month of June 1999. A total of 342 subjects were clinically examined and peripheral blood samples were taken. Of these, 67.3% were with fever, 21.6% without fever but with body-ache and headache, 6.7 % with fever, headache and vomiting and 4.4% subjects with fever, anaemia and jaundice were detected. Out of 342 blood slides examined, 131 were found positive for malaria showing SPR of 38.3%. *P. falciparum* infection was predominant (SfR= 25.14%). People of all age groups and sex were found affected with malaria. Malaria was significantly high in the younger age group of <10 yrs. Malaria cases were highest in Adivasi (tea labourers) community followed by Nepalis, Bengali migrants and Assamese. Malaria prevalence was less prominent in non foot hill areas as compared to foot hill areas. Anopheline density in CDC light trap collection was 21.3% and 27.9% in Bijuli Basti and Kakoi Rajgarh respectively. Density of *An. minimus*, a recognized malaria vector detected during the study, were 15.5 per trap per night in Bijuli Basti and 11.0 in Kakoi Rajgarh. Low density of *An. minimus* in morning in-door collection was recorded. The breeding of this vector was detected in slow moving streams and irrigation channels. Inadequate rain fall in the previous months (March-May 1999), decreased the movement of water in streams and created water pools in the lines of streams which facilitated profuse breeding of *An. minimus*. Retrospective data analysis of NAMP revealed that the two PHCs namely Boginadi and Nowboicha, which experienced the epidemic, showed high API during 1994-98. Moreover, an increasing trend of slide positivity rate has been demonstrated from January to April 1999. It seems that low surveillance, inadequate and late insecticidal spray led to the present malaria outbreak. Moreover, the poor socioeconomic condition, less accessibility of the population to the PHCs and health awareness added to flaring up of malaria situation.

## **3. Coverage evaluation survey for immunisation**

Ministry of Health and Family Welfare, Govt. of India entrusted Indian Council of Medical Research, New Delhi, to evaluate the immunisation status of children (12-23 months) and the mothers of children (0-12 months) and pregnant women under UIP in all the states and union territories of the country. This centre covered six districts viz. Dibrugarh, Sibsagar, Golaghat (Assam), Lower Subansiri (Arunachal Pradesh), Aizawl (Mizoram) and West Tripura (Tripura) of the four north-eastern states. Following 30 cluster sampling procedure, data was collected by interviewing members of households and recording the information in the designed questionnaire. A total of 1260 children (12-23 months) and 1260 mothers of children (0-12 months) were surveyed. Full coverage in different districts of Assam was found to be 57.5 to 66.2% in children and 63.9 to 81.6% in pregnant mothers. In Arunachal Pradesh, full immunisation was 41.4% in children and 57.3% in mothers. In Mizoram, 70.0% children and 76.7% mothers were fully immunised and in Tripura 59.9% children and 81.5% mothers were fully immunised.

## **4. Evaluation of post cyclone disease scenario in Orissa**

Many coastal areas of Orissa were hit by a super cyclone in the month of November 1999 rendering thousands dead and millions homeless. RMRC, Dibrugarh was entrusted to investigate for the probable outbreak of viral fever and malaria. Between 2-15 December 1999, Scientists made extensive field visits in 9 upgraded Primary Health Centres, Block PHCs and District Hqs and collected various health related information. Based on the observations suitable recommendations were made to prevent any possible epidemic of mosquito borne diseases.

### **5. Screening of plant/natural products for larvicidal activity**

Laboratory bio-assay techniques were perfected for screening plant/natural products for detection of mosquito larvicidal and insect growth regulator activities. A few insect based products submitted by RRL, Jorhat were screened for larvicidal and insect growth regulator activity against *Aedes aegypti* and *Culex quinquefasciatus* mosquitoes. None showed promise.

# **INSTITUTIONAL FACILITIES**

## **1. Sero-diagnostic facility for arboviral diseases**

This Centre has been providing diagnostic facilities for arboviral diseases to various health institutions of N.E.Region. During the reporting period, a total of 41 blood samples (36 from Nagaland, 3 from Assam Medical College, Dibrugarh and 2 from Oil India Limited, Duliajan) were received. One sample (from Nagaland) showed HI reactivity for WN antibody, 2 samples (from AMCH, Dibrugarh) were positive for JE antibody with cross reactivity shown by 1 sample to WN virus.

## **2. Malaria clinic**

A malaria clinic has been operating in the centre since 1985. During 1999-2000, 152 persons attended the clinic and 32 were found positive for malaria (Slide Positive Rate 21.05%). Of these, 18 were found positive for *falciparum* malaria (Slide falciparum Rate 12.5%), 13 were positive for *vivax* malaria and 1 was of mixed infection of Pv+Pf. Malaria positives were treated in the clinic.

## **3. Publication and information section**

The publication and information section of the Centre continued to support Scientists through books, journals, reports, up-to-date references and abstracts from MEDLINE CD-ROM system. During the year a total of 55 Indian and foreign journals were subscribed/received as gratis by the library. Further, 60 new books were added in the library raising the number of available books to 1617. During the year 200 nos. of bound volumes of old journals were added. Library was also engaged in abstracting and indexing of RMRC publications.

## **4. Computer facility**

Computer facility was extended to the working places of scientists at laboratory and administrative staff for some of the scientific and administrative work of the centre. One Laptop computer was purchased in the reporting year. Purchase of a VSAT-IPA system for Internet Access is in process.

## **5. Animal house**

Animal House of the Centre is catering to the requirements of the scientists of various laboratory animals for experimentations. This Animal house is registered (registration No. 73/1999/CPCSEA) with Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA), Chennai. Animal house of this centre is having the Institutional Animal Ethical Committee in accordance with the provision of CPCSEA. This committee looks after the use and rationale of laboratory animals in experimental works through reviewing the new/old projects which involve laboratory animals for experimentations. The stock position of various animals being bred in the animal house, as on 31.3.2000, is given in Table-7.

**Table-7 : Stock position of various laboratory animals**

<b>Sl. Name of animal</b>	<b>Strain</b>	<b>Number</b>
1. Mouse ( <i>Mus musculus</i> )	Swiss albino	310
2. do	BALB/C	103
3. Rat ( <i>Rattus norvegicus</i> )	Wistar	85
4. Mastomys ( <i>Praomys coucha</i> )	Coucha	75
5. Hamster ( <i>Mesocricetus auratus</i> )	Syrian	58
6. Rabbit ( <i>Oryctolagus cuniculus</i> )	Belgian	55
7. Goose (Indigenous)	White Indian	06
<b>Total</b>		<b>692</b>

## **6. Insectory**

Following species of mosquitoes are being colonised round the year in the insectary of the centre:

- i) *Aedes aegyptii*
- ii) *Culex quinquefasciatus*
- iii) *Toxorhynchites splendens*

## **WORKSHOP/SEMINARS ORGANISED/CELEBRATION OF IMPORTANT EVENTS**

### **1. Training workshops on management of Diarrhoea for PHC Medical officers**

Two UNICEF sponsored training workshops on 'Management of acute diarrhoea with special emphasis on cholera' for doctors and paramedical staff were organised at Dibrugarh (9.11.99-11.11.99) and Guwahati (27.11.99-29.11.99) in collaboration with NICED, Calcutta. The main emphasis of these workshops was to refresh the knowledge of the doctors as well as paramedicals so that they can effectively and successfully control the morbidity and mortality of diarrhoeal diseases and tackle the epidemic situations. Another collateral benefit of these workshops was to disseminate the knowledge of control of diarrhoeal diseases to the grassroot level so that the CDD (Control Diarrhoeal Diseases) programme can successfully be implemented with effective community participation. In each workshop 20 participants were accommodated from tea gardens, medical college and state health services. Lectures and discussions on various aspects of etiology and epidemiology of acute diarrhoea, management of acute diarrhoea and prevention of diarrhoea were held and there was a close interaction between the faculty and participants.

### **2. National Science Day celebration**



National Science Day was celebrated in the RMRC campus on 28th February, 2000. On this occasion lectures, demonstrations were organised by 'Nature's Beckon', the leading NGO of the north eastern region working on conservation of the nature, in the staff club which was attended by all staff members of RMRC and their families. The Nature's Beckon also arranged a bird watching camp for the children to create awareness about the mother nature and its conservation. In addition, a video show was organised for children on mosquito borne diseases and drug abuse. Further, a lecture on Research Methodology was organised for the Scientists. Dr. C.K. Chetia, Professor of Statistics, Dibrugarh University was the speaker.

## **Ph.D. / M.D. PROGRAMMES**

The Centre has been extending guidance and laboratory facilities to the scientists and doctors for pursuing Ph.D/M.D. thesis work. The following candidates persued work for Ph.D./MD at the centre and submitted their thesis during the year:

### ***Ph.D. Thesis***

- |   |   |
|---|---|
| 1. Mr. R.K. Phukan<br>Technical Officer | "A biostatistical study on some aspects of the epidemiology of oesophageal cancer in Assam" |
| 2. Mrs. B. Mahanta                      | "Studies on filaria vectors in Tea agro ecosystem of Dibrugarh district"                    |

### ***MD Thesis***

- |   |   |
|---|---|
| 1. Dr. Ranjan Saikia<br>diarrhoeal<br>AMC, Dibrugarh<br>years | "A clinical study of acute diseases in children below 5 with a special reference to rota virus diarrhoea" |
|---|---|

## **SCIENTIFIC MEETINGS/ TRAININGS/ WORKSHOPS ATTENDED**

### **Dr. J. Mahanta, Director**

1. Continued Medical Education Programme as the Resource Person at Tata Referrel Hospital and Research Centre, Chabua (19.6.99).
2. Workshop on Malarial Fever organised by Dibrugarh branch of Indian Medical Association (1.7.99).
3. Meeting on Multicentric study on Community Control of Thallesaemia syndrom:awareness, Screening, Genetic Councelling and Prevention at IIH, Bombay (20.7.99)
4. ICMR/WHO National Workshop on Health Research Management at Chennai (14.9.99-16.9.99).
5. Attended XXIII National Congress of Indian Association of Medical Microbiologists at Chandigarh (18.11.99-21.11.99) and chaired the session on Parasitic Diseases.
6. Continued Medical Education Programme as Resource Person at Assam Medical College, Dibrugarh (12.12.99).
7. Meeting on ICMR/WHO Collaborative project on Tribal Health at ICMR Hqts, New Delhi (5.1.2000).
8. National Science Day celebration as the Chief Guest at Regional Research Laboratory, Jorhat (28.2.2000)

### **Dr. N. C. Hazarika, Deputy Director**

1. Seminar on AIDS organised by NSS, Khowang College, Dibrugarh (13.12.99).
2. Resource person in `Training workshops on management of acute diarrhoea with special emphasis on Cholera' held at Dibrugarh (9.11.99-11.11.99) and Guwahati (27.11.99-29.11.99) sponsored by UNICEF through NICED, Calcutta in collaboration with RMRC, Dibrugarh.

### **Dr. A. C. Phukan, Assisstant Director**

1. Workshop on malaria awareness for supervisors of Oil India Limited at Duliajan (4.8.99).
2. Resource person in `Orientation course in malaria epidemic preparedness' for Medical Officers of Assam and Arunachal Pradesh (23.3.2000 - 25.3.2000) held at Regional Institute

of Communicable Diseases, Assam Medical college, Dibrugarh sponsored by ROH & FW, Shillong through Dte of NAMP, Delhi under World Bank assisted EMCP.

**Dr. P. K. Challeng, SRO**

1. UNICEF sponsored training programme on 'Management of acute Diarrhoea with special emphasis on cholera' at Dibrugarh (9.11.99-11.11.99).

**Dr. P. K. Mohapatra, SRO**

1. Symposium on malaria organised by Jt. Director, Health Services, Jorhat (Assam) for Medical Officers of Jorhat district (4.6.99). Delivered the lecture on 'Diagnosis and treatment of malaria'.
2. UNICEF sponsored training programme on 'Management of acute diarrhoea with special emphasis on cholera' conducted by NICEE Calcutta (9.11.99 - 11.11.2000) in collaboration with RMRC, Dibrugarh at RMRC, Dibrugarh.
3. Faculty and Resource person in 'Orientation course in National Anti Malaria Programme' for Medical Officers of SSB, NE region (28.1.2000 - 1.2.2000) held at Sonitpur (Assam), sponsored by ROH & FW, Shillong through Dte of NAMP, Delhi under world Bank assisted EMCP.
4. Faculty and resource person in 'Course in malaria microscopy' for Laboratory Technicians (Re-orientation level) of SSB BNs of NE region (28.1.2000 - 1.2.2000) held at Sonitpur (Assam), sponsored by ROH & FW, Shillong under World Bank assisted EMCP.
5. Resource person in 'Orientation course in malaria epidemic preparedness' for Medical Officers of Assam and Arunachal Pradesh (23.3.2000 - 25.3.2000) held at Regional Institute of Communicable Diseases, Assam Medical college, Dibrugarh sponsored by ROH & FW, Shillong through Dte of NAMP, Delhi under World Bank assisted EMCP.

**Dr. Anil Prakash, SRO**

1. Symposium on malaria organised by Jt. Director, Health Services, Jorhat (Assam) for Medical Officers of Jorhat district (4.6.99). Delivered the lecture on 'Malaria vectors and transmission dynamics'.
2. Awareness programme on malaria' organised by Oil India Limited, Duliajan for its Supervisors (2.7.99). Delivered a lecture on 'Epidemiology of malaria'.
3. Resource person in Integrated training course for Senior Medical and Health Officers of Tinsukhia district organised by District H & FW training centre (4.12.99). Delivered a lecture on 'Recent strategy of malaria control'.

4. Attended 'Training workshop on IEC' organised by ICMR at NIN Hyderabad (20.12.99 - 24.12.99).
5. Faculty and Resource person in 'Orientation course in National Anti Malaria Programme' for Medical Officers of SSB, NE region (28.1.2000 - 1.2.2000) held at Sonitpur (Assam), sponsored by ROH & FW, Shillong through Dte of NAMP, Delhi under world Bank assisted EMCP.
6. Faculty and resource person in 'Course in malaria microscopy' for Laboratory Technicians (Re-orientation level) of SSB BNs of NE region (28.1.2000 - 1.2.2000) held at Sonitpur (Assam), sponsored by ROH & FW, Shillong under World Bank assisted EMCP.

**Dr.H.K.Das, R.O.**

1. UNICEF sponsored training programme on 'Management of acute Diarrhoea with special emphasis on cholera' at Dibrugarh (9.11.99-11.11.99).

**Dr.D.R.Bhattacharyya, RO**

1. 'Awareness programme on malaria' organised by Oil India Limited, Duliajan for its Supervisors (2.7.99). Delivered a lecture on 'Control of malaria'.
2. Resource person in 'Orientation course in malaria epidemic preparedness' for Medical Officers of Assam and Arunachal Pradesh (23.3.2000 - 25.3.2000) held at Regional Institute of Communicable Diseases, Assam Medical college, Dibrugarh sponsored by ROH & FW, Shillong through Dte of NAMP, Delhi under World Bank assisted EMCP.

# SCIENTIFIC PUBLICATIONS

## 1. Research Papers published

1. Baruah HC, Biswas D, Mahanta J. Clinico-epidemiological study of leptospirosis in certain parts of north-eastern region. *J Commun Dis* 1999 ; 31 : 201 - 202.
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## **2. Research work abstracted/ Papers presented**

1. Anil Prakash, P.K. Mohapatra, D.R. Bhattacharyya, J. Mahanta. Malaria outbreak in Assam during 1999 : an investigation in PHC Titabor, district Jorhat  
69th Annual Session of The National Academy of Sciences, India held at Bhopal (11-13 November, 1999)
2. H.K. Chaturvedi, Phukan R.K., J. Mahanta. Influence of some factors on tobacco use.

Joint conference of ISMS and IBSIR, held at Bangalore (2-4 December,1999)

3. Anil Prakash, P.K. Mohapatra, D.R. Bhattacharyya, J. Mahanta. Changing malaria endemicity in Titabor primary health centre, district Jorhat, Assam : a village based study. 5th International Symposium on Vectors and Vector Borne Diseases, held at Patiala (16-18 February, 2000)
4. P.K. Mohapatra, Anil Prakash, D.R. Bhattacharyya, J. Mahanta. Therapeutic efficacy and multi-drug resistance of antimalarial to uncomplicated *Plasmodium falciparum* in Arunachal Pradesh. 5th International Symposium on Vectors and Vector Borne Diseases, held at Patiala (16-18 February, 2000)

### **3. Popular articles**

1. Geographical situation of Assam and malaria (In Assamese) : P.Dutta : *Amar Assam*, Guwahati (19th June, 1999)
2. Malaria transmitting mosquitoes (In Assamese) : P. Dutta : *Prantik*, Guwahati (16th July, 1999)
3. Controlling malaria in the North-east (In English):Anil Prakash & PK Mohapatra : *The Assam Tribune*, Guwahati (13th August,1999)

### **4. Miscellaneous publications**

1. Situatuional Analysis of HIV and Drug Abuse in the North-eastern Region of India : A Report by ICMR
2. Investigation on Malaria Outbreak (May/June, 1999) in PHC Titabor : A Report.
3. Investigation of malaria outbreak during May/June, 1999 in two PHCs of North Lakhimpur district, Assam : A Report.

### **5. Translation**

1. Low Cost Nutritious Supplements (In Assamese)
2. A Manual of Nutrition (In Assamese)

## Public Health Services Rendered

1. The centre participated in free health camp for malaria affected rural people of Jokai reserve forest in Dibrugarh district, organised by State Bank of India, Dibrugarh (29.8.99). This health camp was attended by about 1000 people. Blood smears from 187 fever cases were collected and examined at the spot. Malaria positive cases were treated as per National Drug policy.
2. On being requested by District Malaria Officer, Jorhat, over 400 blood smears for malaria were examined by the centre in August '99 during the epidemic/post epidemic period.
3. Dr. A. C. Phukan, AD and Dr. P. K. Mohapatra, SRO were deputed to Orissa for rendering help to the central co-ordinating cell and the state health authorities for carrying out various health investigations during post cyclone period.
4. The centre participated in Health Mela at Chabua organised by Indian Medical Association, Dibrugarh branch (30.3.2000 - 31.3.2000).
5. The centre investigated the outbreaks of malaria in Titabor PHC of Jorhat district and in North Lakhimpur district of Assam during May-June, 2000.



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The Director acknowledges with thanks the help received from Dr. Anil Prakash for compiling, editing and from Mr. S. K. Goswami for computing the Annual Report.



