

Appendix - A

RESULTS OF ENDEMIC GOITRE SURVEY AMONG SCHOOL CHILDREN

The last report used the criteria given by Perezett al<sup>1</sup> for classification of degree of thyroid enlargement. This has been modified to the classification suggested by Demaeyer et al<sup>2</sup> in the W.H.O. recent report on The Control of Endemic Goitre. The two classifications are given below to provide a comparison.

Classification by DeMaeyer		Classification by Perez	
Grade	Description	Grade	Description
0	Thyroid not palpable or if palpable not larger than normal	0a	Normal thyroid gland
1a	Thyroid distinct by palpable and definitely larger than normal but usually not visible with the head in a normal or extended position	0b	Gland which though distinctly enlarged and abnormal are not usually visible when the head is extended.
1b	Thyroid easily palpable and visible with the head in an extended position. The presence of a small nodule also qualifies the patient for inclusion in this grade	1	Enlarged gland on palpation; usually visible when head thrown back and neck fully extended.
2	Thyroid easily visible with the head in a normal position.	2	Goitre visible with head in normal position, palpation not necessary to establish presence.
3	Goitre visible at a distance	3	Goitre grossly visible at a distance.
4.	Monstrous goitre		

1. Perez, c. et al. Bull. of World Health Organisation, 18, 217, 1958
2. De Maeyer et al, The Control of Endemic Goitre, WHO, Geneva. 1979.

As can be seen the grade 0b and 1 have been changed to 1a and 1b respectively in DeMaeyers classification which is the criteria used in the following table.

Table 1. Prevalence of Different Grades of Goitre in school children.

Grade	No.	%
Normal Thyroid	887	80.3
1a Goitre	172	15.6
1b	37	3.4
Total	1,104	100

Table 2. Age-wise Prevalence of Endemic Goitre among School Children

Age (in Years)	No. Examined	with Goitre	%
Below 16	440	119	27.0
16 yrs & above	664	90	13.6
Total	1104	209	18.9

Table 3. Sex-wise Prevalence of Endemic Goitre in School Children

Sex	No. Examined	with Goitre	%
Male	727	80	11.0
Female	377	129	34.2

Note: All the 37 cases of grade 1b were in female students

Table 4. Prevalence of Endemic Goitre in Different Schools

School	No.Examined	With Goitre	%
Zagun	339	89	26.3
Binchi	103	20	19.4
Jengre	422	78	18.5
Miango	240	22	9.2
Total	1,104	209	18.9

Table 5. Source of Drinking Water and Prevalence of Endemic Goitre among School Children

Source of Water	No.Examined	With Goitre	%
Well	572	133	23.3
Stream/Pond	473	67	14.2
Tap	59	9	15.3
	1,104	209	18.9

Observations;- From the data above the following observations are made;-

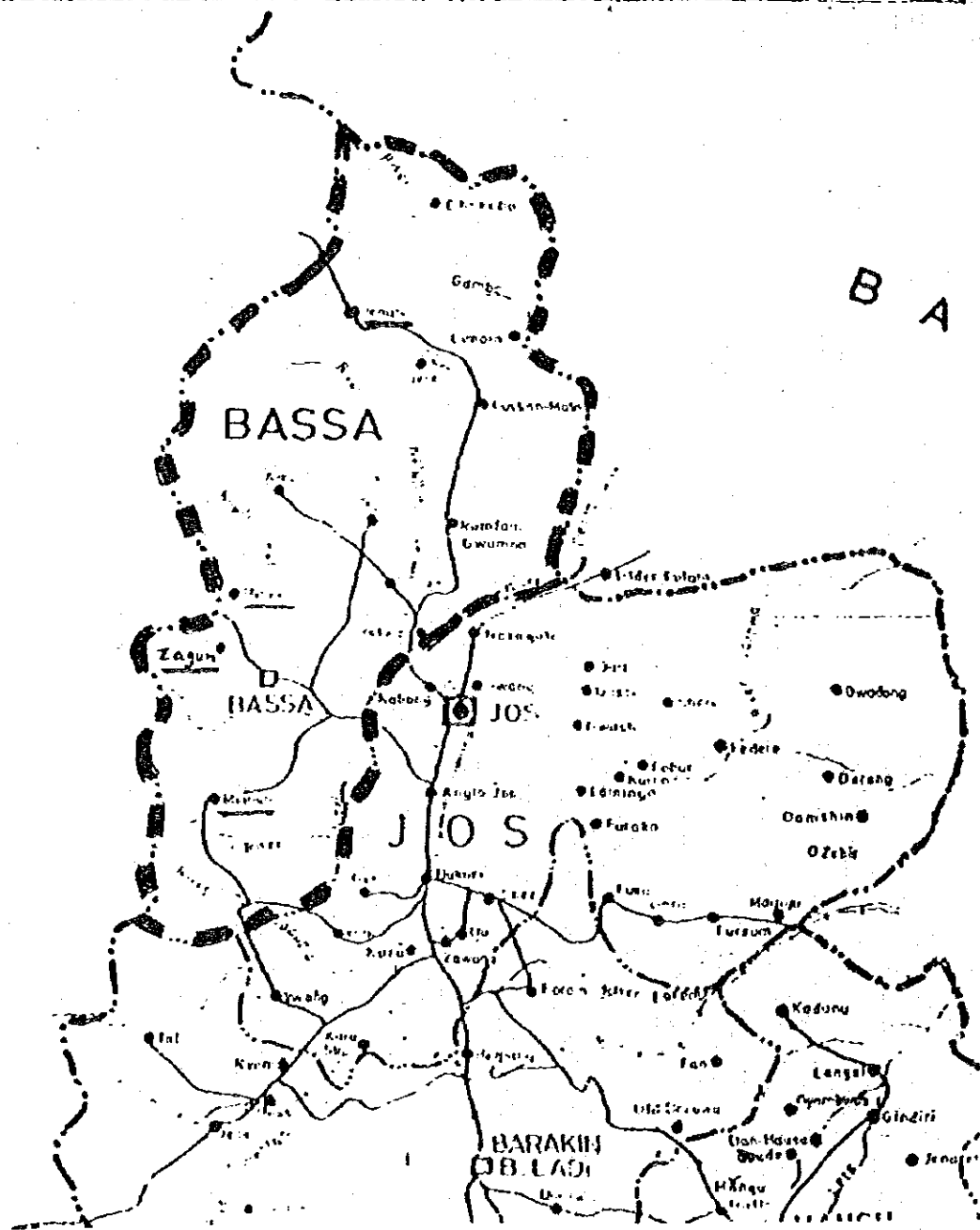
1. Of the 1104 school children examined 172 (15.6%) had endemic goitre grade 1a and 37(3.4%) had grade 1b. The overall prevalence was 18.9%. According to a WHO criterion a prevalence rate of 5% and above of enlargement of thyroid in pre-adolescent are group children indicates that the area has endemic goitre problem. Applying that criterion Bassa LGA sums to be an endemic goitre area.
2. The prevalence of endemic goitre was twice as high in children and below 16 years (27.0%) than in children above 16 years (13.5%).
3. The prevalence of endemic goitre was thrice as high among females (34.4%) than in male children (11.0). Also all the 37 cases of grade 1b thyroid enlargement were among females. Thus the difference is not only quantitative but in terms of size of enlargement.
4. Among the children of four different schools examined the highest prevalence was among Zagun students (26.2%) and lowest among Miango school children (9.1%). While at this stage of the study it is difficult to draw any valid conclusions, this difference could be due to geographical location and altitude of the place. Zagun and Binchi which had higher prevalence rate had an altitude of between 3600-4000 feet a.s.l. as compared to Jengre and Miango which were relatively on a lower level (3000 a.s.l.) Also Binchi and Zagun are located on an undulated area while the other two are on a flat area comparatively.

5. Endemic goitre prevalence was 23.3% in children using well water as compared to 14.2% using water from stream and pond for drinking. Some children used more than one source of drinking water.

Acknowledgemnt:- We are thankful to His Highness Chief of Binci and Village Heads for their co-operation in our work. We express our thanks also to the Principals and teachers of G.S.S. at Binci, Zagun, Jengre and Miango for their help in survey work and Mr. Barko of Plateau State Survey Department for providing us the maps and reading the altitude data for us.

# PLATEAU STATE OVERNMENT COUNCIL AR!

MAP OF PLATEAU STATE SHOWING THE AREAS OF THE STATE AND THE DISTRICTS OF THE STATE



Report presented during National Symposium on Human Vaccines  
Development and Production in Nigeria, Jos, June, 1984.

DIARRHOEA IN CHILDREN - BACTERIOLOGICAL INVESTIGATION:  
A PRELIMINARY REPORT.

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"The acute diarrhoeal diseases have long been recongnized as a major cause of mortality and morbidity in young children in the developing countries... it can be estimated that there were some 744 million to billion episodes of diarrhoea, and 4.6 million deaths in children under five years of age in the developing countries / excluding China/ in 1980" - M.H.Merson, International Symposium on Bacterial Diarrhoeal Diseases, Osaka, Japan, March 1982/2/.

The presented report is a part of the ongoing multidisciplinary project on the clinical, aetiological and epidemiological studies of diarrhoeal diseases in children under five years in Plateau State. This project is carried out jointly by Departments of Medical Microbiology and Parasitology, Pediatrics and Community Health of the University of Jos in close co-operation with Japanese International Co-operation Agency, Tokyo Japan.

Specimens and Laboratory Procedures:

The specimens were collected from diarrhoeal children in Pediatrics Ward, OPD and Child Health Clinic of the University Teaching Hospital, and the Plateau State Hospital. Freshly voided or catheterized stool samples were placed in Carry and Blair transport medium and sent to the laboratory. In the laboratory, the routine techniques, i.e. plating on proper media and serological and biochemical tests were carried out, Table 1 /1/.

Table 1.

Results:

Between October, 1983 and June, 1984, 362 stool samples were examined / Table 2 /

Table 2.

From 91 samples, i.e. 25 % of cases, pathogenic bacteria were isolated. The detected bacteria are presented in Table 3.

Table 3.

Among 96 isolates were: 30 strains of Shigella, 11 strains of Salmonella and 35 strains of Escherichia coli. These groups of bacteria are well known as causative agents of diarrhoea. The last group of 20 isolates comprises 5 bacterial genera, which can also be responsible for this condition. According to WHO experts/2/ at least 25 various microbial agents can be incriminated as causative agents of diarrhoea.

Shigella strains were isolated from 30 specimens /Table 4/

Table 4.

Shigella flexneri, represented by 20 strains belonging to 9 various serotypes was in domination in comparison with S. dysenteriae and S. boydii, 5 and 3 isolates respectively.

There were 11 Salmonella isolated /Table 5/ belonging to B and E groups. Some strains were not serologically classified.

Table 5.

Using 28 specific antisera, among 35 isolates of E. coli, 28 enteropathogenic, and 7 enterotoxigenic strains were identified, Table 6.

Table 6.

Interesting is, that we were unable to identify any enteroinvasive strain.

In the determination of drug susceptibility, 8 drugs, which are active

against Gram-negative rods were used. It does not mean that all used drugs can be administered in the treatment of diarrhoeal cases. The obtained results are presented in Table 7.

Table 7.

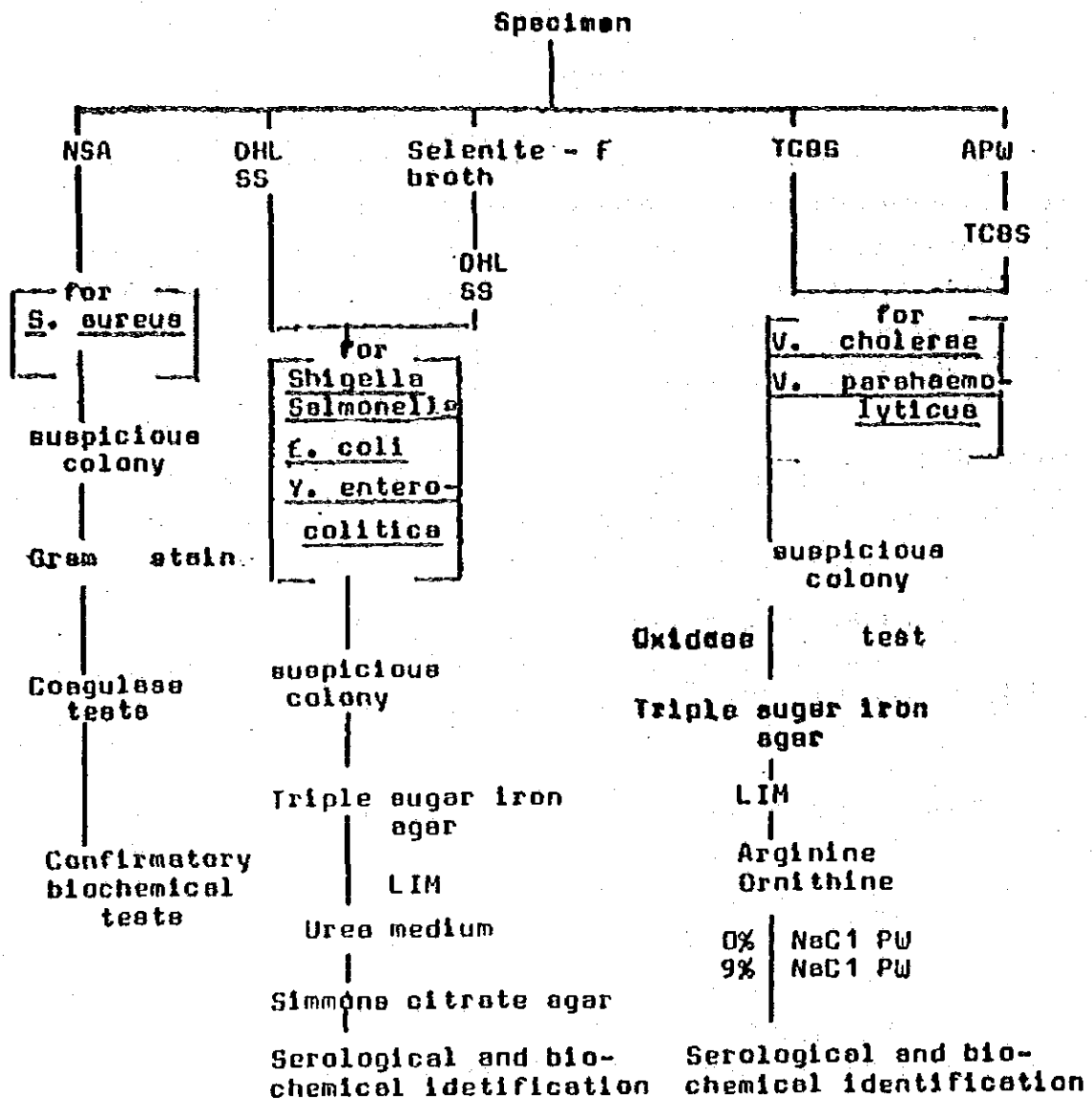
In most cases, Shigella, Salmonella and Escherichia strains were resistant to sulphonamides, streptomycin, tetracycline and ampicillin, i.e. drugs which can be used in treatment of diarrhoea. On the hand, the isolates were susceptible to nitrofurantoin, colistin and nalidixic acid, i.e. drugs which are not used in the treatment of this condition.

#### References:

1. Lenette, E.H./ Editor/, 1980. Manual of Clinical Microbiology. Amer. Soc. Microbiol., Washington.
2. Merson, M.H. 1982: The global problem of acute diarrhoeal diseases and the WHO diarrhoeal diseased control programme. Intern. Symp. on Bacterial Diarrhoeal Diseases, Osaka, Japan. p.1-3.



**TABLE 1**  
**Laboratory Procedures in Isolation and Identification of Pathogens**



MSA - Mannitol Salt Agar; DHL - Desoxycholate Hydrogen Sulfide Agar; TCBS - Thiosulfate Citrate Bile Salt Agar; SS - Shigella-Salmonella Agar; AWP - Alkaline Pepton Water; LIM - Lysine Indole Motility Medium.

TABLE 2

ISOLATION OF ENTEROPATHOGENIC ORGANISMS  
FROM DIARRHEAL CASES (27/10/1983-7/6/1984)

Sex	No. of specimens	
	Examined	Containing Pathogens (%)
Male	219	60 (27.4)
Female	143	31 (21.7)
Total	362	91 (25.1)

TABLE 3

Number of Enteropathogenic Organisms Isolated from  
91 Specimens

Total	Number of Isolated Strains			
	<u>Shigella</u>	<u>Salmonella</u>	<u>E. Coli</u>	<u>Others</u>
96	30 (31%)	11 (11.0%)	35 (37%)	20 (21%)

Others: H. Morganii. (4), Klebsiella (2), K. Pneumoniae (6)  
S. aureus (5), Aeromonas (1) Non O - 1 V. Cholerae (2)

TABLE 4

Serotypes of Isolated Shigella Strains

Serotypes	No. of Isolates	
<u>Shigella dysenteriae</u>	2	1
	3	2
	7	1
	8	1
Subtotal		5
<u>Shigella flexneri</u>	1a	1
	1b	6
	2a	3
	2b	1
	3a	1
	5	1
	6	5
Variant	x	1
Variant	y	1
Subtotal		20
<u>Shigella boydii</u>	8	1
	10	1
	14	1
Subtotal		3
<u>Shigella sonnei</u>	1	2
Total		30

TABLE 5

Serotypes of Salmonella Isolates

O Group	No. of Isolates
O	4
E4	1
Spp	6
Total	11

\* Sero were Provided by DENKA SEIKEN K.K. JAPAN

TABLE 6

**Serotypes of Escherichia Coli Strains  
regarded as pathogenic \*\***

Serotypes*	No. of Isolates
Enteropathogenic	20
Enteroinvasive	-
Enterotoxigenic	7
<b>Total</b>	<b>35</b>

- \* Number of antisera used:  
 Enteropathogenic ----- 16  
 Enteroinvasive ----- 7  
 Enterotoxigenic ----- 5

\*\* Antisera provided by DENKA SEIKEN K.K. Japan

TABLE 7

**Drug resistance of Enteropathogenic Bacterial Strains**

Species	No. of Examined Strains	Resistant to:							
		S	F	NA	CT	PN	SXT	S3	TE
<u>Shigella</u>	25	17	-	1	1	13	9	25	20
<u>Salmonella</u>	10	5	-	-	-	9	2	8	2
<u>Escherichia coli</u>	23	19	-	4	-	11	2	20	16
<b>Total</b>	<b>58</b>	<b>41</b>	<b>-</b>	<b>5</b>	<b>1</b>	<b>20</b>	<b>12</b>	<b>53</b>	<b>38</b>

S: Streptomycin F: Nitrofurantoin NA: Nalidixic Acid CT: Colist  
 PN: Ampicillin SXT: Co-trimoxazole S3: Compound Sulphonamide  
 TE: Tetracycline  
 - = Susceptible

ETIOLOGICAL STUDIES OF INFANTILE DIARRHOEA DISEASE  
SEEN IN JOS UNIVERSITY TEACHING HOSPITAL: A PRELIMINARY REPORT

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ABSTRACT

A total of 589 children, 4 years and below presenting with diarrhoea at Jos University Teaching Hospital were investigated for bacterial enteropathogens from October, 1983 to September, 1984. 141 of them were investigated for Rota Virus. Coampylobacter jejuni was most frequently isolated (8.8%). Others are as follows; Shigella spp (8.5 %), Enteropathogenic E. coli (E.P.E.C.) (6.1%), Salmonella spp (2.9%), S. aureus (1.5%), Aeromonas spp (0.8%), K. oxytoca (0.7%) and non O-1, Vibrio cholerae (0.5%). One strain of E.P.E.C. was found to produce heat-labile enterotoxin (LT). 3.5 % of the number examined for Rota virus (141) was positive. No Yersinia enterocolitica has so far been isolated. The isolate are discussed to age and seasons of the year.

INTRODUCTION

Diarrhoea is a major cause of mortality and morbidity in developing countries, especially among infants. In most clinical laboratories, investigations for causative agents of acute diarrhoea are limited to the older established pathogens; Shigella spp, Salmonella spp, E.P.E.C., and Vibrio cholerae. Current reports have incriminated newer pathogens; C. jejuni (8), Y. enterocolitica (2,10), A. hydrophilla (3, 6) and Rota virus (5). This work intends to isolate and document the bacterial and viral enteric pathogens associated with diarrhoea disease.

MATERIALS AND METHODS

Stool samples were collected into Carry-Blair transport medium and processed with minimal delay. For isolation of C. jejuni, Skirrow's selective media was used. The plates were incubated at 42°C under microaerophilic condition for 48 hrs. This was achieved by gas pak system

without catalyst. Colonies were Gram stained for typical 'S'-shaped Gram negative bacteria. Campylobacter colonies are typically flat, glossy, effuse and have a tendency to spread along the tracks of inoculation. Organisms were tentatively considered to be Campylobacter jejuni/coli if grew at 42°C, Oxidase positive, and corkscrew like motion. Other bacterial pathogens were isolated on appropriate media, biotyped and serotyped according to standard methods (9, 11).

The same procedure was also applied for Aeromonas hydrophila (9, 11) but strains were further subjected to a battery of biochemical test and Oxidase test. The latter was positive for all our strains. Haemolysin production was also carried out on 6 % human blood Agar and zones of haemolysis looked for after 24 hrs incubation.

#### ASSAY FOR ENTEROTOXIGENIC E. COLI

The E. coli were assayed for heat-labile enterotoxin(LT) by the Kit method(Biken Method) ... Manufactured by Meguro Institute C. Ltd. Masumi-Cho, Ikeda-Shi, Osaka Japan.

#### ASSAY FOR ROTAVIRUS

A sample of each stool was prepared and tested by Rota Cell. Rota Cell is reversed passive haemagglutination test Kit to detect Rota virus in stool. Rota Cell is based on the agglutination of fixed sheep red cell coated with specific antibody (to RCDV-Lincoln strain). It involves a screening procedure and a confirmatory procedure to identify and confirm Rota virus in specimens.

#### RESULTS

The isolates are presented in Table 1 and 7.

A total of 40 (8.55) Shigella spp were isolated from 589 patients, 29 (10.6%) from 1-4 years old and 21 (6.7%) from under 1.

Equal number of E.P.E.C. were isolated from both age groups. Considered in this study, thirteen different serotypes were encountered. The predominating serotype was O 155 (17%) followed by O 142 and O 55 (14%). C. jejuni examination yielded 23 (7.1%) from ages 1 - 4. A total of six Salmonella

spp were isolated, 1 from under 1 year and 5 from 1-4 years old.

All Aeromonas species gave zones of  $\beta$ -haemolysis on Blood agar.

Of the 5 Rota virus found in this study, 4 were found from under 1 year and 1 from ages 1-4.

#### DISCUSSION

Of the four Shigella spp, Sh. flexneri was most frequently isolated (68%) and Sh. sonnei the least (2 %). This high percentage rate of Sh. flexneri is not surprising since it has been documented as the predominant species of Shigella found in Nigeria (13). Africa has also been reported to have lower incidence of Sh. sonnei as compared to England and Wales (5,13)

Campylobacter jejuni was isolated from 8.8 % of the patient. It's incidence was higher in children below the age of 1 year. This conforms with others (8, 10). Pattern of antibiogram, reveals high susceptibility rate of C. jejuni to Chloramphenicol and Erythromycin and Kanamycin.

This agrees with other works (10).

Susceptibility of C. jejuni to Nalidixic acid, 30 ug disc, has been reported in some texts as one of the tentative identification tests (7). In this study, 1 of 18 isolates was found resistant to Nalidixic acid, 30 ug disc. Toshie Fukami reported 6 of her 60 isolates resistant to Nalidixic acid (4).

A total of 36 strains of E.P.E.C. were isolated with serotype 0 26 as the most predominant (17 %) (6 of 36 isolates). In a study carried out in Lagos, serotype 0 111 was the predominant strain yielding 9 out of 35 isolates (25.7%).(1)

Serotype 0 111 has an incidence rate of 0.3 % in this study (3 of 36 isolates). 1 strain of E.P.E.C., 0 6:K 15, was found to produce heat-labile enterotoxin (LT).

A total of 17 species of Salmonella were isolated, most of which were found among age 1-4. 1 species was isolated from the under 1 year. 5 of the 17 isolate (29 %) which belong to group B are S. typhimurium. Only 1 S. typhi was isolated. S. typhimurium has been found to be one of the commonest species of Salmonella found in Nigeria (10) and in most other parts of the world (14). A total of 141 patients were examined for Rota

virus. 5 were found positive, from whom no bacterial nor parasitic agent known to cause acute diarrhoea was found. Infants under 1 year were most infected than those between 1-4 years (4 and 1 isolates respectively). This high incident of Koto virus diarrhoea among infants under 1 year as compared with older children, 5 years and above, was recorded in other studies (5).

Generally, bacterial isolation rates tend to peak in the rainy season.

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Table 1 Bacterial isolate from acute diarrhoeal disease

MONTH	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	TOTAL	Z ( / TOTAL CASES)
Shigella	0	2	2	5	5	3	4	8	3	12	3	3	50	8.4889643463497
Salmonella	0	1	0	1	1	2	7	0	0	2	1	2	17	2.886247877589
E.P.E.C.	1	0	1	2	4	3	4	5	2	10	2	2	36	6.1120543293718
C. jejuni	-	-	-	-	-	-	-	2/20	3	9	5	4	23	8.7786259541984
Y. enter.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vibrio spp	0	0	0	0	0	0	0	2	0	0	1	0	3	5.0933786078e-1
K. oxytoca	0	0	1	1	0	1	0	0	0	0	1	0	4	6.7911714770e-1
S. aureus	0	1	1	0	0	2	1	1	0	1	0	1	8	1.3582342954159
Aeromonas spp	0	0	0	0	0	0	0	1	1	0	1	2	5	8.4889643463e-1
Others	0	1	2	2	0	1	4	0	0	0	0	0	10	1.6977928692699
POS. CASES	1	5	7	10	10	10	18	17	8	27	14	13	140	2.37691001697e1
NEG. CASES	12	48	30	22	43	44	33	37	24	49	61	46	449	7.62308998302e1
TOTAL CASES	13	53	37	32	53	54	51	54	32	76	75	59	589	

Table 2 Incidence of Enteropathogenic Organisms according to Age Group

Age (years)	No. of cases examined	No. of positive cases (%)	Shigella	Salmonella	E.P.E.C.	C. jejuni
Under 1	315	63 (20.0)	21 (6.7)	3 (1.0)	18 (5.7)	12/106 (11.3)
1 - 4	274	77 (28.1)	29 (10.6)	14 (5.1)	18 (6.6)	11/156 (7.1)
Total	589	140 (23.8)	50 (8.5)	17 (2.9)	36 (6.1)	23/262 (8.8)

Table 3 Serotypes of Shigella strains isolated

Serotypes		No. of Isolates
Shigella dysenteriae	2	1
	3	2
	7	2
	8	1
	* UT	1
Sub Total		7
Shigella flexneri	1a	2
	1b	10
	2a	6
	2b	1
	3a	3
	4a	4
	5	1
	6	7
Sub Total		34
Shigella boydii	8	1
	10	1
	14	2
	15	2
Sub Total		6
Shigella sonnei		3
Total		50

\* Untypable strains

**Table 4 . Serotypes of Salmonella strains isolated**

O group	No. of isolates
B	5
B1	1
G2	1
D1	2
E4	1
typhi	1
* UT	6
Total	17

\* Untypable strains

Table 5

Serotypes of Enteropathogenic *E. coli* isolated

Serotypes	No. of Isolates
O 26: K 60	6
O 142: K +	5
O 55: K 59	5
O 127a: K 63	4
O 111: K 58	3
O 86a: K 61	3
O 126: K 71	2
O 44: K 74	2
O 128: K 67	2
* O 6: K 15	1
O 114: K 90	1
O 125: K 70	1
O 148: K +	1
Total	36

\* Heat-labile enterotoxin ( LT ) positive strain

Table 6 Drug Resistance of Enteropathogenic Bacteria strains

Species	No. of isolates examined	SM	P	NA	CT	ABPC	Resistant to:				CM	EM
							SXT	Su	TC	IM		
Shigella	43	34	0	1	2	26	18	43	34	2/18	7/18	-
Salmonella	15	5	0	0	0	4	4	12	3	1/5	0/5	-
E.F.E.C.	30	19	0	1	0	11	5	25	15	4/14	6/14	-
C. jejuni	22	3	0	1	6	2	11	2	1	0	0	0

SM: Streptomycin, P: Nitrofurantoin, NA: Nalidixic Acid, CT: Colistin Sulphate, ABPC: Ampicillin, SXT: Co-Trimoxazole, Su: Compound Sulphonamide, TC: Tetracycline, EM: Kanamycin, CM: Chloramphenicol, IM: Erythromycin

Table 7 Incidence of Rota Virus according to Age Group

Age (years)	No. of cases examined	Rotavirus positive cases	( % )
Under 1	58	4	(2.8)
1 - 4	83	2	(0.7)
Total	141	5	(3.5)



Table 8 Cases of Multiple Infection

Shigella + E.P.E.C.	4
Shigella + Salmonella	1
Shigella + C. jejuni	1
Shigella (2) + C. jejuni	1
Shigella + E.P.E.C. + C. jejuni	1
Shigella + Aeromonas	1
C. jejuni + E.P.E.C.	1
Total	10

Fig 1 Incidence of Enteropathogenic Organism  
according to season

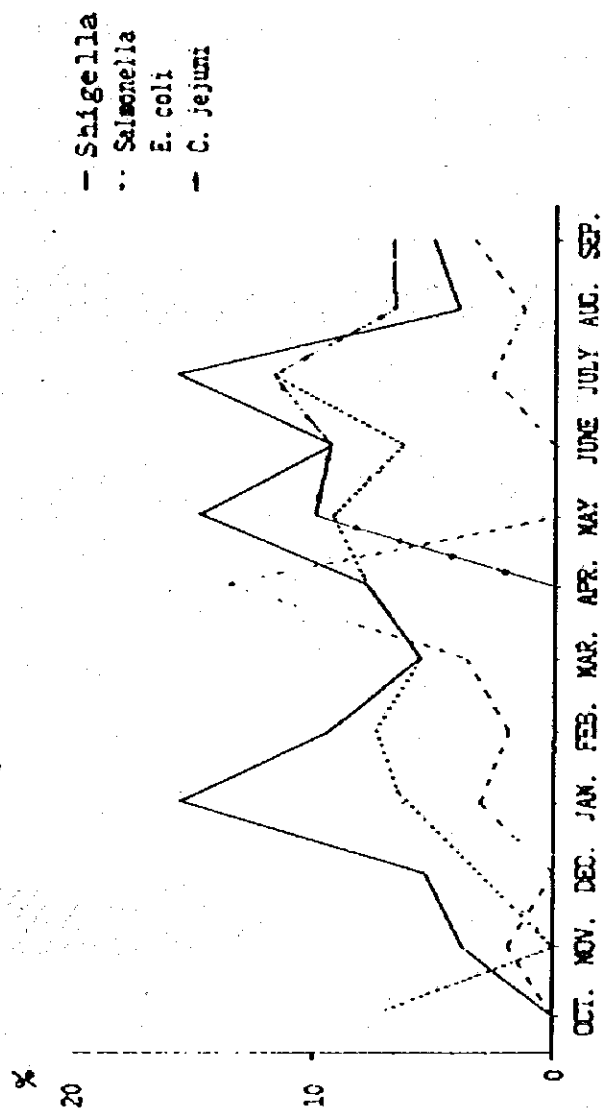
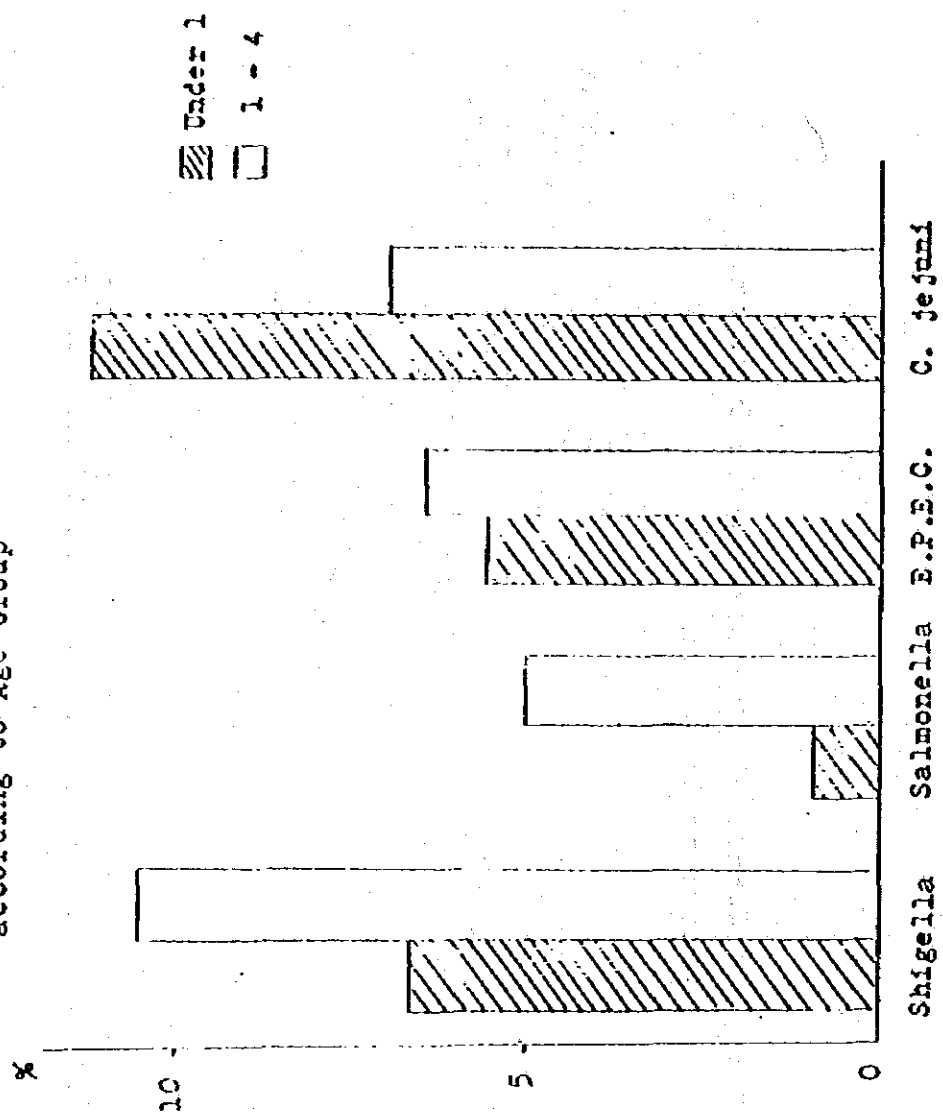


Fig 2 Incidence of Enteropathogenic Organisms  
according to Age Group



# Data on clinical Presentation, Environmental and Socio-Demographic Profile of Diarrhoea Cases.

(JICA-UniJos Research Project on Diarrhoea in under  
five Children)

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Department of Community Health.

The Project Report for 1983 had outlined the objectives and methodology of study, plan of action, phasing of the project and other details. It was stated in report that epidemiological aspect of the study involving community study of diarrhoea in children under five years will be carried out in the second phase of the study to be undertaken from the last quarter of 1984. Meanwhile clinical presentation and socio-demographic, and environmental aspects of the cases of diarrhoea in children under five attending different units of Jos University Teaching Hospital and Plateau Hospital was collected to supplement the data of Microbiological examination.

Table below shows the number of diarrhoea cases studied during 1983 and first half of 1984.

Hospital Unit	1983		1984	
	With Positive Isolation	Negative	With Positive Isolation	Negative
JUTH Paediatric Ward	4	23	10	18
JUTH General O.P.D.	11	40	15	30
JUTH Child Health Clinic	40	87	17	61
Plateau Hospital Wards	1	6	3	-
	56	156	45	109

Cards for 2 cases are missing and hence only 43 have been analysed.

All the diarrhoea cases with positive isolations during 1984 have been analysed for clinical presentation and socio-demographic and environmental data. An equal number of diarrhoea cases from each of the units but without positive isolation were randomly selected and also analysed. The data are presented in Tables 1 to 8 at the end of this report. The following observations are made from the data.

1. Data analysis included 43 cases of diarrhoea with the isolation and 44 cases without positive isolation.
2. Of the 87 cases of diarrhoea studied 36 (41.4%) were infants below one year, and another 19.1% were between 1-2 years. Thus children below 2 years constituted 80.5 % of all cases.

3. Two thirds (66.6%) of all cases were male while remaining were female. This difference could be due to male children being given more care by mothers and therefore seeking medical attention rather than greater prevalence of diarrhoea among male children.
4. More than half (55.5%) of the children gave history of suffering from diarrhoeal attacks in the past 2 months before the present attack, showing that these children are prone to repeated attacks. Children with isolations had positive isolation (60.5% against 50.0% respectively).
5. Sixty percent of the cases had five or more passage of stools per day. However higher proportion of children (73.0%) with positive isolation had larger number of bowel evacuations than the negative isolation cases (46.3%).
6. Passing of watery stool (9.9%), mucus (67.8%) and or blood (31.0%) were the usual presenting symptoms. Fever was present in 63.2% of cases. Of the 10 cases admitted in paediatric ward 52.4% had mild to moderate dehydration on admission while one had severe dehydration.
7. It is important to note that about half (49.4) of cases had already taken treatment from one or other qualified medical personnel before their consultation to JUMI or Plateau Hospital. This could mean consumption of antibiotics leading to lower isolation rate.
8. Majority (87.0%) of the children belonged to lower socio-economic group. Overcrowding (63.2%) in the house, absence of safe water supply (13.8%) and sanitary latrine (80.5% did not have) were the environmental features amongst the cases.
9. Only 17.2% of children were fed on breast alone, the remaining were on top feed. 69% of the mothers did not sterilise the bottle/utensil of the child while 52% did not boil their drinking water.
10. History of presence of another case of diarrhoea was forthcoming in 18.7% of cases suggesting that the transmission could have been intra-familial.

The above data for 87 cases only are presented to highlight socio-demographic and environmental characteristics of cases of diarrhoea besides the clinical presentation. They, however, suffer from the demeris of any data derived from the hospital/clinics. An enquiry covering the field collection of data can only give the much needed epidemiological profile of the cases. The department is getting ready for the same and experts to start the epidemiological studies from last quarter of the present year.

Table 1. Age and Sex-wise Distribution of Diarrhoea Cases.

Age (Yrs)	Cases		Sex	Cases	
	No.	%		No.	%
1	36	41.4	Male	58	66.6
1-	34	39.1	Female	29	33.3
2-	11	12.6			
3 - 5	6	6.9			
Total	87	100			

Table 2. History of Diarrhoea within last 2 months

History	Cases with bacterial isolation		Cases without isolation		Both	
	No.	%	No.	%	No.	%
Present	26	60.5	22	50.0	48	55.5
Absent	17	39.5	22	50.0	39	44.8
	43	100	44	100	87	100

Table 3. Frequency of passing stools.

Frequency/day	Cases with bacterial isolation		Cases without isolation		Both	
	No.	%	No.	%	No.	%
5 times	11	26.8	22	51.7	33	40.2
5 - 10 times	23	56.0	13	31.7	36	43.9
1- +	7	17.0	6	14.6	13	31.7
	41	100	41	100	82	100

Table 4. Clinical Presentation of Cases of Diarrhoea

Symptoms	No. (n= 87)	%
Water/Soft stool	80	91.9
Mucus in stool	59	67.8
Blood in stool	24	31.0
Vomiting	37	42.5
Fever	55	63.2
Pain in abdomen	26	32.2

Note - 1. 52.4% of cases had mild to moderate dehydration.

2. 49.4% of cases had already taken modern drugs for diarrhoea before coming to hospital while 17.2% had taken native medicine.

Table 5. Socio-economic Status of the Families.

S.E. Status	No.	%
High	10	13.0
Middle	34	44.2
Low	33	42.8

Note - Socio-economic status was determined by the occupation of father and mother. Low included manual or semi-skilled workers, middle included skilled workers, office workers etc, while high included professionals, university teachers, businessmen of high standing etc.

Table 6. Environmental Sanitation in the Families.

Sanitation Status	No (n = 87)	%
i) Overcrowding in house	55	63.2
ii) Water supply from well/stream	12	13.8
iii) Absence of sanitary latrine	69	80.5

Table 7. Feeding Practices of the Children

Feeding	No.	%
Breast alone	15	17.2
Bottle	14	16.1
Breast + Bottle	20	23.0
Bottle + Solids	13	14.9
Solids only	18	20.7

Note - 31% of mothers did not sterilise the feeding bottles while baby's water was not boiled by 52.9% mothers.

Table 8. Presence of other Diarrhoea Cases in the Family

Diarrhoea Cases	No.	%
Present	14	18.7
Absent	61	81.3
	75	100

(4)

DEPARTMENT OF ZOOLOGY  
FACULTY OF NATURAL SCIENCES  
UNIVERSITY OF JOS, JOS, NIGERIA

SECOND ANNUAL PROGRESS REPORT OF THE RESEARCH PROJECT TEAM  
ON MEDICAL ENTOMOLOGY AND PARASITOLOGY IN COLLABORATION  
WITH THE JAPANESE INTERNATIONAL COLLABORATIVE AGENCY  
(J.I.C.A.) PROJECTS 1983/84

As a follow-up to the first Annual Report on the JICA - UNIJOS Collaborative Projects on Medical Entomology, and Parasitology, the following is the Progress Report so far for the 1983/84 period.

Altogether nine (9) academic staff, and six (6) Postgraduate Research students participated in the Projects from October 1983 to September 1984. They consist of the following:

Professor H.O.E. Iwuala	Department of Zoology
Dr. D.H. Roberts	" " "
Dr. R. Irving Bell	" " "
Dr. C.O.E. Onwuliri	" " "
Dr. J. Akoh	" " "
Mr. G.E. Anyanwu	" " "
Professor I.C. Tiwari	Department of Community Medicine
Mr. R.O.A. Shonekan	Department of Medical Microbiology
Dr. H. Takahashi	J.I.C.A. Research Project

Postgraduate Students

Mr. H. Iaduabum	Department of Zoology
Mr. D. Boakye	" " "
Dr. I.A. Lawal	" " "
Mr. B.E. Awoke	" " "
Mr. I. Sesay	" " "
Mr. J.A. Ogidi	" " "

A total of eleven (11) sub-projects were mapped out for investigation work (i.e. inclusive of the earlier six sub-projects covered in the 1982/83 Report).

The position so far regarding each Project is as follows:

PROJECT 1: "Study of distribution of Blackflies (Simulium species)  
on the Jos Plateau"  
- Prof. H.O.E. Iwuala, Mr. H. Iaduabum, and  
Dr. H. Takahashi

Introduction

During the phase I aspect of this study, a total of 13 rivers in the Upper Plateau area were consistently sampled for black-fly breeding over an eight month period (April - November, 1983)



Three of the rivers (River Assob, River Farin Ruwa and Gambo River) were the only ones found positive for Simulium breeding, and the greatest intensity of breeding was recorded between June and August, 1983.

#### Recent Work

The bi-weekly sampling exercise was maintained from November 1983 till the end of September, 1984. Also the physical characteristics of the various rivers (especially their pH, temperature, Dissolved oxygen, and conductivity measurements) have been monitored on a regular basis over the past year. Such river measurements as flow rate, depth and width etc. were also considered.

#### Results

At the moment, a total of nine species of Simulium have been recorded from the various rivers. These are S. adersi, S. alcocki, S. aureosinile, S. cervicornutum, S. colas-belcouri, S. hargreavesi, S. macmahoni, S. schoutedeni and S. vorax. Most of these were found in River Assob, with a few species recorded from Rivers Farin ruwa and Gambo.

Physico-chemical measurements from the Rivers showed the pH range to vary between 8.05 and 9.2. Oxygen concentration in ml/litre ranged from 2.45 to 9.6, with significant fluctuations recorded for various rivers in different months. The conductivity measurements were exceedingly low for most rivers, but fairly high in the case of Rivers Assob, Ikingu and R. Poron. As for temperature measurements, this remained fairly consistent for most of the period, with the range being between 22<sup>°C</sup> and 34<sup>°C</sup>.

#### Future Work

In extension of this work, it is intended to study in detail the seasonality of breeding and the factors conditioning the spread and activities of the black-flies in and around the rivers in the Upper Plateau area.

#### PROJECT 2: "Effect of Water Velocity On The Relative Abundance Of Immature Black-Flies"

- Dr. D.H. Roberts and an M.Sc. Student

#### Introduction:

Unbiased sampling of immature black-flies is extremely difficult because of the highly localised distribution of the different species within the river. This seems to be primarily due to:-

- a) Localised substrate differences - this has already been studied by Dr. D.H. Roberts;
- b) Localised differences in the water velocity - this will be studied in the present project, to find the preferred water velocity of each species during their larval and pupal stages.

#### Method:

The water velocity meter only arrived at the beginning of the wet season, so the experiment cannot start until the end of the next dry season (January - March 1985 when the water velocity will be stable. The equipment has however been tested in the River Assob. 20 sites will be chosen in the river (five different velocity ranges, with four replicates for each) and the black-flies will be trapped using polythene string substrates, which will be replaced every two weeks for six replicates.

#### PROJECT 3: "Effect Of Temperature And Humidity On Black-Fly Pupal Survival"

- Dr. D.H. Roberts, Mr. D.A. Bookye, Mr. J.A. Oyidi

#### Introduction:

Two experiments have been carried out:

1. On low temperatures: Transport of pupae from the field to the laboratory requires:- a) Prolonging the pupal stage as far as possible using low temperatures, but at the same time; b) obtaining maximum survival and minimum after effects to the adult. The optimum conditions were investigated in this experiment.
2. On high temperatures: Under natural conditions, the pupae may be exposed to the air for several days due to changes in the water level and they should therefore have evolved a tolerance to high temperatures. This is investigated in the second part of the experiment.

#### Results:

##### Exp. 1 (Low temperatures)

The project started in January 1983. Four temperatures were tested:- 0, 4, 8 and 12°C, to study their effect on pupal survival, adult emergence and adult longevity in Simulium squamosum (a member of the S. damnosum complex). The pupae were exposed to these temperatures for different time periods between 1 - 7 days, then returned to the ambient temperature (approx. 20°C). Survival was greatest at 8°C and lowest at 0°C, then the pupae were divided into young (with pale cuticles)

The Kogoro River (110 km. from Jos) where it passes through an isolated patch of rain forest over a granite boulder bed; this is at the base of the Jos Plateau.

#### Research Staff

A co-ordinated study is being undertaken by:

Dr. R.J. Irving-Bell, Senior Lecturer, who is sampling the Assob River site; Mr. I. Sesay, an M.Sc. student who has undertaken the sampling of the Kogoro River site for part of the year, as his research project under the supervision of Dr. Irving-Bell. Mr. Sesay is in receipt of a W.H.O. student award.

#### Method

Monthly or bi-monthly sampling of both sites began in January 1984. Initial breeding habitats available were rock pools and mud pools. In March additional habitats in the form of tree holes and leaf axils became water-filled owing to the early start of the rains.

The trees/shrubs comprising the habitats have been identified, courtesy of Dr. P. Buckley, Dept. of Geography. Unfortunately the leaf axil habitats available are limited to Pandanus sp., only at the Assob. At the Kogoro site, the banana plants and oil palms present nearby did not retain water in their leaf axils.

#### Interim Results

##### A. KOGORO RIVER SITE

Mr. Sesay has completed 10 visits (sampling occasions) from Jan. to June. His thesis entitled "Mosquito breeding habitats: Distribution and relative abundance of species at a Kogoro forest stream in Northern Nigeria" is currently undergoing examination. A copy of his abstract is attached.

No sampling was possible in July and August owing to lack of transport. Dr. Irving-Bell has resumed sampling of this site from September using private transport.

##### B. ASSOB RIVER SITE

Samples collected so far are shown in Table 1. Species identifications for the collections of Jan. to May have been completed; a list of species is given by Table 2. Reference collections of (a) pinned adults, (b) larvae in 100% ethanol and (c) males in ethanol, have been made.

#### Anticipated procedure for project completion

1. Monthly collections at both sites will continue until Dec. 1984.
2. The difficulties in taxonomy need to be resolved. Dr. Irving-Bell

TABLE 1. MOSQUITO SAMPLES COLLECTED JAN. - OCT. 1984 (ASSOB RIVER SITE)

Sampl. occ.:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Date:	Jan. 27th.	Feb. 1st.	Feb. 22nd.	Feb. 29th.	Mar. 18th.	Mar. 29th.	Apr. 26th.	May 5th.	May 15th.	June 2nd.	June 24th.	July 15th.	Aug. 18th.	Sept. 18th.	Oct. 28th.
-- ROCK POOLS --															
No. of pools	5	5	6	5	5	5	5	5	2	5	2	2	0	5	5
X mosquitoes/pool	233	447	140	145	196	230	118	44	36	124	5	53	-	63	159
-- MUD POOLS --															
No. of pools	7	5	5	5	4	5	5	5	3	5	3	3	0	3	5
X mosquitoes/pool	58	192	134	79	77	84	140	17	8	41	227	5	-	3	112
-- CREEK HOLES --															
No. of samples	-	-	-	-	-	-	5	5	6	5	5	6	5	5	5
X mosquitoes/sample	-	-	-	-	-	-	20	18	9	19	11	7	8	11	1
-- LEAF AXILS --															
No. of samples	-	-	-	-	-	-	5	2	5	5	5	5	5	5	5
X mosquitoes/samples	-	-	-	-	-	-	3	3	27	63	43	67	28	30	32

\* Those pools with larvae + pupae, i.e. excluding barren pools or pools with only mosquito eggs.

\*\* One sample = 1/4 cup of tree hole water

\*\*\* One sample = water from 10 leaf axils of Pandanus

PROJECT 5:

Mosquito breeding habitats: Distribution  
and relative Abundance of Species at a Kagoro forest  
in Northern Nigeria.

Dr. R.J. Irbing-Bell and Mr. I. Sesay

Studies were carried out to determine the distribution and relative abundance of immature stages of mosquitoes associated with a stream in Kagoro Forest, a Northern guinea savanna rain forest. The effects of season and other environmental parameters such as water depth, pH, predators, dissolved organic matter, nitrates and water colour, on the occurrence and abundance of immature stages were also determined. The habitats studied were rock pools, mud pools and tree holes. Each habitat when available, was sampled once or twice monthly from January to June 1984. Culex decens was the most abundant species, followed by Anopheles rhodesiensis. Cx. duttnei and Cx. univittatus were the least encountered, followed closely by Cx. trifilatus. Rock pools were generally more productive with slightly higher temperatures and fewer predators than mud pools. The occurrence of some species was observed to be related to season, for example, Aedes vittatus which was encountered in rock pools as expected, and tree holes. Uranotaenia mshonensis was present only in the wet season. Cx. decens and Cx. tigripes on the other hand, were observed to be absent in mud pools during the wet season. An. rhodesiensis in mud pools, and Cx. decens in rock pools, were not observed to be affected by season with regard to occurrence, but their abundance was conspicuously reduced in the wet season.

From results obtained on the analysis of the effects of depth, pH, predators, dissolved organic matter, nitrates and water colour, none was found to be a significant factor in determining abundance of immature stages of mosquitoes in rock pools. However a significant difference was obtained in the abundance of immature stages of mosquitoes between rock pools and mud pools.

TABLE 2. LIST OF SPECIES IDENTIFIED, J.H. TO M.V. WITH PRESENCE (+) BY HABITAT (ASSOB RIVER SITE)

	ROCK POOLS	MUD POOLS	TREE HOLES	LEAF AXILS
<u>Anopheles</u>				
<u>barberellus?</u>		+		
<u>funestus</u>		+		
<u>gambiae s.l.</u>	+	+		
<u>protoriensis</u>	+	+		
<u>rhodesiensis</u>	+	+		
<u>rufipes</u>	+	+		
<u>Uranotaenia</u>				
<u>fusca</u>	+	+		
<u>mashonensis</u>	+	+		
<u>ornata</u>				+
<u>shillitensis?</u>				+
<u>Aedes</u>				
<u>egypti</u>	+		+	
<u>africanus?</u>			+	
<u>apicargenteus</u>			+	
<u>banbusae?</u>			+	
<u>fowleri</u>	+			
<u>furcifer?</u>			+	
<u>helschi?</u>				+
<u>lanborni</u>			+	
<u>luteocephalus</u>			+	
<u>simpsoni</u>			+	+
<u>stokesi</u>			+	
<u>vittatus</u>	+			
<u>Culex</u>				
<u>annularis</u>		+		
<u>bitaeniorhynchus</u>		+		
<u>cinerellus</u>	+		+	
<u>deans</u>	+	+		
<u>duttoni</u>	+			
<u>ethiopicus</u>		+		
<u>fatigans</u>	+	+		
<u>horridus</u>			+	
<u>insignis?</u>	+	+		
<u>nebulosus</u>			+	
<u>salisburyensis</u>		+		
<u>sinaiticus?</u>	+	+		
<u>simpsoni</u>	+	+		
<u>tigripes</u>	+	+		
<u>trifilatus</u>	+	+		
<u>univittatus</u>	+	+		

? = not confirmed      + presence of adults.

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has consulted two experts in the U.K. and has collected reprints on new species of Culex and Aedes described from West Africa since the publication of the major taxonomic reference book by Edwards in 1941. She has applied to the Commonwealth Institute of Entomology for further reprints, using personal funds. The following procedure is required: (a) Translation of papers from French to English; (b) Permanent mounts of larvae and male genitalia to be prepared for reference and confirmations of identities.

3. Analyses of results. These will include a comparison of the two sites, and an examination of the relationships between species and habitat characteristics, as well as analysis of abundance in relation to predators and rainfall.

#### Difficulties

1. Lack of readily available transport or funds for use of personal vehicle.
2. Shortage of specimen tubes, rearing containers and insect boxes.
3. Difficulties and no financial help for the acquisition of literature and translations.
4. Lack of expert technical help for e.g. preparation of reference slides and pinned specimens.
5. Lack of computer facilities for quick analyses of data.

#### PROJECT 5: "Seasonal and Vertical Distribution Of Tree-hole Mosquitoes"

The most suitable site for this study is the Kagoro Forest 110 km. from Jos. The project cannot be undertaken unless transport is guaranteed, and unless an H.Sc. student is willing to undertake the study. Assuming that these conditions are satisfied, it is envisaged that oviposition traps would be constructed and positioned over the period Jan. to March 1985, and that sampling be performed in the wet season from March/April, continuing over the first half of the following dry season to December, 1985.

#### PROJECT 6: "The Prevalence and Distribution Of Onchocerciasis On The Jos Plateau"

- Dr. C.O.W. Omuliri, Dr. I.M. Lawal and B.E. Nwoke

Eight villages on the foot of Jos Plateau, Nigeria located at various distances from the Assab River have so far been surveyed for the prevalence and distribution of human onchocerciasis.

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A total of 1077 people were examined out of which 177 (10.86%) had *Onchocerca volvulus* microfilariae in their skin snips. The highest infection rate was obtained in a small settlement, Atukum Tozo II where 10(27.0%) of 36 persons examined showed positive skin-snips. At Idaki 24.14% of the people were infected. It was apparent that villages closer to the river had higher infection rates than villages farther away. Consequently in Atukum Tozo II which was only about 1 km from the river 27.8% infection rate was recorded, whereas in Dogon Fili 3.5 km away, the infection rate recorded was only 1.2%.

There was no significant difference in infection rates between males and females in some of the villages since both groups have equal chances of being bitten by infected flies. However, the overall infection rate was higher in males than females. 554 females have so far been examined, of which 52 (9.40%) had infection and 65 (12.40%) of the 523 males examined were infected.

Work is still in progress for other aspects of this project while additional villages are surveyed for onchocerciasis.

PROJECT 7: "Study of the seasonal abundance and population characteristics of immature stages of black-flies in Jos Plateau Area"

- Prof. B.O.O. Iwuala, Mr. N.A. Iaduabum and  
Mr. H. Takahashi

Introduction and Methodology:

As a follow-up to preliminary studies on the distribution of black-flies in the Upper Plateau area (see Project 1), quantitative studies on the seasonal abundance of different types of black-flies breeding in the River Assob (Riyin L.G.A., Plateau State) was commenced in November, 1983.

Larvae and pupae of the insects were sampled on a regular fortnightly basis using polythene strips and *Brassia* palm fronds as substrates.

Also natural trailing vegetation found at the banks of the river were sampled for the immature stages of the black-flies. Other forms of fauna closely associated with the immature insects were collected from the water and from submerged rock surfaces for study and assessment.

The quantitative sampling was undertaken consistently from November 1983 to the end of September, 1984 on a regular bi-weekly basis.

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# Results/Observations

The results of the sampling of immature simuliids are summarised in tables 1 - 4.

Table I below indicates the relative abundance of *Simulium* pupae collected per 90cm<sup>2</sup> on the two substrates of polythene strips and *Borassus* palm fronds respectively for the period November 1983 to March, 1984.

Blackfly species	Nos/90cm <sup>2</sup> on substrates		Overall Total
	Polythene strips	<i>Borassus</i> Palm Frond	
<i>S. hargreavesi</i>	409	433	842
<i>S. Cervicornutum</i>	97	53	150
<i>S. nonshoni</i>	29	20	49
<i>S. schoutedini</i>	16	17	33
<i>S. alcocki</i>	36	29	65
<i>S. ...</i>	9	3	12
<i>S. ...</i>	0	3	3
<i>S. ...</i>	4	7	11
<i>S. ...</i>	9	17	26
<i>S. ...</i>	0	1	1
TOTAL	609	583	1192

TABLE 2 SPATIAL CHANGES OF SIMULIID PUPAE ON POLYTHENE STRIP THROUGHOUT FIRST ALL THE SITES (I, II & III)

Species	Y E A R								OVERALL TOTAL
	APR	%	MAY	%	JUN	%	JUL		
<i>S. hargreavesi</i>	55	90.164	68	83.951	11	68.75	0		134
<i>S. cervicornutum</i>	3	4.918	10	12.346	5	31.25	0		18
<i>S. schoutedini</i>	0		2	2.469	0		0		2
<i>S. alcocki</i>	2	3.279	1	1.234	0		1	100	4
<i>S. ...</i>	1	1.639	0		0		0		1
<i>S. ...</i>	0		0				0		0
TOTAL	61		81		16		1		159

TABLE 3: SEASONAL CHANGES OF SIMULIID PUPAE ON BORASSIUS  
IN THE MICHIGAN SUBSTRATE FROM ALL THE SITES (I, II & III)

Species	Y E A R								OVERALL TOTAL
	APR	%	MAY	%	JUN	%	JUL	%	
<i>S. hargreavesi</i>	45	83.333	48	85.714	20	80	0		113
<i>S. cervicornu- tum</i>	7	12.963	7	12.500	3	12	1	25	18
<i>S. schoutedini</i>	0		1	1.786	1	4	1	25	3
<i>S. alcocki</i>	2	3.704	0		0		0		2
<i>S. vorax</i>	0		0		0		0		0
<i>S. damnosum</i> S.1	0		0		1	4	2	5	3
MONTHLY TOTALS	54		56		25		4		139

TABLE 4: Results of the sampling of natural vegetation for the period April to July 1984 are shown below:

Species	Y E A R								OVER- ALL TOTAL
	APR	%	MAY	%	JUN	%	JUL	%	
<i>S. hargreavesi</i>	15	68.888	81	91.011	12	70.589	13	27.660	122
<i>S. cervicornu- tum</i>	1	1.556	6	6.741	1	5.882	0		8
<i>S. alcocki</i>	0		1	1.124	1	5.881	0		2
<i>S. vorax</i>	1	1.556	0		3	17.647	14	29.787	18
<i>S. schoutedini</i>	0		1	1.124	0		0		1
<i>S. damnosum</i> S.1	0		0		0		20	42.553	20
MONTHLY TOTALS	18		89		17		47		171

Results of the recent final collections showed Coleopteran beetles (Family Psephenidae) and Ephemeropteran larvae (Family Heptageniidae) to be the most preponderant forms associated with the immature simuliids. A few forms of Odonata and Trichoptera were also recorded at the breeding sites of the insects.

#### Further Investigations

The quantitative sampling of the simuliidae will be stepped up in subsequent months of the 1984/85 period. Also potential biological control agents will be collected and screened from water samples in the insects' breeding sites.

PROJECT 8: "Effect Of Predators And Type Of Substrate On The  
Relative Abundance Of Immature Black-Flies"

- Dr. D.H. Roberts & Mr. J.O. Davies-Cole

Introduction

Preliminary studies on the effect of substrate flexibility on black-fly abundance seemed to show that inflexible substrates were colonised by predators and so had few black-flies. Consequently, the relationship between the flexibility of the substrate, predator abundance and black-fly abundance was studied.

Results:

Five types of substrate with different degrees of flexibility were tested:- inflexible, inflexible but articulated, limited flexibility, flexible in one plane, flexible in several planes. Colonisation of these substrates was compared in two ranges of water velocity:-

1. High water velocity. This experiment was carried out in January - March 1984. 8 black-fly species were collected, but the three most abundant were: Simulium hargreavesi, S.vorax and S.cervicornutum. S. vorax preferred the inflexible substrates; S.hargreavesi preferred the inflexible but articulated substrates; S.cervicornutum had no significant preference. Very few predators were collected in these high water velocities, so that they are unlikely to have affected the relative abundance of the black-flies.
2. Moderate water velocity. This experiment will be carried out in January - March 1985 (by Dr. D.H. Roberts). It is expected that the predators will be much more abundant in these velocities and thus affect the black-flies substrate preferences.

Publication:

1. Davies-Cole J.O. (1984) - Investigations on the effect of substrate flexibility and predators on the relative abundance of the immature stages of the black-fly (Diptera: Simuliidae).

PROJECT 9: "Dispersal Of Adult Black-Flies"

- Dr. D.H. Roberts & Dr. R.J. Irving-Bell

Introduction

Little is known about the dispersal of black-flies, because collecting has largely been limited to using human bait. Information from this is extremely limited because:-

- a) Only a small part of the population is being sampled (the biting females).
- b) The method is highly biased, being very vulnerable to differences in the attractiveness and efficiency of the collectors, and to local microhabitat differences.

In this experiment, vehicle-mounted nets will be used, which have the advantage of:-

- a) being unbiased and therefore sampling the whole population.
- b) being very efficient in collecting black-flies at low densities.

Method:

The experiment cannot start until the equipment is received from JICA. It is hoped to start at the end of 1985. Two vehicles with nets mounted on their roof racks will be driven in opposite directions along a 20 km stretch of road at right angles to the river Assob. The catch will be emptied every 2 km, so that the fly abundance will be monitored at 2 km intervals away from their breeding site.

PROJECT 10: "Niche Distribution In Relation To Physiological State Of Adult Populations Of Black-flies And Mosquitoes"

- Dr. R.J. Irving-Bell

This study requires extensive preliminary work in testing the methods proposed, particularly with regard to black-fly collecting. The components for constructing a mechanical aspirator have not yet arrived (see method A). With regard to method B, the use of artificial resting shelters, these have been found to be effective for the collection of resting mosquitoes in the dry season on the University Campus; however small covered buckets were used rather than the cardboard boxes proposed. Since plastic buckets are attractive to petty thieves, it is proposed that a preliminary trial using cardboard boxes be carried out in a woodland site near the University. This is necessary to determine the number needed to obtain reasonable sample sizes, and also to decide on sampling frequency.

Therefore the project as outlined in the proposal is unlikely to begin until Oct./Nov. 1985, by which time it is hoped preliminary trials will have indicated a suitable experimental design.



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UNIJOS-JICA TRACE ELEMENT STUDIES IN PLATEAU STATE,  
NIGERIA

U.P. Isichei, A. Banwo, S.C. Das, B. Adegoke and  
J. Egbuta.

Department of Clinical Chemical Pathology, Faculty  
of Medical Sciences, University of Jos, Jos, Nigeria.

Jos metropolis and its environs lie within the tin-mining districts of Plateau State. Mining leads to pollution of the environment and as an occupation carries with it the risk of certain health hazards. Besides, the landscape of the district is hilly, rugged and open to assault by erosions. Such physical features and terrain have their own health implications as well and explain partly why endemic goitre is a problem in the area. So far hardly any work has been done to study the effect of such changes among the residents of the region especially in relation to variations in the levels of trace elements other than iodine as well as in relation to the health hazards arising from pollution by contaminants released from the local tin, lead and zinc mining industries. The aim of the on-going project in the Department of Clinical Chemical Pathology is to provide some data for the evaluation of the problem in Plateau State.

The work which began a few months ago has made some progress. About 34 blood samples collected from apparently normal subjects have been analysed for their content of several trace elements. Some results are available and others are being evaluated. The aim is to study the impact of age and sex on plasma trace element levels in order to establish the reference range for trace elements for the local population. This exercise is of course a sine qua non for our main project.

Since the main task before us is to study the effect of environmental metallic deposits, in man, the results of the

.... /2.



preliminary survey done by other teams are being studied to enable the Department direct its activities to the areas considered clinically important. The trace element team is continuing its work in this direction.

The aspects of the project which are being studied are as follows:-

1. Plasma and Tissue Levels of Important Trace Elements and the Metallo-Carrier Proteins in Apparently Normal Subjects in Plateau State.  
- the determination of reference values which is a necessary pre-requisite for comparative studies, evaluates the impact of age, sex etc on plasma and tissue trace element levels.  
A. Banwo et al.
2. Plasma and Tissue Levels of Important Trace Elements and the Metallo-Carrier Proteins in Miners, other Inhabitants of the Mining Districts and Special Problem Areas (e.g. Kuru) of Plateau State. J. Egbuta et al.  
- this sub-project studies the occupational health hazard involved among the workers of the mining industry.
3. The Impact of Seasonal Changes on Plasma Trace Element Levels  
- this aspect of the work is considered necessary as there appears to be some indications from the preliminary studies done by other teams that environmental levels of trace elements vary with seasonal changes. (M.Sc. Postgraduate Students).
4. Blood and urine lead and zinc determinations in the lead-zinc mining community of Zurak - a study which inquires into the clinical implications of the heavy metal mining industry.  
J. Egbuta et al.

.... /3

5. Trace Element and Disease : (M.Phil/PhD postgraduate students in the Department)

- the current interest in the Department is on diseases common in this environment e.g. endemic goitre, sickle cell disease, G.6.P.D deficiency, liver cirrhosis etc.

Constraints in executing the departmental trace element Project.

1. The procedure for plasma and tissue analysis for their trace element content is a tedious and long procedure. The group is allocated one day a week for the analysis of samples. This time is very inadequate and has delayed progress of the work considerably. \* (The JICA-Team Leader, Dr. H. Takahashi, has been approached about the possibility of providing the Department cathode lamps and standard solutions in order to make our departmental equipment (a Pye-Unicam's Model) functional. This will greatly accelerate the work of the departmental team.
2. The kits for transferrin and caeruloplasmin determination are not locally available. JICA Team leader has been approached to see if these could be obtained from Japan.

Other Remarks

Interaction with other Departments in some project areas is vital so that blood trace element levels could be evaluated along with environmental changes.

\* For the project, it is vital to include the determination of tin and rubidium; the former because of possible pollution of the environment by contaminants from the tin mining industry, the latter because preliminary analysis of the Jos water and soil samples seem to indicate that the content of that element is relatively high. Cathode lamps and standard solutions for these two trace elements are not available at the moment and so should be included in the list of the laboratory materials to be provided by JICA.

## REPORT FROM TRACE ELEMENT PROJECT 2: 1985

**TITLE:** TRACE ELEMENT DISTRIBUTION IN PLATEAU STATE AND ITS ENVIRONMENTAL SIGNIFICANCE, BY A.C. OGEZI, M.C. ADIYUKU-BROWN AND M.I. OGUNBAJO (DEPARTMENT OF GEOLOGY AND MINING).

### 1. SUMMARY OF 1983/84 WORK

During this period, a large number of samples of minerals, stream sediments, surface and underground water from Jos Plateau and its environs, particularly areas of known mineral occurrences and mineral processing were analysed for major, minor and trace elements of economic and environmental significance, using the AAS, XRF, XRD, microscopes, and a micro-probe analyser.

Studies on the minerals included:

- a) Identification of the crystal structure.
- b) X-ray fluorescence and wet analysis for component elements.
- c) An investigation of an efficient, cheap and convenient method of determining trace elements in simple sulphide minerals.

In the studies on sediments, emphasis was laid on establishing:

- a) Which sediment fraction contained the highest concentration of trace elements.
- b) Which acid is more effective for the leaching of sediment samples.
- c) Which trace elements are contained in the sediment samples and their economic and environmental significance.
- d) The relationships between trace element contents of the sediment samples, the water samples and the bed rock.

Also, surface and underground waters were analysed for trace elements.

Results from the on-going research revealed that:

- a) The surface water samples contained low concentrations of some toxic elements, such as Cd, Pb and Zn.
- b) Some minerals mined on Jos Plateau, for example, monazite, contains the radioactive elements, uranium and thorium.

In the course of the reconnaissance survey, oral discussion with the Director of one of the mining companies revealed that some residents of the area were already showing symptoms of effects of dangerous radiation levels e.g. cancerous growths on the skin, pre-mature deliveries, etc.

2.

- c) Well waters were generally lacking in toxic elements due to filtering action of aquifers and absence of contaminants.
- d) The sediments also contained some toxic amounts of the trace elements, especially in areas polluted by mining activity.
- e) The sediment fractions finer than 0.125 mm mesh size contained higher concentrations of trace elements due to adsorption and element mobility.
- f) 50% HCl was efficient for the leaching of sediment samples and quite cheap and safe to use for large number of samples treated.
- g) Some of the minerals contain high amounts of the much needed alloying elements, for the steel company. These elements include, Zr, Nb, Ta, Hf and they were found in the minerals, columbite and zircon, etc contained in mine/mineral processing dumps and in tin smelting slags.
- h) Some of the sulphides analysed contained economic amounts of Cd and Ag, which if exploited would make the mining of the sulphides more feasible. Others have major Health implications.
- i) A simple dilute HNO<sub>3</sub> digestion was found to be efficient and convenient for the wet digestion of simple sulphides and this was cheaper, safe and easier to use for the large number of samples that would be treated during this project.

## 2. SUMMARY OF WORK IN 1984/85 SESSION

During this period, emphasis was placed on studies of the effects of mining in Zurak and checking the results and the significance of the work carried out in 1983/84.

Mineral and Water samples were collected from some wells and ponds in the abandoned mining area of Zurak, S.E. Plateau where Pb-Zn mining took place up till just before World War II. Plant leaves were also collected from the neighbourhood of the ponds.

The samples have been analysed for the following trace element: Pb, Cd, Zn, Mn, Ag, Cu, Co, Ni, Cr, etc by Atomic Absorption spectrophotometry (AAS) in the Department and the Nigerian Mining Corporation, Jos.

The samples were also analysed for the anions SO<sub>4</sub><sup>2-</sup>, PO<sub>4</sub><sup>2-</sup>, NO<sub>2</sub><sup>-</sup>, Cl<sup>-</sup>, F<sup>-</sup>, etc., using the ion exchange chromatographic analyser provided to the Department of Biochemistry, by JICA. The heavy and trace elements were analysed using the AAS of the Department of Geology and Mining.

3.

Occasionally, the samples were analysed using the AAS provided by JICA, for comparative purposes. The results often compared favourably.

Results from the research revealed that Pb, Cd, and Zn are present in the pond water, which is acidic, at concentrations above World Health Organizations (WHO) permissible limits. There was no major biote in the water. Analysis of fresh leaves from the environment revealed that there is a high concentration of Cd, Zn, and Pb, reflecting the extent to which the soil and underlying bedrock is rich in these metals.

Results of cation analysis of some sphalerite and mine dump dust samples around the ponds show a high concentration of Pb, Zn, and Cd. These toxic elements were probably leached into the water from the surrounding mining wastes and the surrounding mineralised sedimentary rocks.

Anion concentrations were relatively high, especially the  $\text{SO}_4^{2-}$ . The well water in Zurak village, far from the mineralised zone, had non-detectable amounts of toxic trace elements.

The situation in Zurak calls for an inter-disciplinary research. These metals, when present in toxic concentrations in human beings, form particularly stable bonds to the active sites of some enzymes and this chemical affinity is the basis of metal toxicity in man. The attachment to an enzyme of these metals impairs the normal metabolic role of the enzyme. Thus, the high affinity of  $\text{Pb}^{2+}$  for thiol and phosphate-containing ligands in living systems inhibits the biosynthesis of heme, affecting membrane permeability of the kidney, liver, and brain cells, thereby, causing their damage, leading eventually to convulsions, behavioral disorders and death. Excess Cd causes high blood pressure and interferes with zinc metabolism.

The residents of Zurak, who are presently drinking water from these ponds, may soon be experiencing these problems, if they are not doing so already. Adequate planning is very necessary in order to establish realistic criteria and standards to protect

4.

Public Health and water quality in the area.

The significance of the identification of several minerals and elements in mine dump and slag will be investigated in 1985/86.

### 3. 1985 - 86 RESEARCH PROPOSAL

In the 1985/86 year, more minerals, rocks, sediments and water samples will be analysed from both the Jos and Zaria areas. Chemical Studies of the minerals will also be intensified and detailed mineralogical, X-ray diffraction and radiometric studies carried out. Geological and geochemical studies of element mobility, solid waste disposal and their health effects in parts of Plateau State would also be intensified.

Subject to the availability of equipment and materials, at least three publications are expected at the end of the period.

### 4. EQUIPMENT RECEIVED SO FAR FROM JICA: THEIR UTILIZATION AND PRESENT STATE.

The following major equipment have so far been received from JICA, with gratitude:

- i) General Laboratory wares already received, such as mortars, pipettes, volumetric flasks, measuring cylinders, beakers, etc are all being effectively utilised. Replenishment has been requested for in 1985/86.
- ii) The analytical balance is yet to be properly installed, but efforts have been made by the Department and JICA to get all the parts from Japan.
- iii) The quality of water from the deionizer is presently being tested in order to ascertain how efficiently deionized the water is. This equipment needs a transformer to be properly functional.
- iv) It has been difficult to put the water quality checker to use. It does not seem to be conducting and contacts are being made to make it functional.
- v) The transformer attached to the grinder and the pH meter has not been located and is being searched for.
- vi) The tripod stand was supplied without the clamps.
- vii) The support for the Kjeldahl apparatus was not also supplied.

5.

5. PROBLEMS AND PROSPECTS

The absence of analytical balance and a fume cupboard have caused a great deal of set-back to the project. We have had to go as far as the Nigerian Mining Corporation (NMC), Jos, to be able to digest our samples.

The X R F and Microscopic studies were done in France and Germany, respectively. We acknowledge assistance of equipment received from JICA and other projects, such as V W Foundation (through A.C. Ogezi) etc and access to Universities in France, the Federal Republic of Germany and Great Britain. We also thank the Nigerian Mining Corporation, Jos, and other Departments and colleagues of the University of Jos, especially Zoology, Biochemistry and Chemistry for support and access to equipment.

We have requested for a number of new equipment for radiometric, petrographic, mineralogical, and chemical analysis and replenishment or new supplies of chemicals and reagents. We hope to continue with increased vigour during the 1985/86 session, subject to the availability of materials, equipment and time.

With the current level of support by JICA, the group hopes to make several very significant findings with important health, environmental and economic implications. We sincerely acknowledge assistance of JICA and its scientists, especially Dr. H. Takahashi, in these investigations.

# UNIJOS/JICA TRACE ELEMENT STUDIES

## Sub Project 3: RESEARCH PROJECT ON TRACE ELEMENTS BASED IN ZOOLOGY DEPARTMENT, FACULTY OF NATURAL SCIENCES, UNIVERSITY OF JOS, JOS

The distribution of trace elements in surface water and streams sediments in the Jos plateau in relation to their concentration in tissues of aquatic organisms.

### Research Plan For 1985/86

1. Evaluation of trace element levels in water, sediments and tissues of aquatic organism in two mine lakes in Jos area for the second full year.
2. Trace element levels in water sediment and macroinvertebrates in two artificial impoundments and their relationship with the geological formation and reservoir age.
3. Comparative Evaluation of the varying levels of trace-elements in plankton through macro-invertebrates to fish in surface waters located in (a) mining and non-mining districts of Jos plateau. This work will attempt a synthesis of the biological significance of the results obtained in the past two years on the main project.
4. Trace element concentrations in vegetable matter (relevant to human nutrition) and produced through dry season irrigation with water polluted with heavy metals in Jos area.
5. Studies on the physiological activities of selected trace elements at levels observed in waters used by man in the Jos plateau - cadmium, lead, zinc, manganese and organic tin.

### EXPECTED PUBLICATIONS BY THE TRACE ELEMENT PROJECT SUB-PROJECT 3 BASED IN ZOOLOGY DEPARTMENT ON COMPLETED STUDIES

1. Distribution of Trace Elements in some surface waters by Ejike C, D. Anadu, I.J. Chidobem and E.C. Nkemdirim.
2. Trace Element Levels in the water and sediment in Two Old Mine Ponds and their Relation to Pond Primary Productivity by Ejike C, J.W. Wade, D. Anadu and I.K. Chidobem.
3. Seasonal Variations in Trace Elements Contents of Water, Sediments and Macroinvertebrates in Two Reservoirs in the Jos Plateau by
4. Studies on the Impact of Water quality Characteristics, Gradient and Water Velocity on Survival and Larval Transition in Simulium by Ejike C., Makpo J.K. and Okayi R.C.



SUMMARY OF BIOCHEMISTRY DEPARTMENT TRACE  
ELEMENT SUB - PROJECT DATA FOR THE YEAR  
1984 - 1985 AND RESEARCH PROPOSAL FOR  
THE PERIOD 1985/1986

Gregory Abraham UJCN and Chiyoichi Noda  
 Department of Biochemistry, Faculty of Medical  
 Sciences, University of Jos.

Our report is a summary of work undertaken (some completed and others to be completed) for the year 1984/1985 and a projection into what we intend to pursue in the year 1985/1986 under the JICA - UNICEF supported project.

Completed works include:

- (i) Water quality survey in Jos metropolis and its suburbs.  
 The water quality surveys involve cation and anion concentration determinations in treated (tap) and untreated (well, stream, dump and industrial effluent) waters.
- (ii) Comparative studies on water and food chemical components from areas already identified as goitrous with those from non-goitrous areas.
- (iii) Chemical composition seasonal fluctuations in water and foods from Jos and its suburbs.
- (iv) New technique for determining micro-amounts of halogens present in foods. This technique requires the bomb (oxygen) combustion of partly dried foods to destroy organic components and the dissolution of emitted gases in hydrogen peroxide. The resultant liquid is then subjected to ion chromatographic analyzer (ICA) treatment.

The completed works have required a combination of several chemical and physical techniques (extractions, digestions, atomic absorption spectrometry, chromatographic separations) to effect. These completed works are being written up for publication with UJCN and Noda as the principal authors. Dr. Isuchiya and Dr. Sesano, the short term experts, who have been very instrumental to the success of our work through advises and personal involvements will be duly acknowledged.

Our research plan/s for the year 1985 - 1986 will come under the following general guidelines:

1. Monitoring the organic components of health significance in water and foods. Our interests involve the determinations of concentrations of benzene, chlorinated alkanes and alkenes, chlorophenols, polynuclear aromatic hydrocarbons, trihalomethanes and pesticides in our waters and foods. These organic compounds are precursors to carcinogens or are carcinogens themselves and should be detected and controlled even when they occur in micro amounts in our environment. This aspect of the work will be actively pursued once we have a gas chromatograph (GC).
2. The impact of human activity on drinking water will be studied using variables like ammonia, nitrate, nitrite, silicate, turbidity, colour and surfactants (F345) contents as indicators.
3. The uptake and concentration patterns of trace and heavy metals from the soil and water through crops and vegetables to humans will be studied. This has become rather important as industrial effluents are being used for irrigation in most of Plateau State during the dry season.
4. Comparative studies of chemical composition of water and foods from several identified areas with typical diseases to establish common chemical deficiencies or excesses that potentiate these diseases.
5. Collaborative work between our group and microbiology department will be carried out in an attempt to establish any relationship/s, if any, between cation and anion concentrations in water and the prevalence of bacteria therein.
6. Some collaborative work will also be carried out between our department and the department of Community Health. The proposed work will entail surveys of disinfected and non-disinfected drinking waters: relationship between these and diarrhoeal incidences.
7. The determination of total organic carbon in drinking water before and after disinfection as a means of monitoring the concentration of chlorinated organic compound that result from disinfection. This phase of work will require the use of the total organic carbon determination equipment which we do not presently have and would request that we be supplied with one.

#### OUR EQUIPMENT NEEDS FOR 1985 - 1986

1. TOTAL ORGANIC CARBON DETERMINATION EQUIPMENT
2. GENERATOR FOR ICA, FLUO PORTION OF AAS DISTILLER
3. REPLACEMENT PARTS FOR AAS
  - (a) CUVETTES (ONE AND HALF TYPES) 200 EACH,
  - (b) HOLLOW LAMPS (Ca, Mg, K, Sn, Pb, Mn, Cu, Ni, Zn, Fe, Cd, Ti, Cr, Co,)

- c. STANDARDS FOR Ca, Mg, K, Sn, Pb, Mn, Cu, Na, Zn  
Fe, Cd, Li, Cr, Co.
- d. AAS ASPIRATOR TUBES
- 4. REPLACEMENT PARTS FOR ICA
  - (a) COLUMNS FOR CATION AND ANION SEPARATIONS  
(6 each).
  - (b) Millipore filters
  - (c) SAMPLING BOTTLES 100ml, 200ml (100 each).
- 5. Hg and As determination equipments

ENDEMIC GOITRE RESEARCH PROJECT IN PLATEAU  
STATE, NIGERIA (PHASE 2 REPORT)

Prof. U.P. Isichei, Dr. S.C. Das, A.I. Banko and  
J. Egbuta.

Department of Clinical Chemical Pathology,  
Faculty of Medical Sciences, University of Jos,  
NIGERIA.

The results of work done in Phase I was presented in a previous report. What follows is a description of the work done by the Department of Clinical Chemical Pathology in Phase 2, the current phase of the project. In Phase I, the emphasis of the work done in the project was on epidemiological survey. At the end of Phase I, one of the Principal Investigators, Prof. I.C. Tiwari, the Head of Community Health Department resigned his appointment and withdrew from the project. In the current phase, the emphasis of the work is on the clinical pathology of the disease as well as work directed at determining some of the aetiological factors involved in goitre in Plateau State. Epidemiological survey however continues but this time was extended to include the adults within the general community. The work done in the current phase was executed by members of the Chemical Pathology Department under the supervision and direction of Prof. U.P. Isichei assisted by Dr. S.C. Das. The details of the work done are as follows:-

1. About 300 samples of blood were collected and subjected to analysis for the determination of the following thyroid function parameters using the enzyme-linked immunoassay technique : thyroxine ( $T_4$ ), triiodothyronine ( $T_3$ ), thyroid stimulating hormone (TSH), thyroxine-binding globulin (TBG), thyroxine binding capacity (TBC), and the free thyroxine index (F.T.I.). The samples analysed included both normal and pathological.

.... /2.

2. Several samples were collected from apparently normal subjects to study the impact of age and sex on the above parameters. Reference values were derived by subjecting the results to statistical analysis to obtain the mean and range values.
3. Pathological samples from patients with endemic goitre (grades 1 - 4) were collected and processed to determine the functional status of the thyroid gland in relation to plasma thyroid hormone levels, thyroid stimulation, the content of thyroxine binding globulin, the capacity of hormone binding and the free-thyroxine index. The work is continuing.
4. A comprehensive study of plasma lipid profiles among the goitrous population which began in this phase is still going on. The parameters currently being determined include the following : Total cholesterol, beta lipoprotein cholesterol, HDL-cholesterol, LDL-cholesterol, triglycerides and the lipoproteins.
5. Similarly a differential study of the protein constituents of plasma in endemic goitre has started. So far this work has been restricted to the determination of total serum protein and the albumin/globulin components due to the limited facilities. It will be extended to include the evaluation of thyroid and lipid associated specific carrier proteins in relation to thyroxine and cholesterol metabolism as soon as facilities become available.
6. Several water samples as well as soil samples were collected from the endemic and non-endemic zones for physico-chemical

.... /3.

analysis to determine some of the possible aetiological factors responsible for endemic goitre in Plateau State. Some of these have already been analysed and the rest will follow as soon as possible.

7. The endemic goitre survey was intensified and extended to include the adult population within the general community. A total number of 1004 subjects were examined in the present phase of the project. Two areas with different geological formation were selected for mass-screening of subjects -- Binci (granite formation) and Miango (basalt lava). A few patients referred to us in the hospital were included in the survey.
8. Questionnaires have been designed and are used during the survey to gather vital information in relation to clinical observations (e.g. cretinism, hypothyroidism, deaf mutism, type of staple diet, water and vegetable sources etc). Several cases with monstrous goitres and some cases of cretinism were identified and photographed.
9. A family from Barkin Ladi with 6 children, four of whom are cretins was investigated and currently being studied. The patients were discovered, clinically examined and evaluated during the course of our survey in our Department. The family is being presented jointly by the Departments of Clinical Chemical Pathology and Internal Medicine as case report.

AETIOLOGICAL STUDIES OF INFANTILE DIARRHOEA DISEASES  
SEEN IN JOS UNIVERSITY TEACHING HOSPITAL, JOS NIGERIA  
A Preliminary Report\*

Ani, Agatha,<sup>1</sup> Takahashi, M.,<sup>2</sup> Saide, H.,<sup>2</sup> Kozak, W.H.,<sup>1</sup>  
Kumar, V.,<sup>1</sup> Shonekan, R.A.O.<sup>1</sup> and Agbonlahor, D.E.<sup>3</sup>

<sup>1</sup> Department of Medical Microbiology, University of Jos

<sup>2</sup> Japanese International Co-operation Agency

<sup>3</sup> National Veterinary Research Institute, Vom

ABSTRACT

A total of 589 children, 5 years and below, presenting with diarrhoea at Jos University Teaching Hospital were investigated for bacterial enteropathogens from October 1983 to September 1984. 262 of these were examined for Campylobacter jejuni (C. jejuni) while 144 were examined for Rota virus.

The prevalent rate of C. jejuni was 8.8%; others are as follows: Shigella spp (8.5%); Enteropathogenic E. coli (EPEC) (6.1%); Salmonella spp (2.9%); Staphylococcus aureus (1.5%); Aeromonas hydrophila (0.8%); Klebsiella oxytoca (0.7%) and non-O1 Vibrio cholerae (0.5%). One strain of EPEC was found to produce heat-labile enterotoxin (LT). No Yersinia enterocolitica has so far been isolated. 3.5% of the number examined for Rota virus was positive. The results are discussed according to age of children and seasons of the year.

ISOLATION OF CAMPYLOBACTER JEJUNI IN JOS,  
NIGERIA.

ANI, TAKAHASHI M, TAKAHASHI T, KOZAK W, KUMAR V, AND  
SHONEKAN RAO

Campylobacter jejuni was isolated from 8.1% of 667 stool samples from children with diarrhoea and 0.5% of 180 samples from apparently healthy children, during 1 year (May 1984 - April 1985) survey in Jos, Nigeria. The equivalent figures for other bacterial enteric pathogens isolated were Shigella spp 8.7%; Enteropathogenic Escherichia coli (EPEC) 8.0% Salmonella spp 8.3%; 1.3% Aeromonas hydrophila (A. hydrophila) 1.3% and non O-1 agglutinable Vibrio cholerae (NAG. V. Cholerae) 0.6%.

From results obtained in this study, the differences in the prevalence of C. jejuni from diarrhoeal children, when compared with those of shigella and EPEC are not statistically significant. The prevalences of Salmonella, A. hydrophila and NAG V. cholerae in the children are however, relatively low, compared to that of C. jejuni.



Drug Susceptibility Tests and Minimum Inhibitory  
Concentrations of 88 Strains of Bacterial Enteric  
Pathogens

13th August, 1985

A. Ani *et al.*

Summary

A total of 88 strains of enteropathogenic bacteria isolated from cases of infantile diarrhoea seen at Jos University Teaching Hospital was subjected to drug susceptibility test and minimum inhibitory concentrations (MIC). Among these isolates were 43 strains of Shigella, 30 strains of enteropathogenic Escherichia coli and 12 strains of Salmonella. They were all tested against 8 different types of antimicrobial agents, viz: Nalidixic acid (NA), Streptomycin (SM), Kanamycin (KM), Cephalexin (CEX), Ampicillin (PN), Chloramphenicol (CM), Tetracyclin (TE) and Sulphonamide (S3).

The percentage resistance to the drugs exhibited by the different bacteria were as follows. Salmonella species: S3=100%, TE=16.7%, PN=16.7%, KM=16.7%, SM=16.7% and CM=8.3%. All strains were sensitive to NA and CEX. Shigella species: S3=90.7%, TE=81.4%, PN=60.5%, KM=4.7%, SM=72.1% and CM=65.1%. All strains were sensitive to NA and CEX. Enteropathogenic Escherichia coli: S3=83.3%, TE=66.7%, PN=50.0%, KM=23.3%, SM=56.7% and CM=40.0%. All strains were sensitive to NA and CEX.

Generally, all the bacterial isolates exhibited high resistance rates to S3. Shigella species were highly resistant to S3, TE and SM, and also to CM and PN. Enteropathogenic Escherichia coli strains were highly resistant to S3, TE, PN and SM. All 88 strains tested were however sensitive to NA and CEX.

Viral, Bacterial and Parasitic Enteric Pathogens  
Associated with Diarrhoea Children

4th October 1985

M. TAYAHASHI *et al*

Summary

A total of 641 diarrhoeal children, under 5 years and below, were investigated for Viral, Bacterial and Parasitic enteric pathogens at Jos University Teaching Hospital from July 1984 to June 1985.

As Viral enteric pathogens, only Rotavirus was studied. Stool samples were collected from three different sections namely Paediatrics Ward (Paed.), Out Patient Department (O.P.D.) and Child Health Clinic (C.H.C.). Infection rate of Rotavirus was high at Paed. (14.8%) comparing with at O.P.D. (5.7%) and C.H.C. (2.5%). As an average, 7.0% of Rotavirus infection cases were found from diarrhoea children. There was no significant difference on the infection rate of Rotavirus with sex; male (6.7%) and female (7.4%).

Rotavirus was found mostly from age group under 2 years. The infection rates among various age groups were as follows; 9.4% (under 6 month), 10.6% (6-11 month), 5.0% (12-17 month), 6.5% (18-23 month) and 2.2% (24 month and above).

There was high peak of incidence of Rotavirus (28.6%) in November, and also the infection rate was higher in Dry season (12.9%)(Nov. - Mar.) than in Rainy season (4.2%)(Apr. - Oct.).

There were 5 multiple infection cases with Rotavirus. They were Rotavirus and Enteropathogenic Escherichia coli (EP EC)(3 cases), Rotavirus and Campylobacter jejuni (1 case), and Rotavirus and Entamoeba coli (1 case).

Infection rates of enteropathogenic bacteria at Paed., O.P.D. and C.H.C. were 23.5%, 22.3% and 17.5% respectively. As an average, it was 21.4% (137/641). Shigella, Enteropathogenic Escherichia coli (EPEC) and Campylobacter jejuni were most commonly isolated organisms, and their infection rates were 7.3%, 7.2% and 6.9% respectively. Salmonella and Vibrio were isolated only 2.7% and 0.5% from the patients. All of Vibrio strains isolated were Non O-1 Vibrio cholerae (NAG Vibrio). No Yersinia enterocolitica was isolated.

Though diarrhoea cases with enteropathogenic bacteria were seen in all age groups, there was no significant difference on the infection rate among age groups. There was also no difference on the infection rate between Dry season (22.0%) and Rainy season (21.1%). Among Shigella strains, Shigella flexneri was the most frequently isolated strain (61.7%). 18 different kinds of serotypes of EPEC were found, and among Salmonella strains, B group strain was highly isolated (9/17). There were 17 multiple infection cases of enteropathogenic bacteria. Among them, 3 cases were triple infection cases, others were double infection cases.

610 out of 641 diarrhoeal children were examined for parasites. Infection rate of parasites was 10.2% (62/610) as an average. It was high at O.P.D (13.6%) and at Paed. (10.3%), and low at C.H.C. (2.7%). 12 different kinds of parasites were found. Infection rates of Entamoeba histolytica and Giardia lamblia were 1.5% and 2.1% respectively. According to age growing, the infection rates of parasites were increased; 0-1 year (3.1%), 1-2 years (9.6%), 2-3 years (22.2%), 3-4 years (28.1%) and 4-5 years (41.4%). 9 multiple infection cases of parasites were found, and 13 multiple infection cases with enteropathogenic bacteria and parasites were also found.

Enteropathogenic Bacteria and Parasites Associated  
with Diarrhoea Children

3rd October 1985

M. TAKAHASHI *et al*

Summary

A total of 1,137 children, 5 years and below, presenting with diarrhoea at Jos University Teaching Hospital were investigated for bacterial and parasitic enteropathogens from October 1983 to June 1985.

829 of these were examined for Campylobacter jejuni (C. jejuni), and 989 of these for parasites. 525 stool samples were collected from Out Patient Department (O.P.D.), 220 stool samples from Paediatrics Ward (Paed.) and 392 stool samples from Child Health Clinic (C.H.C.).

Infection rates of enteropathogenic bacteria were 24.2% at O.P.D., 24.1% at Paed. and 16.6% at C.H.C. Shigella (8.4%), C. jejuni (7.1%) and Enteropathogenic Escherichia coli (EPEC) (6.9%) were most frequently isolated bacteria. Isolation rates of Salmonella and Vibrio were 2.9% and 0.4% respectively. All of the strains of Vibrio were Non O-1 Vibrio cholerae (NAG Vibrio). No Yersinia enterocolitica was isolated.

In age group from 4 years to 5 years, the infection rate of enteropathogenic bacteria was the highest (38.8%). The lowest infection rate was in age group under 1 year.

Seasonal incidence of enteropathogenic bacteria was studied from November 1983 to March 1985. Infection rate was slightly higher in Rainy season (April to October) (18.3%) than in Dry season (November to March) (13.6%, 14.9%).

Among Shigella strains isolated, Shigella flexneri was the most frequently isolated strain (64.2%). 23 multiple infection cases of enteropathogenic bacteria were found. Among them, mixed infection with Shigella and C. jejuni

was frequently found.

For drug susceptibility test, 11 different kind of anti-biotic drug disks were used. They were Ampicillin (ABPC)(25ug), Colistin Sulphate (CT)(10ug), Nalidixic Acid (NA)(30ug), Nitrofrantoin (P)(200ug), Compound Sulphonamide (Su)(300ug), Streptomycin (SM)(25ug), Tetracycline (TC)(50ug), Co-Trimoxazole (SxT)(25ug), Chloramphenicol (CM)(30ug), Kanamycin (KM)(30ug), Erythromycin (EM)(10ug). 80 of Shigella strains were tested, and showed high resistant to ABPC (63.8%), Su (71.3%), TC (56.3%) and SM (55.0%). Compound Sulphonamide (Su) had the highest resistant rate with Salmonella strains. EPEC strains also showed high resistant to Su (93.2%), TC (68.5%) and SM (57.5%). Drug resistant rates of EM and NA with C. jejuni were 2.4% and 7.3% respectively. There was no resistant strains against KM and CM among C. jejuni strains.

Infection rates of parasites was 9.4% (93/989) in age group 0 - 5 years old. 14 various kind of parasites were found. According to age growing, the infection rate was increased; 0 - 1 (2.6%), 1 - 2 ( 8.7%), 2 - 3 (21.6%), 3 - 4 (28.3%) and 4 - 5 (40.0%). Entamoeba histolytica and Giardia lamblia were found only in 1.3% (13/989) and 1.7% of diarrhoea children respectively. 14 multiple infection cases of parasites and 24 multiple infection cases with enteropathogenic bacteria and parasites were found.

Survey on Bacterial and Viral Enteric  
Pathogens Associated with Diarrhoea  
in Four Primary Schools in Jos

5th October 1985

M. TAKAHASHI *et al*

Summary

A total of 619 primary school children were investigated for Bacterial and Viral enteric pathogens, and also studied relationship with pathogens and drinking water and toilet. For this survey four primary schools were chosen namely Gangare primary school (P.S.), Ekan P.S., Jenta P.S. and Tudun-Wada P.S. Among a total of 619 school children, 99 of them (16.0%) had diarrhoea within 3 days only, 33 of them (5.3%) had within 3 days and 3 weeks, 24 of them (3.9%) had within 3 weeks but not within 3 days. In total, 156 children (25.2%) had diarrhoea within 3 weeks. In Gangare P.S., 26.7% of children had diarrhoea, in Ekan P.S. 20.5%, in Jenta P.S. 25.8%, in Tudun-Wada P.S. 26.4% respectively.

Among those complained with diarrhoea within 3 weeks, 108 of them (69.2%) were treated with drug for it. Among 108 treated children, 12 of them (11.1%) still had enteropathogenic bacteria while 3 (6.3%) of 48 non treated children had enteropathogenic bacteria. At home, many children drink Tap water only (62.2%), some drink Tap and Well water (25.8%), and a few drinks well water only (12.0%). There was no significant difference on the infection rate of enteropathogenic bacteria among children who drink Tap and/or Well water. As a type of toilet at home, Pit latrine was very common (81.3%), and Water closet was used only in 17.9%. Again there was no significant difference on the infection rate among children who use Pit latrine and Water closet.

Infection rate of enteropathogenic bacteria at Tudun-Wada P.S. was lower (7.4%) than at other schools; Gangare P.S.

(13.3%), Ekan P.S. (13.7%) and Jenta P.S. (15.3%). Among non diarrhoea children in four schools, 13.2% of them had enteropathogenic bacteria while among children who had diarrhoea within 3 weeks, 9.6% of them had it. From four school children, as an enteropathogenic bacteria, enteropathogenic Escherichia coli (5.7%), Campylobacter jejuni (5.7%), Shigella (0.6%), Salmonella (0.6%) and Yersinia enterocolitica (0.2%) were isolated. No Vibrio strain was isolated.

The infection rates of enteropathogenic bacteria among various age groups in four schools were as follows; 15.8% (4-6 years), 13.6% (7-9 years), 10.1% (10-12 years) and 11.8% (13-15 years).

309 children from Gangare P.S., Ekan P.S. and Jenta P.S. were examined for Rotavirus, and no Rotavirus was found.

## Preliminary parasitological survey in the Jos Plateau, Nigeria

Kuninori Shiwaku<sup>1</sup>, Hiroshi Takahashi<sup>1</sup>, Bertram E. B. Nwoke<sup>2</sup>,  
C. O. E. Onwuliri<sup>1</sup> and God O. Ufomadu<sup>4</sup>

**Abstract:** A survey on schistosomiasis, intestinal parasitic infections and filariasis was performed at three villages in the Jos Plateau, Nigeria, during from February to March 1985. Of 668 fecal samples, 66.8% was found to harbour parasites. The overall prevalence of people with respective parasites were followed: hookworm, 40.3%; Ascaris lumbricoides, 9.1%; Strongyloides stercoralis, 0.3%; Trichuris trichiura, 0.4%; Schistosoma mansoni, 18.9%; Taenia sp., 0.1%, Hymenolepis nana, 0.1%; and cysts of Entamoeba histolytica, 6.7%; Entamoeba coli, 31.4%; Iodamoeba bütschlii, 11.1%; Endolimax nana, 2.5%; Chilomastix mesnili, 1.6%; Giardia lamblia, 1.5%. Hookworm was the predominant helminth, and the infected larvae of N. americanus identified in six pupils examined using filter paper-cultures. The recorded rates from three population samples varied in prevalence of hookworm infection significantly, 53.9% at Sop, 33.3% at Jebu and 6.0% at Haigemu. It seems that the difference in prevalence of hookworm among three villages are due to difference of humidity in soil in a dry season. Out of 344 inhabitants, 5.2% and 13.4% were found to harbour microfilariae of L. loa and D. perstans at present study villages respectively.



JICA - UNIJOS RESEARCH PROJECT  
ON DIARRHOEA IN CHILDREN UNDER  
FIVE YEARS OLD

RESEARCHER: OKORONKWO, M.O., TAKAHASHI, T,  
TAKAHASHI, M, AND NWENE U.P.

DEPARTMENT OF COMMUNITY HEALTH  
ANNUAL REPORT JULY 1984-JUNE 1985

This represents a summary of data collected in one year on clinical presentation, environmental, socio-demographic and epidemiological profile, obtained from children attending different Units of the Jos University Teaching Hospital (JUTH). Samples of stool were collected and examined at the JICA/University of Jos Microbiology Laboratory. A total of 1,178 diarrhoea cases was recorded in the various hospital units, but epidemiological data is available for only 942 cases, and out of these, six forms did not contain epidemiological information. Hence, only 936 cases have been analysed.

\*

Chromosomes of Onchocerca volvulus from Nigeria.

H. Hirai,<sup>1</sup> I. Tada,<sup>1</sup> H. Takahashi,<sup>2</sup> B.E.B. Nwoke,<sup>3</sup> and G.O. Ufomadu<sup>4</sup>

Onchocerca volvulus (Spirurida:Onchocercidae) is the parasite which cause river blindness in Africa, which distribute mainly in the East and West Equatorial Africa and Central and South Americas. It has been said that there are differences in the clinical manifestations between African and American onchocerciasis (Browne 1961; Woodruff et al. 1966; Oomen 1969; Tada et al. 1974). Further, the vector blackflies - the parasite complex in individual endemic areas is distinct to each other (De Leon and Duke 1966; Duke et al. 1967; Omar and Garms 1975; Garms and Ochoa 1979; Garms 1983). However, no distinctive morphological differences have ever been found in the parasite between America and Africa (Sandground 1934; Franz 1980). Therefore, it is very important to clarify the genetic nature of both African and Mesoamerican O. volvulus. This paper deals with the chromosomes of Nigerian parasite and the comparison between African and Mesoamerican (described in a previous paper, Hirai et al. 1985) strains, to each other.

A BIOMETRIC STUDY OF ONCHOCERCA VOLVULUS MICROFILARIAE FROM NIGERIA BY THE NUCLEAR COUNTING METHOD.

T. MIMORI , I. TADA , K. SHIWAKU , G. O. UFOMADU and B. E. B. NWOKE

Abstract. By using the nuclear counting method, we counted the nuclei in the cephalic space and nerve ring (CS-NR) region of Onchocerca volvulus microfilariae from Nigeria. The mean nuclear number was 88.01. There was no statistically significant difference in the nuclear numbers of O. volvulus microfilariae between Nigeria (present result) and Guatemala (87.73, from our previous data).

## UNIJOS-JICA TRACE ELEMENT STUDIES IN PLATEAU STATE

### Department of Clinical Chemical Pathology Programme

Main Project Title : Plasma and Tissue Levels of Important Trace Elements and the Metallo-Carrier Proteins Among the Inhabitants of the Mining Districts of Plateau State (Isichei et al)

### Research Plan for 1985/86

1. Plasma and Tissue Levels of Important Trace Elements and the Metallo-Carrier Proteins in Apparently Normal Subjects in Plateau State.
  - the determination of reference values which is a necessary pre-requisite for comparative studies, evaluates the impact of age, sex etc on plasma and tissue trace element levels.
2. Plasma and Tissue Levels of Important Trace Elements and the Metallo-Carrier Proteins in Miners, other Inhabitants of the Mining Districts and Special Problem Areas (e.g. Kuru) of Plateau State.
  - this sub-project studies the occupational health hazard involved among the workers of the mining industry.
3. The Impact of Seasonal Changes on Plasma Trace Element Levels
  - this aspect of the work is considered necessary as there appears to be some indications from the preliminary studies done by other teams that environmental levels of trace elements vary with seasonal changes.
4. Blood and urine lead and zinc determinations in the lead-zinc mining community of Zurak - a study of the clinical implications of the heavy metal mining industry.
5. Trace Element and Disease (this part of the programme which is a long term project will continue after the JICA programme ends). The Department intends to develop a centre of Trace Element studies in the Disease.
  - the clinical chemistry of trace elements is gaining a prominent place as an indicator of deficiency syndromes and toxicity states. For example, the discovery that deficiencies of specific trace elements such as copper and zinc may be involved in the pathogenesis of some

diseases hitherto regarded as idiopathic has generated much interest and lead to enquiries in other directions. The current interest in the Department is on diseases common in this environment e.g. \*endemic goitre, sickle cell disease, G-6-P.D. deficiency, liver cirrhosis etc.

#### Remarks

1. The procedure for plasma and tissue analysis for their trace element content is a tedious and long procedure. The group is allocated one day a week for the analysis of samples. This time is very inadequate and has delayed progress of the work considerably. (The JICA-Team Leader, Dr. H. Takahashi, has been approached about the possibility of providing the Department cathode lamps and standard solutions in order to make our departmental equipment (a Philip's Model) functional. This will greatly accelerate the work of the departmental team.
2. The kits for transferrin and caeruloplasmin determination are not locally available. JICA Team leader has been approached to see if these could be obtained from Japan.
3. Interaction with other Departments in some project areas is vital so that blood trace element levels could be evaluated along with environmental changes.

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P.S. \* a sub-project within the Faculty-JICA endemic goitre project which attempts to elucidate some of the aetiological factors involved in the pathogenesis of endemic goitre in Plateau State.

DEPARTMENT OF CLINICAL CHEMICAL PATHOLOGY  
FACULTY OF MEDICAL SCIENCES  
UNIVERSITY OF JOS

From: Prof. U.P. Isichei  
Head, Department of  
Clinical Chemical Pathology  
& Principal Investigator,  
Endemic Goitre Project.

To: The Dean  
Faculty of Medical  
Sciences.  
Dr. H. Takahashi,  
Team Leader, JICA

14th October, 1985

UNIJOS - JICA ENDEMIC GOITRE SURVEY IN PLATEAU  
STATE (NIGERIA)

Main Project Title: ENDEMIC GOITRE STUDIES IN PLATEAU STATE,  
NIGERIA (Isichei et al)

Research Plan for 1985/86

Sub-Projects:

1. The Biochemistry and Clinical Features of Endemic Goitre  
in Plateau State, Nigeria

- this part of the work examines some of the possible aetiological factors related to endemic goitre in the region and studies the hormonal changes occurring in the patients as well as the prevalence of other clinical conditions which occur in association with endemic goitre e.g deaf-mutism, cretinism hypothyroidism etc. Detailed information is acquired through

- 1) the examination of patients in the field (nearly 2000 patients have been examined) on a weekly basis as well as those referred to the Department in the Hospital.
- 2) water sample studies in the endemic and non-endemic goitre regions
- 3) evaluation of the information obtained through questionnaires (family history, nutrition including type of vegetable diet domestic water source etc) and
- 4) analysis of blood samples collected from normal subjects and patients with endemic goitre in the laboratory.

../2.

2. Differential Lipid and Serum Protein Studies in Normal Subjects and Patients with Endemic Goitre in Plateau State, Nigeria  
- this aspect of the work will include in addition to the above studies a study of the immunopathology of endemic goitre and the variations which occur in plasma free and bound hormones as well as reverse  $T_3$  in the endemic region (if facilities are provided by JICA for these investigations).
3. A Study of An 'Endemic Goitre Family' in Barkin Ladi  
- this is a case report of a family with four cretins: the patients who were discovered during the course of our studies were referred to the Department from Barkin Ladi for clinical examination. After physical examination and confirmation of the diagnosis with laboratory tests, they were referred to the Department of Medicine for further management. The report is being presented jointly by the Departments of Clinical Chemical Pathology and Medicine.
4. The Prevalence of Neonatal Hypothyroidism in Plateau State, Nigeria  
- this study is considered necessary as it does appear from the results of one preliminary studies that the incidence of cretinism in the region is high. This conclusion is drawn on our discovery of a family with four cretins during the course of our studies. The study will involve mass screening of all newborn infants and will continue into the 3rd phase (but can only be done if facilities are provided by JICA).

It is expected that separate scientific papers would be published based on each sub-project within the next few months when adequate results have been collected.

Departmental Team: Isichei - Das - Towobola - Banwo - Egbuta  
(Towobola was relieved after some months from his assignment by Egbuta when he left the Department).

Prof. U.P. Isichei

PROPOSED FIELD SURVEY PLAN FOR THE SECOND PHASE OF THE  
INFANTILE DIARRHOEA PROJECT

This phase of the Infantile Diarrhoea project aims at using a systematic follow-up of the incidence of disease and infections spreading in humans (surveillance) to study the epidemiology and prevention of diarrhoeal disease in Plateau State, Nigeria.

Interdisciplinary epidemiological studies incorporating bacteriological and statistical methods, as well as the nutritional status and feeding habits of the population to be studied, are needed in the exploration of the problems related to diarrhoea and will determine endemic and non-endemic areas in the state. The microbiological laboratory findings in the form of isolation and identification of aetiological agents including their characterisation and serological study have been used in recognizing and analysing the cause of the disease; and the epidemiological situation is now to be studied.

These studies should incorporate investigations for a wide variety of enter-microbial organisms such as bacteria, parasites, viruses and a cursory look at the influence of such haemoparasites as malaria. A house to house study would be undertaken to examine the environment, water, food and animals in order to detect carriers, sources of infection and mode of transmission of pathogens.

LOGISTICS:

- 1 (a) A pilot epidemiological survey will be carried out on school children in some primary schools in Bassa Local Government Area. The list of schools will be made available later.
- (b) The Sole Administrator for Bassa LGA, and subsequently the schools headmasters are to be approached for permission before the field trips. A representative of the Department of Community Health is to accomplish this.
2. Sampling will commence from the first week until the second week of January 1986 (one week). The total number of samples to be collected will depend on the population of the schools.
3. From the second week of January until the second week of February 1986, the collected samples will be examined (one month).
4. The sample will consist of stool and blood only.
5. Stool samples will be examined for bacterial, parasites and (viruses); while blood films will be examined for malaria parasites.
6. For a period of one month (second week of February to second week of March) the survey will go beyond the school children into the villages.
7. Sampling of the school children will give an idea of the prevalence and geographical distribution of diarrhoea in the area, and will therefore, be used to know the village(s) from where children with the highest infectivity rate come.
8. At this time, three Japanese experts are expected namely a Paediatrician, a Microbiologist and an Epidemiologist.



9. Staffing for this aspect will consist of:-
 

a) Miss Agatha Ani	}	Bacteriology
b) Mr. T. Takahashi		
c) Mr. Godwin B. Kulori		
d) Mrs. Hava Umaru		
e) Mr. M.O. Okoronkwo - Community Health		
f) Mr. Ezekiel Y. Hware - Parasitology		
g) Mr. Ucheda - Japanese parasitologist		
10. A Toyota Landcruiser van will convey the team to and from the schools.
11. Questionnaires will be designed in Japan, and some chemicals reagents and equipment will also be provided by JICA.
12. Souvenirs will consist of these:-
  - a) one soccer ball for each school
  - b) sweets for the pupils
  - c) A token gift for the headmaster (yet to be decided)
13. Village Survey:- The village(s) to be surveyed depend on the results of the pilot survey (see item 7).
14. The team for the Community field work will be composed of the following:-
  - a) Representative from Paediatrics
  - b) Representative from Community Health
  - c) 5th year medical students on Community Health Posting (about 10 in number).
  - d) Japanese experts (3, as in item 8 above)
  - e) Interpreters are to be taken from the Health Centre at Bichi.
  - f) Laboratory Staff for sample examination will consist of:-
 

Miss Agatha Ani	}	Bacteriology
Mr. T. Takahashi		
Mr. Godwin B. Kulori		
Mrs. Hava Umaru		
Mr. Ucheda	}	Parasitology
Mr. Ezekiel Y. Hware		
Mr. M. O. Okoronkwo - Examination of drinking water samples for Coliforms and Most Probable Number (MPN).		
15. Samples to be collected include stools, blood and drinking water. Stool will be examined for bacteria, parasites and rotavirus for children under five years old. Blood will be examined for malaria parasites and drinking water for Coliforms and most probable number.
16. Since the size of the survey team has increased, two Toyota Landcruiser vans would be required.
17. Again the questionnaire (different from item 11 above) will be designed in Japan.
18. For effective epidemiological survey, a map of Bissa L.G.A. will be prepared. Mr. Okoronkwo and one Japanese epidemiologist will do this.

19. All data would be modified and analysed with the computer. Again Mr. T. Takahashi and Mr. Okoronkwo will do this.
20. Gifts will be issued as follows:-
- a) Villagers with identified pathogens will be treated at the Health Centre where some drugs will be donated by JICA
  - b) Little children - Sweets
  - c) The village heads:- a token gift that will be decided later.

Proposed by Mr. M. Takahashi  
Mr. M. O. Okoronkwo  
30/9/85.

URGENT/URGENT TIME 11.10 AM  
THE DPM OF OCTOBER 1985

RESEARCH PROPOSAL FOR 1986

The new proposals were considered in the light of the staff strength of the various departments involved. The Head of Microbiology Department complained about the staff strength of his department saying that the research has depleted the number of the departmental staff. Community Health Department is facing the same problem, although Prof. Usuda will be joining them soon, on a one - year sabbatical leave, and he may have an input to make towards the progress of the research. Dr. Takahashi also reported that Dr. Happa - a Paediatrician from Japan will be joining them to help work on the questionnaires.

#### RESEARCH PLAN

Dr. Happa will work on the questionnaires relating to Clinical findings with Associate Prof. Z. Lazowski. The Head of Medical Microbiology Department was requested to meet the J.U.T.H. Authorities in order to make available the records and facilitate the compilation of data from the Out-Patient Department (OPD); In-Patients and Child Health Clinic (CHC). The data will be collected by Dr. Happa and Assoc. Prof. Lazowski. Dr. Takahashi then informed the members that JICA has got a computer at Room 19 in Pharmacology Department. Assoc. Prof. Lazowski raised an objection with the proposal to discontinue the acceptance of specimens from JICA. He was later cleared on this point.

#### PROPOSALS

- (1) Primary survey for the first two months.
- (2) This will be followed by visits to the families concerned where:
  - (a) water survey
  - (b) Gaitre survey
  - (c) *Enchococcus volvolus* infection and
  - (d) The assessment of the level of hygiene will be undertaken.

Thus extending that the field survey should be a general survey

in which the primary work will be based on the findings of stool examination conducted followed up by the other aspects of survey.

Dr. Takahashi informed the members that by February 1987, some experts will be invited from other Nigerian Universities to consider the JICA/UNIJOS Research.

The submission of lists of equipment and reagents will be done on Monday the 24th of October 1985 and should consist mainly of expendables and spare parts for servicing the existing equipment.

#### PUBLICATIONS:

The Chairman reported on the plenary meetings recent decision on funding of Publications. The J.I.C.A. will be funding the Publications of all work done under the JICA/UNIJOS Project and these Publications should be coded in sequence as JUJIR/01 etc. or UJ/JIP/01 etc. There has to be due acknowledgement to JICA and all publications should include all the active participants. In the event of any publication, JICA will sponsor the production of two-hundred (200) copies and this number may be increased in the case of multiple authors.

The meeting came to an end by 12.45 p.m. so as to enable a few of the members to welcome the State Governor on a visit to the Jos University Teaching Hospital.

R. A. O. Shonkan.  
Chairman.

E. Ikeh.  
Recorder.

RAO/MO

UNIVERSITY OF JOS  
DEPARTMENT OF ZOOLOGY

Phase IV Project Proposals for Studies by  
the Unijos - JICA Medical Entomology and  
Parasitology Group (1985/86).

In furtherance of the Research works for phase I, II and III, the following projects are listed for continuation into the phase IV period; i.e. 1985/86.

- Project 1: "Studies On The Distribution Of Black-flies (Simulium spp) on Jos Plateau"  
- Prof. M.O.E. Iwuala and Mr. M. Maduebe
- Project 2: "Effect of Water Velocity On Black-fly Relative Abundance"  
- Dr. D.M. Roberts and M.Sc. Student
- Project 3: "Effect of Temperature and Relative Humidity On Pupal Survival of Black-flies"  
- Dr. D.M. Roberts and Mr. D. Eoakye
- Project 4: "Distribution Of Immature Mosquitoes Associated With The River System In Jos Plateau"  
Dr. R.J. Irving Bell and M.Sc. Student
- Project 5: "Study Of Seasonal and Vertical Distribution Of Tree-hole Mosquito Breeding"  
- Dr. R.J. Irving-Bell
- Project 6: "Studies On The Prevalence and Distribution Of Onchocerciasis In Plateau State"  
- Dr. C.O.E. Onwuliri, Mrs. E. Hwke and M.Sc. Student

- Project 7: "Study of The Seasonal Abundance and Population Characteristics Of Immature Stages Of Black-flies In Jos Plateau Area"
- Prof. M.O.E. Iwuala and Mr. K. Maduabum
- Project 8: "Effect of Predators and Type Of Substrate On The Relative Abundance Of Immature Black-flies"
- Dr. D.M. Roberts and M.Sc. Student
- Project 9: "Studies On The Dispersal Of Adult Black-flies"
- Dr. D.M. Roberts and Dr. R.J. Irving-Bell
- Project 10: "Niche Distribution In Relation To Physiological Adult Population Of Black-flies and Mosquitoes"
- Dr. R.J. Irving-Bell, Dr. D.M. Roberts, and Mr. G.I. Akoh
- Project 11: "Some Factors Influencing The Endemicity Of Onchocerciasis In The Jos Plateau, Nigeria"
- Dr. C.C.E. Chavuliri, Dr. I.N. Iwuala and Mr. B.E. Nwoke.
- Project 12: "A Study of Age Composition of Mosquito populations of the Jos Plateau"
- Dr. J.O.A. Onyeka, Prof. M.O.E. Iwuala and Mr. G.I. Anyawu.
- Project 13: "Host feeding Preference and feeding patterns of Mosquitoes of the Jos Plateau"
- Dr. J.O.A. Onyeka, Prof. M.O.E. Iwuala and Mr. G.I. Anyawu.

PROJECT 14: Cytotaxonomic analysis of the black flies, Simulium damnosum complex from Jos Plateau Nigeria.

Investigator(s): Dr. John I. Akoh & Mr. E.B. Alo

#### Introduction:

Human Onchocerciasis is a serious debilitating disease of tropical Africa, Asia and America (WHO, UNDP/OCF/73.11 1973).

In West Africa, this filarial parasite, Onchocerca volvulus is largely transmitted by black flies of the S. damnosum species complex (Crosskey 1969; Bull.Br. Mus. Nat. Hist. (Ent.) 14).

S. damnosum is a species complex with an intriguing biology and ecology. The epidemiological picture of Onchocerciasis is further complicated by the existence of distinct forest, guinea savanna and Sudan Savanna Simulium-Onchocerca complexes (WHO 1985, IDR/FIL-SWG(11)/85.4).

The first step towards an understanding of these complexes is the elucidation of the taxonomic status of the vector species complexes in relation to their vectorial capacity. Most taxonomic studies of the S. damnosum complex had focus mainly on adult morphology for field identification and larval cytogenetics for specific cytospecies analysis. (C.G. Vajime and R.W. Dunbar; Tropenmed. Parasit. 26, 1975, Adult Morphological taxonomy is very much inadequate, while larval cytotaxonomy cannot directly correlate the vectors with their vectorial status. An extensive adult cytotaxonomic analysis would probably provide a better insight into the problem of Simulium - Onchocerca complexes. The successful utilization of this approach in resolving the taxonomic status of the Anopheles gambiae species complex (Akoh, Ph.D Thesis, University of London; 1984); showed this method to be feasible.

Objectives: The aims of this project includes:-

- (a) a detail analysis of Chromosomal polymorphism of O. volvulus recovered from patients on Jos Plateau.
- (b) Correlation of histochemical variations with chromosomal variations of the some microfilariae.

Study Plan

- (1) A comprehensive survey and collection of O. volvulus parasites from patient from various parts of Jos Plateau would be carried out during the early part of 1986.
- (2) The parasites would be carried to an appropriate laboratory in Japan for a detailed cytogenetic analysis.

The author (Dr. J.I. Akoh) is therefore applying for funds from JICA to enable him undertake an intensive three months training/study of the methods for analysing O. volvulus cytogenetics in Japan during the summer of 1986.

Collaborators

- (1) Prof. H. Takahasi; JICA, Jos.
- (2) Dr. G.O. Ufomadu, NITR, Vom-Jos.



PROJECT 15: Cytogenetic analysis of Onchocerca volvulus  
Chromosomal Polymorphism.

Investigator(s): DR. John I. Akoh

Introduction:

Onchocerciasis, a serious debilitating disease of tropical Africa, Asia and Central America; is caused by the filarial parasite

Onchocerca volvulus

Recent studies have revealed the composite nature of this parasite with up to 13 different histochemical variants on Jos Plateau (Ufomadu et al; (1985) In Press). Chromosomal analysis have shown that this parasite has the same conservative diploid chromosome number of  $2n = 8$  as its central American strain (Hirai et al, (1985) In Press).

There is therefore the need for a detailed cytogenetic analysis of the chromosome complements of this human parasite. This would probably throw more light on the genetic basis of the histochemical variants and the Simulium - Onchocerca variations that have complicated the epidemiological picture of Onchocerciasis in West Africa. It would also provide data for a comparative study of this W. African strain with those from other parts of the world.

Objectives: This project is geared towards:-

- (a) Larval cytotaxonomic evaluation of the S. damnosum complex from Jos Plateau.
- (b) Evaluation of adult ovarian nurse cells, Malpighian tubules and other tissues for polytene chromosomes, and their cytotaxonomic importance.
- (c) Correlating adult polytene chromosomes with those of the larvae, pin-pointing their cytotaxonomic correlates.
- (d) Evaluation of adult cytotaxonomy in relation to the Simulium - Onchocerca complexes
- (e) Cytogenetic analysis of S. damnosum chromosomal polymorphism in relation to the ecological and biological factors affecting Onchocerciasis control.

Importance: This project would definitely throw more light on the Simulium - Onchocerca complex relationship, thereby putting man in a better position to plan a more effective Onchocerciasis Control Strategy.

Equipment:

- 1) Phase Contrast Microscope with automatic photographic component. (1)
- 2) Binocular insect dissecting microscope. (1)
- 3) Slides and slide covers . (1,000 each)
- 4) Refrigerator for storage of specimens. (1)
- 5) Chemicals:

- (a) Glacial acetic acid (2.5 L.)
- (b) Stock lactic acid (2.5 L)
- (c) Absolute alcohol 2.5 L
- (d) Stock Propionic acid (2.5 L)
- (e) Stock solution of aceto-lactic Orcein (500 ML)
- (f) Orcein powder (5 bottles)
- (g) Anaesthetic ether 500 ML X 4
- (h) Methylated spirit (stock). (2.5 L)
- (i) Giemsa stain (2.5 L)
- 6) Specimen vials or containers
- 7) Whatman No. 1 filter papers
- 8) Dropping pipettes
- 9) Insect dissecting needles and forceps. (2 dissecting kits)
- 10) Vehicle for field sampling trips.

Collaborators; Dr. H. Takaoka, Oita Medical College.

Prof. H. Takahashi, JICA, Jos.

# SUB PROJECT: TRACE ELEMENTS ANALYSIS

Chairman: Dr. I. MIZOGUCHI

Director: Dept. Environ. Hlth.  
Tokyo Metropolitan Res. Lab.  
of Public Health

## RESEARCH PLAN FOR 1985/1986

The sub-project Trace Metals Analysis intends to put together and arrange the data already obtained by the end of 1985. The sub-project proposes following plan of researches during the period 1985/1986.

Main Research Project: Trace Elements in Surface Water of Jos Area.

### Sub-items:

- 1) Evaluation of the trace element levels of city water supplies for Jos Metropolis.
- 2) Seasonal variation of the trace elements in surface water of Jos Area.
- 3) Heavy metal water pollution and its sources of Assob River, Jos, Nigeria.
- 4) Trace element levels of well and tap water of several Jos suburban areas.

The sub-project Trace Metal Analysis supposes that the four sub-items above mentioned are able to be completed by the end of 1985. In order to complete these researches, Dr. Y. Tsuchiya is sent to Uni-Jos from 31 August to 30 September, 1985.

- 5) Trace metal levels in vegetables and cereals yielded in Jos Area.
- 6) Trace metal levels in soil of Jos Area.
- 7) Trace metals in Minerals and sediments in Jos Area.

The Sub-Project proposes that these three sub-items have to be carried on by Uni-Jos counterparts from 1986. Dr. Tsuchiya will give several technical advices on these sub-items during his stay at Uni-Jos in this September.

Reports concerning to each sub-item are expected to be submitted to the international scientific journal "Water Research".

Dr. Tsuchiya will ask Team Leader's (Dr. Takahashi's) and counterparts' (Uni-Jos Members') advices on authors of each report in Jos.

## SUB-PROJECT: INFANTILE DIARRHOEA

Chairman: Prof. R. Nakaya  
 Department of Microbiology  
 Tokyo Medical and Dental  
 University School of  
 Medicine

## RESEARCH PLAN FOR 1985/1986

The sub-project Infantile Diarrhoea proposes following plan of researches during the period 1985/1986 based on the discussion in the steering sub-committee held at JICA on 30th July, 1985.

## Sub-items:

1) Clinical, etiological and epidemiological investigations of infantile diarrhoeal diseases in Jos.

(1) The clinical and etiological data so far accumulated will be analyzed from the epidemiological point of view. The following aspects are to be analyzed and summarized statistically by referring to the records on the "Questionnaire on Diarrhoea in Children": a) Age, sex, and place of residence; b) Clinical findings; c) Epidemiological findings; d) Laboratory findings (bacteria, viruses, and parasites) with respect to frequency of detection, seasonal variation and incidence in age group. These data should be analyzed individually by the places of examination of the patients under investigation (JUTH OPD, JUTH Paediatric Ward, JUTH Child Health Clinic, MCH Clinic, and other Hospitals). e) Serotyping, toxigenicity and antibiotic susceptibility of the bacterial isolates.

(2) To perform the analyses, it is required to utilize the informations from the medical records of outpatients, inpatients, and CEC. An operational team should be organized for transcribing the materials mentioned above.

(3) Mr. T. Takahashi will be in charge to the statistical analyses.

(4) Miss Agatha Ani will be in charge to the laboratory investigations on the clinical specimens coming from now on [see(5)] and the bacterial isolates not identified yet.

(5) Collection of clinical specimens from JUTH should be discontinued. Only the specimens of emergency or of special request will be considered to be processed under this research project.

2) Field survey on enteropathogenic organisms in a rural area of Plateau State (February-March, 1986).

(1) This is an independent sub-item of research from the sub-item 1).

(2) Some rural area in the vicinity of Jos metropolis will be set up to perform health examination survey during February to March, 1986. The survey will be carried out mainly at the primary schools and/or at the junior-high schools of the area through questionnaire. If it is possible, a limited number of stool specimens for laboratory examination on enteropathogenic organisms will be collected which may consist of the control of the sub-item 1).

A detailed plan of this survey will be prepared by the Committee of University of Jos/JICA Research Project. Sufficient preparations for this survey should be made after consulting the advice of the visiting team of JICA in November, 1985. It is recommended to avoid an extravagant plan for microbiological investigation.

(3) Points for planning and performance of the field survey.

- a) Selection of rural area.
- b) Recording and collection of questionnaires.
- c) The form of questionnaire should be designed to be in harmony with the section of the epidemiological data in the "Questionnaire on Diarrhoea in Children".
- d) Period of the survey.
- e) Does the survey include villages or colonies through school children?

(4) Expert members to participate.

Dr. B. Takahashi, Mr. T. Takahashi, Miss Agatha Ani, A Nigerian physician in Pediatrics.

Japanese experts to be dispatched during the period of the field survey; A Japanese physician in Pediatrics and Epidemiology, A bacteriologist, A Japanese physician in Infectious Diseases.

Following articles of the research will be prepared:

- 1) Survey on Parasitic, Bacterial, and Viral Enteric Pathogens Associated with Infantile Diarrhoea in Jos, Nigeria.
- 2) Survey on Parasitic, Bacterial, and Viral Enteric Pathogens among School Children in Rural Area of Plateau State of Nigeria.

Notes: The results of currently ongoing examinations on the stool samples from 4 schools children are considered as a control and the background of the sub-item 1) and also a preparatory step for the sub-item 2).

※飲料水調査

## SUB PROJECT: MEDICAL ENTOMOLOGY

Chairman: Prof. R.Kano  
President, Tokyo Medical  
and Dental University

## RESEARCH PLAN FOR 1985/1986

The sub-project Medical Entomology proposes following plan of researches during the period 1985/1986 based on the discussion in the steering sub-committee held at JICA on 30th July, 1985.

Main research item: STUDIES ON FILARIASIS AND ITS TRANSMISSION  
PARTICULARLY ONCHOCERCIASIS.

## Sub-items:

- 1) A study on Simulium-Onchocerca complexes in Nigeria.

This sub-item includes investigations on geologic zone-specific transmission of the disease based on the cross-susceptibility test of blackfly vectors to Onchocerca volvulus. Field experiments will be performed at various areas ranging from the rain forest to savannah (Sudan and Guinea) of the country.

- 2) Studies on O.volvulus and the microfilariae.

Recent chromosomal analysis of O.volvulus from Plateau State clarified that the chromosomal number was,  $2n=8$ , which was identical to that of Central America reported by us (Hirai et al., 1985). Detailed study is recommended to be performed particularly on the poly-morphism of chromosomes to compare the cytogenetic nature of the parasite between Africa and America.

Biometric and histochemical analysis of the microfilariae of O.volvulus should also be done from the comparative viewpoint of the parasites between Africa and America.

- 3) Clinical and immunological studies of the disease.

Our recent study clarified the immuno-diagnostic specificity of ELISA to detect O.volvulus-specific IgG. The roles of various immunoglobulin classes and cell-mediated hypersensitivity in onchocerciasis should be investigated.

From the comparative viewpoint, clinical manifestations with histological findings should be investigated in comparison with those of Central and South Americas. Because, although the disease is considered to have been transported from West Africa through slave trade to America, the clinical manifestations differ greatly depending on the countries. A multi-disciplinary survey is needed for this purpose.

In order to perform above mentioned research items, I suggest that following Japanese would be dispatched to Jos University during the period 1985/1986.

Expert name	Specialty	Supposed oeriod of stay
Dr.A.Uchida	parasitologist Associate Professor, Azabu University	Nov.,1985-Oct.,1986
Dr.H.Takaoka	entomologist/parasitologist Associate Professor, Oita Medical College	Apr.,1986-Jun.,1986
Dr.K.Shiwaku	parasitologist Associate Professor Aichi Medical University	Apr.,1986-Jun.,1986
Dr.H.Yamada	ophthalmologist Associate Professor, Fukushima Medical College	Apr.,1986-Jun.,1986

Remarks: Following papers are presently under preparation for publication, which are concerned in the sub-project Medical Entomology within the period,1985.

1. Chromosomes of Onchocerca volvulus from Nigeria.  
HIRAI, TADA, TAKAHASHI, NWOKE and UFOMADU  
(Z.Parasitenkunde)
2. A biometric study of Onchocerca volvulus microfilariae from Nigeria by the nuclear counting method.  
MIMORI, TADA, SHIWAKU, UFOMADU and NWOKE  
(Amer.J.Trop.Med.Hyg.)
3. Detection of Onchocerca volvulus-specific IgG antibodies in the inhabitants from Nigeria.  
TADA, KORENAGA, SHIWAKU, UFOMADU and, NWOKE  
(Trans.Roy.Soc.Trop.Med.Hyg.)  
OGUNBA,
4. A survey on blackflies (Simuliidae) in Plateau state, Nigeria.  
KADOSAKA, SHIWAKU, KANEKO, ROBERTS, IWUALA and TAKAHASHI  
(J.Aichi Med.Univ.Assoc.)
5. A parasitological survey in Plateau state, Nigeria.  
SHIWAKU, TAKAHASHI, NWOKE, ONWULURI and UFOMADU  
(Japan.J.Trop.Med.Hyg.)
6. Epidemiological studies of human onchocerciasis in Plateau state, Nigeria.  
NWOKE, SHIWAKU, UFOMADU and TAKAHASHI  
(Tr.Roy.Soc.Trop.Med.Hyg.)



November 14, 1985

PUBLICATIONS EXPECTED BY THE PROJECT.

(before end of 1986)

1. Trace Elements Analysis:

## SUB-PROJECT 1. Clinical Chemical Pathology

- 1) Plasma and tissue levels of important trace elements and the metallo-carrier proteins in apparently normal subjects in Plateau State. A.I. Banwo et al.
- 2) Plasma and tissue levels of important trace elements and the metallo-carrier proteins in Miners, other inhabitants of the mining districts and special problem areas (e.g. Kuru) of Plateau State. Egbuta et al.
- 2) The impact of seasonal changes on plasma trace element levels. M.Sc. Postgraduate Students.
- 4) Blood and urine lead and zinc determinations in the lead-zinc mining community of Zurak. Egbuta et al.

## SUB-PROJECT 2: Geology and Mining

- 1) Rapid analysis of sulphide ores by Atomic Absorptions Spectrophotometry (AAS) and their economic, environmental and genetic significance. Ogezi, A.E. & Adiuku-Brown, M.E.
- 2) Geochemical and Hydrogeochemical studies of the mining areas of the Sabongida - Vom - Kura - Meipang area, Jos Plateau, and their environmental significance. Ogezi, A.E., Adiuku-Brown, M.E.
- 3) Significance of trace element distribution in soils, vegetation, rocks sediments and waters in the lead-zinc mining area of Zurak, S.E. Plateau State. Ogezi, A.E., Adiuku-Brown, M.E. & Ogunbajo, M.I.

## SUB-PROJECT 3: Zoology

- 1) Distribution of trace elements in some surface waters. Ejike, C., Anadu, D., Chidobem, I.J. & Nkendirim, E.C.
- 2) Trace elements levels in the water and sediment in the Old Mine Ponds and their relation to Pond Primary Productivity. Ejike, C., Eade, J.W. Anadu, D. & Chidobem, I.K.
- 3) Seasonal variations in trace elements contents of water, sediments and macroinvertebrates in two reservoirs in Jos Plateau.
- 4) Studies on the impact of water quality characteristics, gradient and water velocity on survival and larval transition in Simulium. Ejike, C., Makpo, J.K. & Okayi, R.C.

## SUB-PROJECT 4. Biochemistry

- 1) Trace elements content in water of Plateau State, Nigeria. Ubom, G. & Noda, C.
- 2) Comparative study of water quality in goitrous and non-goitrous areas of Plateau State, Ubom, G. & Noda, C.
- 3) Seasonal variation of cations and anions concentrations in water in Jos Metropolis and its suburbs. Ubom, G. & Noda, C.
- 4) A new method (combustion) determining microamounts of Iodide (Iodine in water/foods). Ubom, G. & Noda, C.

II. Goitre

- 1) The prevalence of endemic goitre in pre-adolescent and adolescent school-children in Plateau State, Nigeria. Tiwari, I.C., Okoronkwo, O., Das, S.C. & Isichei, U.P.
- 2) Endemic goitre in Plateau State, Nigeria. Isichei, U.P., Das, S.C. & Banwo, A.I.
- 3) The chemical pathology of endemic goitre in Plateau State, Nigeria. Isichei, U.P., Das, S.C., Towobola, O. & Egbuta, J.
- 4) A comprehensive study of plasma lipid and lipoprotein profile of a goitrous population. Das, S.C. & Isichei, U.P.
- 5) Differential study of the protein constituents of plasma in endemic goitre and the evaluation of thyroid and lipid associated specific carrier proteins in relation to thyroxine and cholesterol metabolism. Isichei, U.P., Egbuta, J., Das, S.C. & Ezeogu, V.
- 6) Determination and evaluation of plasma total cholesterol, HDL and LDL-cholesterol and the triglycerides as markers of coronary heart risk in patients with long standing history of endemic goitre. Isichei, U.P. and Das, S.C.
- 7) A study of an "Endemic Goitre Family" with four cretins in Barkin Ladi. Kirti, S., Isichei, U.P., Das, S.C. & Egbuta, J.

III. Infantile Diarrhoea

- 1) Aetiological studies of infantile diarrhoea diseases seen in Jos University Teaching Hospital, Jos, Nigeria. Ani, A., Takahashi, M., Saida, B., Kozak, W.H., Kumar, V., Shonekan, R.A.O. & Agbonlahor, D.E. (JUJIP No-01)
- 2) Isolation of Champylobacter jejuni in Jos. Ani, A., Takahashi, M., Kozak, W.H., Kumar, V. & Shonekan, R.A.O.
- 3) Drug susceptibility tests and minimum inhibitory concentrations of 88 strains of bacterial enteric pathogens. Ani, A. et al.

- 4) Viral, bacterial and parasitic pathogens associated with diarrhoea in children. Takahashi, M. et al
- 5) Enteropathogenic bacteria and parasites associated with diarrhoea in children. Takahashi, M. et al..
- 6) Survey on bacterial and viral enteric pathogens associated with diarrhoea in four primary schools in Jos. Takahashi, M. et al
- 7) Preliminary parasitological survey in the Jos Plateau, Nigeria. Shiwaku, K., Takahashi, H., Nwoke, E.B., Onwuliri, C.O.E. & Ufomadu, G.O. (JUJIP No-04)
- 8) Parasitological study on four school children in Jos. K. Kaneko, et al.

#### IV Medical Entomology

- 1) Chromosomes of Onchocerca volvulus from Nigeria. Hirai, H., Tada, I., Takahashi, H., Nwoke, B.E.B. & Ufomadu, G.D. (JUJIP No-02)
- 2) A biometric study of Onchocerca volvulus microfilariae from Nigeria by the nuclear counting method. Mimori, T., Tada, I., Shiwaku, K., Ufomadu, G.D. & Nwoke, B.E.B. (JUJIP No.-03)
- 3) An application of ELISA for the immunodiagnosis of onchocerciasis in Nigeria. Tada, I., Korenaga, , Shiwaku, K., Ogumba, Ufomadu, Nwoke.
- 4) A survey on blackflies (Simuliidae) in Plateau State, Nigeria. Kadosaka, Shiwaku, Kaneko, Roberts, Iwuala and Takahashi.
- 5) A parasitological survey in Plateau State, Nigeria. Shiwaku, Takahashi, Nwoke, Onwuliri & Ufomadu.
- 6) Epidemiological studies of human onchocerciasis in Plateau State, Nigeria. Nwoke, Shiwaku, Ufomadu & Takahashi
- 7) Acid phosphatase variations in the microfilariae of Dipetalonema perstans and Loa loa from the Jos Plateau, Nigeria. Ufomadu, Ekejindu, Taka, Shiwaku, Nowke.







