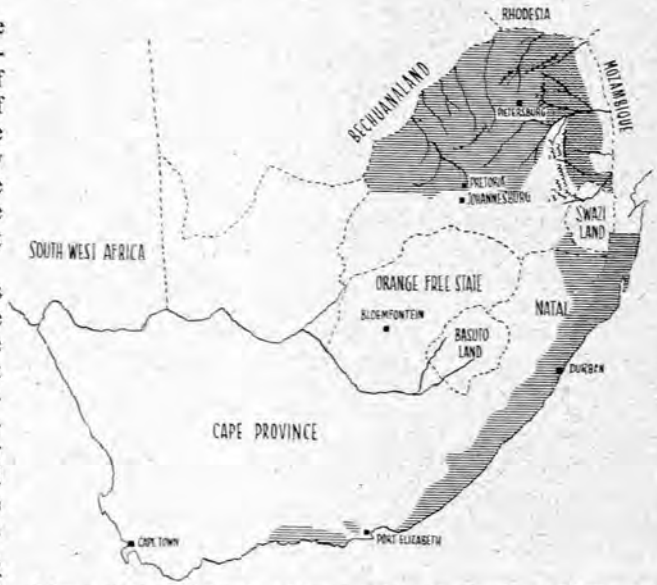
MASS CHEMOTHERAPY IN BILHARZIA IN NORTHERN TRANSVAAL

C. J. H. BRINK, B.A., M.D., CH.B., D.P.H., D.T.M. & H., *Chief Regional Health Officer, Pietersburg;*
H. P. BOTHA, M.B., CH.B., *Regional Medical Officer, Tzaneen;* H. J. COMBRINK, *Senior Health Inspector, Nylstroom;* and
F. J. ERASMUS, *Technical Officer, Tzaneen*

Bilharzia is a social disease, the control of which must be approached from a broad angle and with the close co-operation of the medical profession and the lay public. If any measure of control over this disease in the Union of South Africa is to be achieved in our time then it will have to be combated more vigorously; but before this country can embark on a widespread anti-bilharzia campaign, more promising evidence than that recorded here will have to be produced to show that satisfactory results at reasonable cost can be expected.

Surveys so far have clearly indicated that bilharzia occurs in well over 50% of the Bantu children of school-going age in the subtropical parts of the Northern Transvaal. In these areas the disappearance of malaria paved the way for great economic development which favoured the spread of bilharziasis. More intensive cultivation encouraged the introduction of this scourge into new irrigation schemes or increased its intensity in existing irrigated areas. The marked difference in the extent of the areas affected by the disease becomes apparent from a comparison of the papers on the subject by Annecke and Peacock[1] (1951) and Annecke, Pitchford and Jacobs[2] (1955) with the limited number of papers of earlier date. The present distribution of bilharzia in the Union can be seen from Map I, compiled by Dr. R. J.



Map 1. Union of South Africa showing distribution of bilharzia. Scale 1 inch = c. 543 miles. *S. haematobium* found in cross-hatched areas; *S. mansoni* found in stippled areas.

Pitchford, of the CSIR Bilharzia Research Unit at Nelspruit.

Surveys made recently not only showed a very high bilharzia incidence but also unveiled the noteworthy prevalence of other helminth infections (Tables I and II). The

TABLE I. DIAGNOSTIC TESTS FOR BILHARZIA, NORTHERN TRANSVAAL: 1956-57

Area	Urines		Faeces	
	Number tested	Number positive	Number tested	Number positive
West ..	6,251	1,306 (20·9%)	Nil	Nil
Central ..	1,685	242 (14·4%)	Nil	Nil
North ..	7,327	3,592 (49·0%)	2,889	1,517 (52·5%)
East ..	4,944	2,533 (51·2%)	875	448 (51·2%)

excreta in Native territories and rural areas with a backward population of some 1½ million; (4) active steps to avoid the risk of bilharzial infection by the provision of pure or purified water supplies for all household purposes; and (5) apart from the probable high cost of this effort, a prolonged and intensive educational campaign to convince the whole community and obtain their intelligent cooperation in the scheme.

In order to gauge the feasibility of such a scheme the proposed methods have been extensively tested over the past 2 years (1957-58) in specially selected localities. This paper deals with these trials, the results obtained, and the conclusions arrived at so far.

TABLE I. PREVALENCE OF HELMINTHS IN NATIVE SCHOOLCHILDREN: LETABA DISTRICT, 1957

Name of School	No. urines examined	No. positive S. haematobium	No. faeces examined	No. positive S. mansoni	No. positive Hookworm spp.	No. positive Ascaris spp.	No. positive Taenia spp.
Mariveni School	245	96 (39·1%)	225	218 (97·7%)	4	11	5
Mohlaba H.K. School ..	383	213 (55·6%)	301	291 (96·3%)	5	2	1
Mohlaba H.K. (other) ..	83	11 (13·3%)	83	21 (25·3%)	1	1	1
Khuyane (Mohlaba) ..	157	84 (53·9%)	96	86 (89·5%)	1	4	—
Dan School	388	174 (44·8%)	315	289 (91·1%)	39	15	4
Rita Thabina	172	125 (72·7%)	130	113 (86·9%)	3	2	—
Metz	60	52 (86·7%)	54	39 (72·2%)	12	5	2
Thabeng (Magoboya) ..	154	88 (59·1%)	130	85 (65·4%)	3	3	—
Nthabena (Letsitele) ..	97	67 (69·1%)	48	30 (62·5%)	12	0	3
Thabina School	89	50 (56·2%)	56	34 (60·7%)	8	3	—
Loraine School	74	62 (83·9%)	45	24 (53·3%)	5	1	—
Maake School	214	141 (66·5%)	141	69 (49·0%)	4	12	1
Letaba Estate	111	81 (74·0%)	51	24 (47·1%)	13	12	2
Phalaborwa	31	19 (61·3%)	86	27 (31·4%)	2	4	1
Balloon School	85	53 (62·4%)	67	13 (20·0%)	16	15	—
Mashati	254	145 (57·0%)	152	20 (13·1%)	28	13	—
Mabelek (Mamathola) ..	334	19 (5·8%)	119	11 (8·4%)	59	25	—
Sekororo	200	144 (72·0%)	210	16 (7·6%)	103	115	1
Maghonga School ..	215	47 (22·0%)	146	9 (6·1%)	26	14	3
Total	3,356	1,669 (49·7%)	2,455	1,419 (57·8%)	344 (14%)	257 (10·5%)	24 (0·98%)

ova of *Ascaris* and *Ancylostoma* species occurred in the stools of a high percentage of Native children attending schools situated along the Eastern slopes of the Drakensberg in the Transvaal.

Although bilharziasis was first reported in this country by Harley[3] in 1864, little success has been achieved in its control. Craig and Faust[4] wrote in 1954: 'Diseases of trematode aetiology may theoretically be relatively easily controlled by the simultaneous application of the following methods: (1) Chemotherapy of all cases of the disease discovered in the population, (2) anti-molluscan campaigns, (3) disinfection of excreta or their sanitary disposal, (4) education of the population.'

Similar proposals for the prevention and control of this disease had already been put forward by Manson-Bahr[5] (1947), Price[6] (1950) and Strong[7] (1945). According to these, a successful bilharziasis control scheme for the affected area of nearly 60,000 square miles in the Northern Transvaal should provide for (1) the mass oral drug treatment of an infected Native population between the ages of 4 and 16 years, estimated conservatively at 50,000, with an efficient anthelminthic under the supervision of an adequate medical staff; (2) the destruction by an experienced field staff using an effective molluscicide of the vector snails in the numerous irrigation systems large and small, and in natural water courses; (3) improved methods of sanitary disposal of

General Consideration of Mass Oral Chemotherapy

Official attempts at large-scale chemotherapeutical control were started in 1927, when the Transvaal Bilharzia Committee came into being and arranged for mass therapy of groups of European school children at holiday camps (Kieser[8]). The course of treatment, initially with intravenous antimony tartrate, certainly had excellent results in the curing of individuals with haematobium bilharzia, but the effect of the various annual campaigns on the epidemiological situation was limited. The factors responsible for this were the lack of a coordinated campaign of snail destruction, the limited extent to which infected Native children were treated at the same time, the fact that mansoni bilharzia was not adequately investigated, and the sporadic and localized nature of the educational campaign amongst the population exposed to infected water.

During the 1957-58 chemotherapeutical trials it was considered to be an essential preliminary step to try to establish complete control of molluscan vectors by means of an attack on unsatisfactory environmental conditions through public education. During the preparatory period all the standard epidemiological and clinical investigations were carried out by the same medical officer throughout to ensure the greatest measure of uniformity. The results and data obtained are stated below in two sections, dealing

TABLE III. GENERAL AND CLINICAL COMPOSITION OF SCHISTOSOME-INFECTED SCHOOLCHILDREN GROUPS

		Tzaneen		*Nylstroom*	
		A—Urban	*B—Rural*	*C—Urban*	*D—Rural*
Number Observed or Examined		445	975	93	67
Tribal Distribution					
Sotho group	%	94	10	78	72
Shangana-Tsonga group	%	6	90	10	1
Sex					
Males	%	55	64	60	70
Environmental Sanitation					
Household water, open source	%	2	83	0	100
Indiscriminate faecal disposal	%	60	100	0	100
Diet					
Fairly balanced	%	100	43	100	3
School Performance					
Physically fit	%	95	88	81	99
Regular school attendance	%	92	82	85	60
Clinical History and Examination					
Haematuria	%	6	28	62	52
Blood in stools	%	2	6	0	33
Obvious malnutrition	%	15	25	10	4
Liver enlarged (2 fingers +)	%	22	30	28	24
Palpable spleens	%	3	3	0	0
S. haematobium infections	%	49	51	100	100
S. mansoni infections	%	87	96	0	0
Special Tests					
Number investigated		137	20	12	—
Haemoglobin below 10 g. %	%	96	2	0	—
Plasma proteins above 6·5 g. %	%	100	92	58	—

with (*a*) the clinical investigations, and (*b*) the chemotherapeutical trials.

I. CLINICAL INVESTIGATION OF SCHISTOSOME-INFECTED CHILDREN

Method

The clinical examination and the special tests were supplemented by questionnaires completed by the teachers at the schools concerning the environmental sanitation, the water supply, the child's diet at home, and his performance at school. Only satisfactorily completed questionnaires were taken into account. The results are reflected in Table III.

For the spleen examination each child was examined in a recumbent position, and the following laboratory examinations were carried out afterwards.

Urine. After physical exercise, the whole volume of urine of each child was collected in a separate wide-mouthed bottle. After this had stood for at least 30 minutes, the supernatant urine was decanted and the remaining fluid (approximately 5 ml.) placed in a centrifuge tube and centrifuged for 2 minutes at 1,000 r.p.m. A drop of the sediment was then examined microscopically.

Faeces. The entire stool was collected and from the outer portion or the part containing mucus or blood about 5 g. was removed and shaken up thoroughly in a test-tube with 5 ml. of 10% solution of sodium sulphate. It was then filtered through a fresh piece of mosquito-mesh wire-gauze into a centrifuge tube to which was added an equal volume of technical ether. It was centrifugated at 1,000 r.p.m. for 2 minutes and the upper layers of faecal debris and ether poured off afterwards. A drop of the sediment was examined microscopically.

Haemoglobin and total plasma proteins. The copper sulphate method 9 was used for the measuring of specific gravity of whole blood and of plasma. For school A the field method was used, while for schools B and C the estimations were carried out by the South African Institute for Medical Research at Pietersburg. Haemoglobin and plasma-protein estimations were made only in those children with enlarged livers or palpable spleens or severe malnutrition.

By examining a thick blood-smear a search was made for malaria parasites in the children with palpable spleens. No parasites could be demonstrated. Serological tests for syphilis were also carried out on this group in the Mohlaba schools (see B in Table III), and positive Wassermann tests were given by 9 children out of 45 (20%), of whom 7 had enlarged livers of 3 fingers or more and 2 had spleens that were just palpable.

Results

The children of 4 schools were systematically examined in this way and in Table III a comparison is made of the findings at an urban school A and a rural school B in the Letaba district, where *S. mansoni* bilharziasis predominates, and an urban school C and a rural school D in the Nylstroom district, where *S. mansoni* infections are not found. A study of Table III reveals the following important points:

1. Bilharziasis does not show any predilection for one or other of the major ethnic groups.

2. Males probably expose themselves to infection to a greater degree than females.

3. Although there was an obvious difference between the environmental sanitation of urban and rural areas, conditions such as overcrowding and bad siting favour the spread of bilharziasis in urban locations.

4. The Native children of urban areas have a fairly balanced diet—including starch, vegetables, and meat at least twice weekly. Obvious signs of malnutrition were found especially in rural school B (Mohlaba), where mealie-meal forms the bulk of the diet.

5. The general performance of the scholars does not suggest the presence of a debilitating disease.

6. Notwithstanding a high incidence of bilharziasis, clinical signs suggestive of the disease were not in evidence.

7. Enlarged livers were quite common and in many instances the liver edge could be more easily felt in the epigastrium than along the outer side of the rectus muscle. The place of bilharziasis in the causation of these enlarged livers will have to be investigated together with the question whether the so-called hepatosplenic bilharziasis (Benaim Pinto[11] syndrome) is commoner in South Africa than is generally believed. Hepatic manifestations did not at this stage offer much help in establishing a clinical gradient for bilharziasis because irreversible progressive cirrhosis would probably only follow massive worm infestation (Zerpa Morales[12]).

8. According to our findings an enlarged spleen was part of the pathological picture of mansoni bilharzia rather than of malaria; because the low malarial parasite rates found during random blood surveys in this area would indicate proportionately low malarial spleen rates (Brink[10]).

9. The epidemiological picture of bilharziasis differs from region to region. West of the Drakensberg ridge mansoni-infected reservoirs were found only in a few small and circumscribed localities, whereas the incidence was high in the subtropical North-Eastern Transvaal.

10. The haemoglobin and plasma-protein values were not lowered beyond critical levels.

II. EXPERIMENTAL CHEMOTHERAPEUTIC TRIALS IN SCHISTOSOME-INFECTED SCHOOLCHILDREN

From the literature on chemotherapy in bilharziasis it seems clear that the ideal drug is still to be discovered. What is wanted is a drug that is effective when taken orally and produces no serious side-effects. The treatment should be completed within a school week or 5 days, because it is schoolchildren that can be reached most readily for mass treatment.

Our choice of drug and dosage as well as duration of course was based mainly on the results obtained by workers in Southern Rhodesia.[13] They have recommended lucanthone hydrochloride in a dosage schedule based on 60 mg. per kg. of body-weight. The total dosage is spread over 3 days.

The field of anti-bilharziasis chemotherapy has been extensively explored by workers in their search for the ideal oral drug.

Abdel Azim *et al.*[14] were successful with lucanthone hydrochloride and this drug was used by Blair *et al.*[15] in a dosage of 15 mg. per kg. for 5 days in mass treatment. Newsome and Halawani,[16] claimed a high cure rate with repeated oral courses.

Against urinary bilharziasis Schwetz[17] had good results with nilodin. Alves and Gelfand[18] went a step further by giving antimony orally, but considered the results with oral antimony compounds as most disappointing.

In a departmental report, Annecke (1954) stated that mass treatment trials with fuadin in the previous year were unsuccessful, for only 38 persons out of an initial number of 150 went on to receive the full course. In the same year experimental campaigns with nilodin and miracil D had to be abandoned because of severe side-effects (Pitchford[19]).

In 1956 further reports came from severa workers,[20-22] and n the same year Parodi *et al.*[23] used one of the basic desoxybenzoins (1183TH) in an oral preparation for old-standing mansoni infections. With negligible side-effects the cure rate was high after 3 months; but as only 18 cases were treated a definite conclusion will only be arrived at after trials with larger numbers. In most of the published work the numbers of patients in the treatment groups were too small.

A more comprehensive trial was conducted by Halawani *et al.*,[24] in Egypt, where 350 cases of urinary bilharziasis were treated with miracil D as out-patients, while 114 cases of intestinal bilharziasis were treated in hospital. The authors concluded that miracil D is satisfactory in the treatment of ambulatory cases of urinary bilharziasis, but not so effective in those with intestinal bilharziasis.

Closely related to the question of drug and dosage is the final test of cure. Rowland[25] and Newsome[26,27] dealt with this thoroughly and from their reports one is convinced that the final test of cure should include at least both urine microscopy and the hatching of eggs.

Finally, in a critical review of the treatment of bilharziasis, Schneider[28] differentiates between the aims in treatment of the clinician and the epidemiologist. The object of the epidemiologist is to suppress the infection sufficiently to interrupt transmission; radical cure is illusory in an endemic area where patients are constantly subjected to reinfection.

Experimental Chemotherapy

For the trials in the Northern Transvaal it was decided to subject lucanthone hydrochloride to several small-scale tests before embarking on a major trial. In these tests Nilodin (Burroughs Wellcome) and Miracil D Co. (Bayer) were used in different dosages over a varying number of days and a close study was made of the possible toxic effects as well as the methods of obviating it. These pilot tests showed the following:

1. In a course of treatment of 4 days' duration it does not make any difference to the cure rate whether the dosage of miracil D is 40 or 60 mg. per kg. of body-weight. In both groups 50% of the urines were sterilized at the end of 6 weeks.

2. When miracil D is given in a dosage of 70 mg. per kg. over 4 days severe side-effects are encountered. The toxic effect of lucanthone hydrochloride, which upsets the Native child mostly, in either infection, is *dizziness with disturbance of equilibrium.*

3. A little porridge or soup taken with the tablets minimizes side-effects.

4. Belladonna either incorporated in the tablet or given separately will diminish the abdominal distress occasionally experienced with these drugs.

5. A group of 42 schoolchildren with urinary bilharziasis were treated with miracil D co. in a dosage of 100 mg. per kg. over 10 days. After 6 weeks the urines of 50% of the groups were found to be negative with 2 tests a few hours apart.

6. Excellent results were obtained in a group of children with urinary bilharziasis only where nilodin was given in a total dosage of 200 mg. per kg. over 10 days. Unfortunately toxic reactions were common and combined with the long duration of the course resulted in a high percentage of absentees in the second week of treatment. Nilodin in a dosage of 140 mg. per kg. over 20 days gave comparatively poor results with very few side-effects in a group of children suffering from urinary bilharziasis.

Based on these findings an extensive trial was planned for the Tzaneen Native school. The 445 infected children were divided into 3 groups according to the drug administered to the group namely, miracil D co., nilodin or Blaud's tablet (tab. ferri carb.). The latter was used as a placebo for the control group. The children were weighed beforehand and the therapy conducted under direct medical supervision; the first treatment taking place after school had opened and the next treatment before the children went home. Toxic side-effects in the form of disturbances of equilibrium occurred in about 1 or 2% of the children treated with nilodin or miracil D co.

In the follow-up period, extending over 9 months, the same method of examining the urine and faeces was applied and where viable eggs with distinct and clear outline were found microscopically at a single test they were taken to be positive. Discoloured eggs were taken as a negative finding.

Results

The results of the treatment are illustrated in 2 figures and 2 tables. Table IV represents 3 approximately equal groups suffering from a mixed *S. mansoni* and *S. haematobium* infection, while Fig. 1 represents members of the three groups

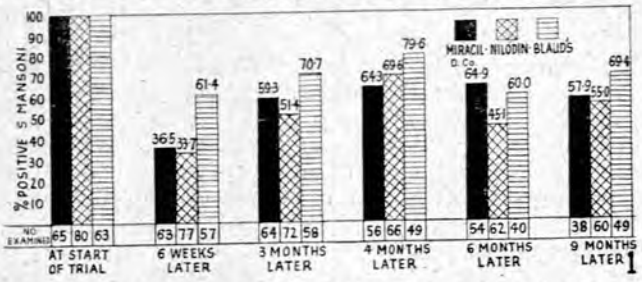


Fig. 1. Chemotherapy of school children infected with *S. mansoni.*

who did not show the additional infection with *S. haematobium.* In Table V are shown 3 groups of children treated with miracil D, nilodin and tab. ferri carb. respectively (some suffering from a mixed infection), while those represented in Fig. 2 showed no infection other than with *S. haematobium.*

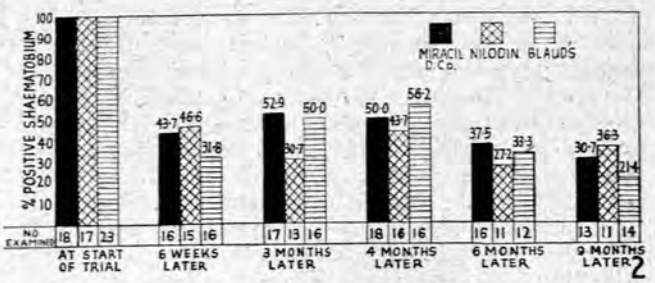


Fig. 2. Chemotherapy of school children infected with *S. haematobium.*

A comparison of Figs. 1 and 2 shows fairly clearly that at the end of 9 months many more of those suffering from *S. haematobium* (Fig. 2) had become negative than those infected with *S. mansoni* (Fig. 1).

Figs. 1 and 2 indicate a marked initial fall in the number of positives at the first test after treatment, followed by a rise at later tests. No reason for this phenomenon can be advanced unless it is due to temporary incapacity of the schistosomes with subsequent recovery of their egg-laying ability after 6 weeks to 2 months. If the first treatment injured the schistosomes as markedly as shown in the figures then it may be concluded that a second and subsequent treatments during the parasites' convalescence may lead to its ultimate destruction. This conclusion is being tested by giving 3 or 4 treatments in full doses ranging over 1 or 2 days repeated at intervals of 3-4 weeks.

TABLE IV. LARGE-SCALE CHEMOTHERAPEUTIC TRIALS IN BILHARZIA: S. MANSONI: TZANEEN BANTU SCHOOL: 1957

Drug	Age-group (years)	Start Pos.	Start Neg.	6 weeks Pos.	6 weeks Neg.	3 months Pos.	3 months Neg.	4 months Pos.	4 months Neg.	6 months Pos.	6 months Neg.	9 months Pos.	9 months Neg.	% neg. at start	% neg. at 9 mths.
Miracil 40 mg. per kg.	5— 9	37	9	16	26	28	15	24	12	25	10	13	11		
	10—14	71	8	34	37	57	20	52	16	44	19	39	19		
	15+	5	0	1	4	2	3	2	2	2	3	1	0		
Total		113	17	51	67	87	38	78	30	71	32	53	30	13·1	23·1
Nilodin 40 mg. per kg.	5— 9	45	6	10	39	17	27	24	19	18	23	20	17		
	10—14	71	10	33	42	43	30	51	20	34	33	38	27		
	15+	6	1	2	5	4	2	5	2	2	3	0	3		
Total		122	17	45	86	64	59	80	41	54	59	58	47	12·2	33·8
Blaud's 5 gr.	5— 9	36	7	24	14	23	14	21	12	17	11	22	7		
	10—14	64	12	44	21	44	20	50	9	26	26	50	8		
	15+	7	0	1	5	5	2	7	0	3	3	1	2		
Total		107	19	69	40	72	36	78	21	46	40	73	17	15·1	13·5

The headings stand respectively for 'At start of treatment', '6 weeks after treatment', '3 months after treatment', etc. Miracil = Miracil D Co. Blaud's = Tab. Ferri Carb

TABLE V. LARGE-SCALE CHEMOTHERAPEUTIC TRIALS FOR BILHARZIA: S. HAEMATOBIUM: TZANEEN BANTU SCHOOL: 1957

Drug	Age-group (years)	Start Pos.	Start Neg.	6 weeks Pos.	6 weeks Neg.	3 months Pos.	3 months Neg.	4 months Pos.	4 months Neg.	6 months Pos.	6 months Neg.	9 months Pos.	9 months Neg.	% neg. at start	% neg. at 9 mths.
Miracil 40 mg. per kg.	5— 9	19	28	19	22	15	28	15	22	18	19	8	15		
	10—14	45	34	20	55	14	58	26	39	19	44	13	45		
	15+	1	5	0	6	0	6	1	5	0	6	0	1		
Total		65	67	39	83	29	92	42	66	37	69	21	61	50·7	46·2
Nilodin 40 mg. per kg.	5 —9	22	29	15	32	14	30	15	29	14	28	9	28		
	10—14	36	45	18	62	12	62	29	46	19	42	12	43		
	15+	1	6	0	7	0	7	0	7	0	4	0	3		
Total		59	80	33	101	26	99	44	82	33	74	21	74	57·5	53·2
Blaud's 5 gr.	5— 9	23	20	21	16	16	21	13	21	12	20	9	20		
	10—14	38	38	11	53	11	51	31	29	17	39	21	43		
	15+	2	5	1	5	0	7	1	5	1	3	2	1		
Total		63	63	33	74	27	79	45	55	30	62	32	64	50·0	50·8

See interpretations at foot of Table IV.

Tables IV and V lead to the following deductions, some of which are based on the statistical analysis carried out by the consultant statistician of the King George V Hospital in Durban:

1. The differences between the 3 treatment groups do not appear to be statistically significant.

2. In the initial rise and subsequent fall in the percentage number who remained negative two conclusions are possible, viz. (*a*) high reinfection rate and (*b*) ineffective blood-level and short duration of action of drug and consequent recovery of the worm. The high rate or reinfection is demonstrated by the additional finding that, out of the 143 bilharzia-free and untreated children tested before the start of treatment in others, 49% became positive for *S. mansoni* and 15·4% for *S. haematobium* at the end of 4 months.

3. Table VI suggests that very few of the treated children can be classified as cured after 9 months and demonstrates the difficulty at this stage of curing infected Bantu school-children with mass oral drug therapy in spite of simultaneous intensive efforts at vector control. Mass treatment may have reduced the worm load and consequently later complications. It may also help to change the epidemiological picture if the dosage is repeated every 3 or 4 months. This is being tested at present in the Mohlaba schools, where miracil D co. is being administered to approximately 1,500 children at more or less regular intervals in a dosage of 40 mg. per kg. over 3 or 4 days.

TABLE VI. CHEMOTHERAPEUTIC TRIALS: TREATED CASES CONSECUTIVELY NEGATIVE AT FOLLOW-UP EXAMINATIONS

	S. haematobium infections		*S. mansoni infections*	
Treatment group	*Total number positive at start of trial*	*Constantly negative over 5 consecutive follow-up examinations*	*Total number positive at start of trial*	*Constantly negative over 5 consecutive follow-up examinations*
Miracil D. Co ..	65	12·5%	113	0·1%
Nilodin	59	11·8%	122	1·6%
Blaud's Tablet ..	63	6·3%	107	0%

OTHER MEASURES

Anti-mollusc Work

The snail-destruction campaign was conducted in those natural rivers and streams which formed the *habitat* of the vector snails. Copper sulphate had been used in the past and the sulphating of the waters was applied at the so-called contact points where activities such as swimming, bathing and washing suggested continued and close contact between man and vector. The copper sulphate was applied to the water surface in a concentrated solution with a copper or brass sprayer. The concentration was calculated according to the depth of water and the size of the pool so as to produce a final dilution of 10-20 parts per million. Aquatic vegetation had usually to be removed manually before sulphation to prevent deviation of the copper sulphate by organic and other materials.

A country-wide programme of applying copper sulphate to natural bodies of water could not be contemplated at this stage. The introduction of a more effective molluscicide which may perhaps replace copper sulphate is awaited. Anti-mollusc measures of a more permanent nature, however, are of extreme importance in the planning of new irrigation systems. A piped water supply or the cementation of canals, which allows a faster flow of water, would amongst other advantages also prevent the growth of aquatic vegetation which protects snail life and reduce seepage and pool formation which favours vector breeding.

Furthermore, to prevent snails from migrating from the natural rivers and streams into irrigation systems, an efficient snail trap or screen must be constructed.

Educational Campaign

Bilharziasis is a fair indication of a deficient standard of environmental hygiene and the lack of a sanitary conscience in the community. Tradition dies hard, and it is only after intensive precept and sustained teaching that the Bantu people, especially the rural Bantu, will eventually as a whole realize and accept the necessity for proper sanitation. Not only the health and education authorities, but civil administrators in rural areas and employers of Bantu labour like farmers and managers of factories, mines and estates will have to help in creating a sanitary conscience in the Bantu.

The Department of Health is actively engaged in this great task of creating a more critical sanitary attitude. A mobile film unit travels through Bantu areas and a fairly high proportion of the population is in this way inducted in the basic rules of health. In addition, courses in hygiene are organized for our own Bantu field staff, Bantu school teachers and for chieftains and other Bantu leaders.

Concomitant with the educational campaign for a better sanitary conscience, is the need for all to avoid exposure to the infection. The Bantu children live at a continuous risk and an arduous task awaits those whose work it is to persuade the Bantu of the necessity of using only safe bathing places and purified household water. The Bantu makes contact in the watery habitat of the infected snail sometimes simply for the purpose of recreation but usually through necessity to wash or quench thirst. In Europeans such contact can be considered as foolhardiness or stupidity, because it was shown by Kieser,[8,29] of the Transvaal Bilharzia Committee, that all the streams in the warmer parts of the Transvaal from Zeerust and Rustenburg northwards to the Limpopo and eastwards to Komatipoort must be considered as potentially infected. For those who live in the Northern Transvaal a safe or purified water supply is advocated. Where boreholes cannot be utilized, water should be used which has been subjected to sedimentation, filtration and chlorination.

The medical profession can influence public opinion greatly if these aspects of the bilharziasis problem are presented by the medical practitioner to his patient.

CONCLUSIONS

1. Investigations in connection with the prevalence of bilharziasis in the Northern Transvaal have revealed the high incidence of helminth infections in general. The problem of bilharziasis may in the future be considered as only a subdivision of the wider problem of helminthiasis in this area.

2. It is not clear at this stage whether the finding of schistosome ova in human excreta is evidence of somatic pathological processes. In almost all the infected school children none or relatively few abnormalities could be

discovered with the clinical examinations. The question therefore arises whether bilharziasis should be regarded as a disease in the Native or may be considered to be a harmless host-parasite relationship.

3. Mass therapeutical procedures with oral drugs which can be carried out both safely and effectively within a period not exceeding the normal school week do not, with the drugs at present available, offer a solution of the problem of bilharziasis in the Northern Transvaal.

4. Permanent anti-bilharziasis measures like improved environmental hygiene constitute our most effective weapon. Education in this respect is needed and the medical profession can play an important role in cooperating in the enlightenment of the public.

SAMEVATTING

Die omvang van bilharzia word aangetoon in die lig van ondersoeke wat in die afgelope jare uitgevoer is in Noord-Transvaal.

Daar word aangetoon dat bilharzia 'n parasitiese wurmaandoening is wat teoreties behoort uitgeroei te kan word deur die verbreking van een of meer van die skakels in die lewensloop van die betrokke Schistosoma-soort. Op proefondervindelike wyse is die onderdele van 'n dergelike program van bilharzia-beheer op bepaalde plekke toegepas.

Die toediening van geneesmiddels per mond op 'n massaskaal is voorafgegaan deur 'n soortgelyke epidemiologiese en kliniese ondersoek van aangetaste Bantoe-skoolkinders. Die inligting hierdeur verskaf word in tabelvorm weergegee en oor die algemeen kon daar min klinies verkeerd gevind word in kinders van wie die urine en stoelgang Schistosomaeiers bevat het.

Ons het nog nie die wonderstof om bilharzia op groot skaal met chemoterapeutiese middels te probeer uitwis nie. Vergelykende studies tot 9 maande na behandeling, het min verskil aangetoon tussen nilodin en miracil D. ko. in 'n dosis van 40 mg. per kg. gegee in 'n totale dosis oor 4 dae. Weliswaar het die uitwerking van altwee nie veel verskil van die kontrolemiddel wat gegee is aan 'n derde groep kinders nie. Kliniese genesing kon in slegs 'n klein persentasie aangetoon word en dit kan ook gewyt word aan voortdurende herbesmetting. Dit mag moontlik epidemiologiese waarde hê om die wurmlading in die bevolking te verminder deur herhaalde behandelings in 'n digbewoonde Bantoegebied waar die slakbesmette waters hulle self tot slakbeheer leen.

Verbetering van die omgewingshigiëne en verhoogde lewenstandaarde gaan beslissende faktore word in die stryd teen bilharzia. Die geneeskundige professie het 'n belangrike voorligtingstaak in hierdie wye program van siektebestryding deur middel van voorligting.

The authors wish to thank the Secretary for Health for permission to publish this article.

The cooperation and help of Dr. H. W. Alberts and his staff at the South African Institute for Medical Research, Pietersburg Branch, is acknowledged, and also the kind assistance of Mr. S. E. Cruse, Consultant Statistician of the King George V Hospital, Durban. We are specially indebted to the technical officers and field staff who have assisted in these trials.

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