

SOME PERSONAL VIEWS ON THE CONTROL OF SCHISTOSOMIASIS MANSONI

KURT KLOETZEL

Departamento de Medicina Social, Escola de Medicina, Universidade Federal de Pelotas, Caixa Postal 464, 96010-900, Pelotas RS, Brasil

Our views are based, among other, on a recent study of a district of União dos Palmares (Alagoas). Although being a very compact community (32 city blocks holding two thousand families), transmission is very uneven, the geometric mean egg counts in the various blocks ranging between extremes of 96 and 1920. (Results do not correlate with the availability of domestic water supply). We thus are led to conclude that: (a) transmission is primarily peridomestic, resulting from pollution of open ditches and other collections of water; (b) control of transmission can be done on a selective basis, requiring quite modest investments.

Given the inefficacy of population-based chemotherapy, when used alone, the author insists that this alternative cannot any longer be overlooked. He also regrets the emphasis placed upon vaccine development; allegations that this would, at any rate, prevent severe morbidity can be dismissed, since-whatever the cause-morbidity due to schistosomiasis has been rapidly declining in Northeast Brazil.

Key words: *Schistosoma mansoni* – control

In 1985, after a few years of absence from field work, the author (who had baseline data available for one specific region) was asked to assess the effectivity of PECE, the special programme for the control of schistosomiasis initiated in 1975 by the Ministry of Health. This programme, it may safely be said, had for years relied almost entirely on “mass-treatment” to achieve its purposes.

This limited study served as stimulus for pursuing this matter in more depth so that in 1986, after funding was secured, a series of investigations, based on six counties of the northeastern state of Alagoas, was begun. The final conclusions of this project, reported in a number of papers (Kloetzel et al., 1987, 1988, 1989, 1990), can thus be summarized:

The first finding concerned the extreme heterogeneity of the outcomes. Although official reports were very favourable for most counties, as soon as prevalence data were broken down and examined on a “micro-level”, that is, for distinct areas of the same town, it became clear that overall prevalence was mis-

leading. Some areas in effect exhibited a substantial decrease in prevalence rates but these were invariably associated with the presence of well-above average socio-economic conditions, such as satisfactory housing, paved streets and improved sanitation and domestic water supply. (Given enough time, the same results would probably have occurred spontaneously). On the other hand, in less privileged neighborhoods transmission rates had not abated, and egg counts returned to their former levels within a period of 6-12 months.

After the analysis were completed, yet another “mass-treatment campaign” was carried out in two towns of Alagoas, aiming at a non-participation rate in the 5-14 years-old not exceeding 10% (the final figure actually came closer to 7%). Three-monthly egg counts confirmed that reinfection indeed took place very rapidly in areas at greater risk, furthermore, that the rates of reinfection were highest within a number of well-defined neighborhood clusters.

To date, a total of 3,183 children between 2 and 14 years of age were examined in Bairro Frio (quantitative Kato method), an estimated coverage of 93%.

Results are presented in Table I.

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TABLE I

Prevalence and EPG for Bairro Frio

Age (years)	Number of patients	Prevalence (%)	Mean counts (EPG) ^a	
			Arithm.	Geometr.
2	252	3	< 20	< 20
3	269	5	24	144
4	220	18	24	240
5	251	25	94	288
6	227	40	84	257
7	273	42	194	511
8	251	47	240	634
9	229	55	274	766
10	255	62	298	763
11	209	58	346	931
12	276	74	374	987
13	226	69	301	560
14	217	64	295	650

a: total, including negatives.

We may express these findings in yet another way (for the 5-13 years range):

EPG % (of total)	
0	51
1-100	17
101-400	16
400	16

Never before in our experience of 30 years or so in northeastern Brazil have we met with such high intensities of infection, which is particularly striking when one remembers that these are patients residing in an urban area! (It has to be realized, of course, that the county of União dos Palmares has not been submitted to population-based chemotherapy since June, 1986).

Right away it was observed that high egg counts were not randomly distributed throughout Bairro Frio but aggregated not only within certain families (an observation which is not unusual) but in certain city blocks. This can be shown in Table II.

It took us a few months to confirm that such clusters could lend themselves as indicators for detection of the main foci of infection, and that these were mostly peridomestic in distribution as well as of restricted size. In consequence, as well as the fact that their identification would not demand lengthy snail surveys, it once again became clear that environmental intervention, contrary to prevailing opinion, does not require investments considered exorbitant for a developing country. Also, while we had for a number of years recom-

TABLE II

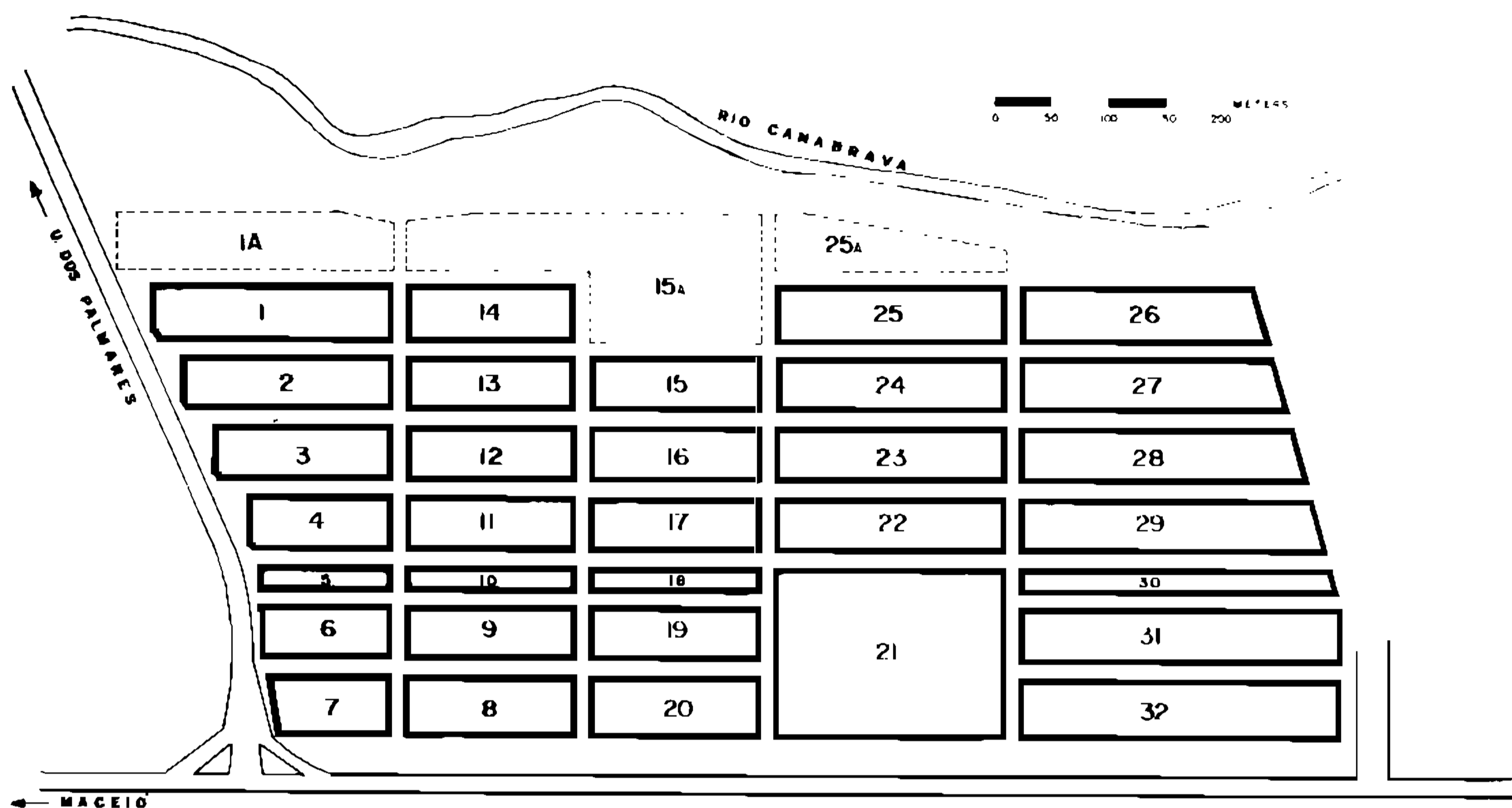
EPG in city blocks of Bairro Frio

Block no.	Geometric mean (EPG)
1A	312
1	360
2	168
3	144
4	264
5	192
6	408
7	432
8	96
9	240
10	288
11	312
12	336
13	552
14	552
15A	696
15	912
16	312
17	240
18	72
19	312
20	216
21	432
22	312
23	360
24	840
25	1128
25A	1368
26	1224
27	408
28	432
29	432
30	432
31	216
32	312

mended a policy of selective chemotherapy (Kloetzel 1967, 1974), these findings suggested that selective environmental control would likewise prove to be feasible.

However, a selective strategy will only prove practical if a way can be found to dispense with the traditional overall faecal surveys, expensive in terms of funds and personell when carried out on a state-wide basis. Accordingly, in search of a simplified technology useful for surveillance and detection of areas at high risk, our group devised and tested a number of sampling procedures, two of which were subsequently recommended: the use of pooled faecal samples; "screening on grounds of suspicion".

At this point, after it became evident that chemotherapy alone would not suffice for



control of transmission and that a specifically targeted as well as integrated approach held out more promise, we started planning a comprehensive field test. For that purpose, we choose to locate the project in Bairro Frio (county of União dos Palmares, Alagoas), a densely populated settlement, comprising within its 40 hectares a population of approximately 12,000 inhabitants (Fig.).

In addition to its compactness, Bairro Frio offers other advantages, such as proximity to the state capital, an excellent highway and adequate technical support, both on the part of SUCAM, a federal agency for endemic diseases, and FSESP, a responsible and efficient foundation involved since World War II with water supply and sanitation in North and Northeast Brazil.

In fact, since both agencies were actively interested in Bairro Frio, an informal agreement for joint cooperation was drawn up.

Funds from abroad reached us in February, 1990, shortly before inauguration of the new federal government. This led to a forced delay in starting the project, since we had to wait for the appointment of the new directors of SUCAM and FSESP. However, these positions remained vacant for many months, so we finally decided to go ahead on our own resources, although anticipating that we thus would be unable to attain all our objectives. (In fact,

only in mid-1991 were the appointments decided upon).

Although these results conform to a rather clear-cut spacial pattern when plotted on the map (Fig.), nevertheless a multiple regression analysis was felt to be desirable. This demonstrated that the geographic distribution and geometric mean egg counts were indeed highly significantly correlated as was, to a somewhat lower extent, age and egg counts. As anticipated from our previous experience, neither prevalence nor intensity of infection differed among the sexes. But we certainly did not expect that the duration of residence in the present house or in the settlement would be irrelevant to the outcome.

Bairro Frio is in a process of steady growth and we found that respectively 39% of the households had resided two years or less at their present address or in that particular area, and we anticipated that this group would not present such substantial intensities of infection. Since this assumption was proven to be wrong, two different hypothesis are open to discussion: (a) that these families originally migrated from areas with similar characteristics; (b) that under the conditions prevailing in Bairro Frio the increase in worm burden proceeds at an uniquely high rate.

These are motives enough to favour the second hypothesis.

It indeed seems surprising that an area of such limited size (450 by 900 meters) exhibits such marked differences in the intensity of infection. It is obviously inappropriate to speak in terms of "peridomestic" or "neighborhood" foci in the case of such compact and densely populated area, yet Table II shows that risk factors predominate in certain parts of the township, being highest within city blocks 25 and 25A and declining therefrom in direction of the upper right corner of Fig. 1, the intersection of route 104 to Maceió and the highway leading to the city of União dos Palmares.

While a rather steep slope leads from route 104 down to the Canabrava river, city blocks 1, 14, 25 and 26 are already on level ground. The river itself for most of the year does not exceed the size of a modest, shallow creek, unsuitable for bathing or recreation and not to be considered polluted. In August or September, however, during the rainy season, it rises above its margins, floods part of the valley and reaches the doorsteps of the first line of houses. While we still lack detailed information concerning the mechanisms of transmission, one can be reasonably sure that the periodical flooding of outhouses and improvised toilets presents a major health hazard to the population.

However, throughout the entire year Bairro Frio is exposed to yet another risk factor, the open-air sewers to be found everywhere in the area.

Bad sanitation is thus the main factor to be met with it. Conditions and availability of potable water do not appear to play any significant role. Some 73% of the households have running water, the others either rely on their neighbors or on the public faucets distributed all over the settlement.

Be that as it may, once again it can be demonstrated that environmental intervention does not require any major engineering thus does not place too great a demand on the budget. It is not particularly expensive to deepen the bed of the Canabrava nor to recruit a group of volunteers in order to periodically pump out overflowing septic tanks, improve flow in ditches or fill out stagnant collections of water. A programme of integrated and well-coordinated efforts on the part of the local government or even community groups may well suffice. This is particularly true when a selec-

tive strategy is followed, that is, when these efforts are targeted towards readily identified neighborhoods at high risk.

Our original purpose was to demonstrate that the control of transmission through selective chemotherapy (Kloetzel, 1967, 1974) plus improved-and likewise selective-sanitation would prove to be effective in the control of transmission of schistosomiasis mansoni. Unfortunately we did not complete this part of the project, owing to indefiniteness and indecision on the part of federal agencies.

The author has to confess not only to a lack of enthusiasm concerning a putative schistosome vaccine but his outright regret that this sort of research is encouraged to such an extent by the developed countries. It is not surprising that glamorous appeals such as these end up by interfering with common-sense health planning on the part of their underprivileged fellow countries.

It is often mentioned that even partial protection would be acceptable, since the vaccine would necessarily lead to a reduction of severe morbidity. This view is highly debatable, at least in the case of schistosomiasis mansoni as seen in Northeast Brazil.

The fact is that morbidity, as shown by a number of reports, has already declined substantially, so that at present we are faced with the problem of *control of transmission* alone.

For more of a decade we haven't met with severe clinical forms of schistosomiasis, so familiar from former years-and this experience is shared by most physicians. Naturally this phenomenon has been attributed to the beneficial effects of population-based chemotherapy. The examination of hospital records, however, seem to suggest that the trend towards a decline in the number of cases of hepatosplenic schistosomiasis began as early as two decades ago, thus in the years preceding PECE. More striking yet are the reports from areas not as yet submitted to mass chemotherapy (the states of Bahia and Minas Gerais), which similarly point to a change in the clinical pattern. In addition, if one takes into account that the non-participation rate for chemotherapy in Alagoas in past years used to be 30% or so, at the very least, there are obviously sufficient grounds for reexamining the issue.

Specially when we realize that the close relationship between egg counts and morbidity (which only applies, it is well to remember, to the 7-15 years age group), a paradigm since the sixties, suddenly appears to have failed. So overwhelming is the rate of reinfection in areas of continuing transmission, that egg counts swiftly attain their former levels-and yet the clinical pattern remains benign!

This observation, which first claimed our attention in other counties of Alagoas, is now repeated in Bairro Frio. This time, however, anticipating the need for more sophisticated instruments than the routine physical examination, we decided to include abdominal echography in our survey. Since details on the 155 echograms were presented at this meeting by Dr Flair Carrilho, let it suffice to say that positive evidence of severe morbidity was found to be lacking-including in a group of 27 subjects with egg counts above 2400 EPG!

We thus are left with two distinct alternatives: (1) Our original findings relating egg counts to morbidity had led us to false conclusions (Kloetzel, 1962). Thus "schistosomal hepatosplenomegaly" would either be unrelated to the schistosome or be multifactorial, one or more additional and not yet identified factors being needed before severe morbidity can be expressed. (Among the manifold possibilities, concomittant infections by other agents may have to be considered). (2) The intensity of infection is indeed related to the clinical pattern of schistosomiasis but only in untreated individuals. Since it is well-known that chemotherapy may lead to a regression of liver fibrosis, at least during its early stages, it is also a distinct possibility that these drugs, even if unsuccessful in preventing reinfection, may hinder or even prevent further development of fibrosis and portal hypertension.

On reexamination of our records dating back 25 years ago, some supporting evidence can be detected. In addition, preliminary data recently presented by Zwingenberger et al. (1990) suggest that drug therapy can lead to a "dissociation of factors regulating fibrogenesis and immunomodulation after treatment and reinfection".

As far as future research is concerned, at this point to proceed with further population surveys would be tantamount to flogging the proverbial dead horse. Neither these nor "ba-

sic" research by itself will advance our objectives and the time has arrived when the control of transmission of schistosomiasis has to be put on an operational basis.

Furthermore, all the evidence gathered over these last 6 years allow the prediction that selective chemotherapy combined with selective environmental intervention will eventually lead to a state of satisfactory control. Science has provided us with enough tools for this endeavour-the remaining obstacles lie entirely within the sphere of management and administration.

In order to avoid the vagaries of centralized decision-making and premature interruptions of such programmes, it is proposed to test the effectiveness of local administration and management, namely the cooperation, at grass-roots level, of volunteer corps, community groups and neighborhood organizations.

The virtues of such an approach are manifold. For instance: although a selective strategy is employed, once a focus of active infection is identified the totality of the individuals with high egg counts will have to be treated. The positive feedback effect in schistosomiasis *mansoni* is such that one 10-year old with 5.000 EPG is able within a very short time to surround himself with a cluster of similarly infected persons. (In other words, the non-participation rate has to be kept at a minimum).

It will also be necessary to assure that all new residents in that area agree to be treated, an objective which can only be attained with the aid of active neighborhood groups. (Obviously the awareness of the need for better sanitary conditions will likewise be higher at a micro-level).

This research proposal will be complemented by two items which, while apparently unrelated to the control of schistosomiasis itself, are sufficiently challenging to deserve investigation: (1) The findings of Zwingenberger and his group are outright provocative and we propose to repeat this study in a larger and less selected population. This will entail close cooperation with other groups of investigators, more experienced in this field. (2) We also propose to establish normal standards of abdominal echography for northeastern Brazil, in line with the recommendation by a WHO working committee, which stressed the

need for each area to determine their own parameters of normality.

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