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by

R. J. Pitchford

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R. J. Pitchford *

Control of man's environment by chemical means automatically pre-supposes, I think, that the country concerned is able to bear the costs and that the prevailing ecological conditions are reasonably favourable. These two factors largely determine whether any method of control is likely to be acceptable when the problem as a whole, and not just an isolated research project, is considered. Bilharzia control today has reached a stage where from a practical point of view it should be able to be removed from the research platform and be placed fairly and squarely in the lap of administrators. Adminstrators, however, for very good reasons, seem somewhat reluctant to accept, with the result that the research organizations carry on "controlling" bilharzia in isolated pockets without really advancing very much. Occasionally, lack of cooperation from governmental bodies force the research control schemes to pack up; usually the research controlled area is too small and natural ecological factors such as migration, negate a great deal of the work.

This state of affairs could go on indefinitely and has in fact gone on in Africa since Leiper produced his monumental work in 1915. One would think that after more than 50 years some sort of programme would have evolved whereby any country could adopt some economic basic control mechanism which would keep the disease in check. This has not materialized and it would appear that each country might have to mould its own control programme to suit its own particular requirements, bearing in mind that any one control measure alone may not produce the required results, depending of course on local circumstances.

The picture with regard to the chemical control of bilharzia by the use of molluscicides, seems to be that in certain given situations, the disease can be adequately and well managed with a recurrent annual expenditure which may or may not be crippling if expanded to include the whole of these given situations. The Rhodesians have, I think, given ample evidence that bilharzia can be well controlled by molluscicides on irrigation schemes several thousand morgen in extent with cement-lined canals taking a few hundred cubic feet of water per second with numerous drains and with communal piped water supplied for the

* Bilharzia Field Unit, C.S.I.R., Nelspruit, Eastern Transvaal.

domestic use of labour and their families ; there is very little left to do in the way of research and similar schemes could be handed over to the administrators to do likewise. The obvious objections are firstly the recurrent expenditure necessitated by the fact that there is at present no known means of preventing snails entering irrigated areas after molluscicide application. It would be foolish to apply molluscicides to the upper uninhabited reaches of moderately sized irrigation projects, where negligible transmission occurs, because of costs. But these upper reaches are a continual source of snails and together with the water source, force a policy of recurrent applications and expenditure. In Egypt, it would appear that molluscicide application to very large irrigation canals, where the amount of water is measured in thousands of cubic feet per second, is far too costly, but where because of proximity of the human population, a considerable amount of transmission probably occurs.[1] Secondly, on most similar schemes in South Africa, the people whose disease is being controlled, would be no better off during or after the control operations with regard to their general standard of living, nor with regard to any reduction of other water borne diseases. Because bilharzia is directly linked with low living standards, especially related to water, this would seem to be of some importance. It must also be admitted, that in the whole of Africa, with Egypt and Sudan as exceptions, by far the majority of bilharzia problems are not presented by large or even moderately large irrigation schemes, for the simple reason that there are so few of them.

In South Africa there are a handful compared with the small privately owned schemes using between $\frac{1}{2}$ and 25 cubic feet of water per second. These systems are generally not cement-lined and leak. Because of their small size and the periodic scarcity of water there are innumerable small earth-lined storage dams, and there is no piped water for the use of the human population who generally live just above the canals. Even most of the bigger schemes do not provide piped water for domestic use and certainly not for recreational purposes, for labourers and their families.

Much has been said about irrigation schemes per se, spreading and increasing bilharzia because of the increased snail population they bring with them. Nothing however, is said about the increased human population nor, which is more important, about the increased human population density and consequent increased urinary and faecal pollution of water. This is evident on all irrigation schemes, but more particularly the small ones, because of the smaller volume of water and the relatively greater amount of pollution.

Chemical control of small irrigation schemes has been shown to be enormously costly in

1. Bell D.R., Farooq M. et al. Ann. Trop. Med. & Parasit. Vol 61, No.4, 1967, P. 422-428.

this country because of the frequent recurrent applications necessitated by the rapid repopulation by river snails, of the small storage dams and canals which the African population is forced to use. The expenses are not derived so much from the cost of the moluscicides but from the labour and the need to clear vegetation from the small earth canals and dams before applying molluscicide.

Either a substantial rise in the living standards of the Bantu labour with regard to water supplies and utilization or improved irrigation methods or both would be required if molluscicides were not to fail both financially and practically on these small irrigation schemes.

In addition all irrigation schemes in South Africa have at least a moderately sized river flowing through them in which considerable transmission takes place but which are far too large for the effective and economical use of molluscicides. On the other hand proper water provision and utilization preferably with improved irrigation methods would largely obviate the need for molluscicides.

Apart from irrigation schemes the vast majority of Africans south of the Sahara are at some time or another exposed to bilharzia in its "natural environment" i.e. in streams, rivers, and other natural waters. Many of these people - possibly the majority, have had no experience at all of irrigation systems, yet their infection rates are often higher than those of Africans living on irrigated areas, especially with regard to Schistosoma haematobium. The reasons for this are undoubtedly numerous but two may be mentioned here: firstly children seldom swim alone and usually do so in ratherconfined natural waters thereby causing maximum urinary pollution with subsequent high cercariae density in the selected pools; secondly, the natural waters on which the human population is dependent are very often extremely limited in extent which again results in high pollution and high cercariae density.

Chemical control of vast areas of country with innumerable streams and a scattered human population is clearly a mammoth undertaking and one which has so far not produced satisfactory results in reducing bilharzia infection rates. Apart from its magnitude many streams and small rivers are blocked with vegetation from bank to bank for miles on end, and it is virtually impossible to apply the chemicals effectively either in pellet form or with helicopter or by any other means. Clearing the vegetation, apart from the cost, is not a particularly wise procedure because of the possibility of stream erosion in areas which are subjected to droughts and floods. Focal molluscicidal control of contact points, even on irrigation schemes

has not produced satisfactory results. Streams in this country partially dry up and form pools at certain times of the year making hand application to each individual pool imperative; at other times usually when molluscicides should be applied for maximum effect, the streams are in flood, making any application worthless. Often the most dangerous spots in a stream are residual side pools which again force hand application. Added to these difficulties are the inherent properties of the chemicals themselves in combination with the various physical and chemical make up of field waters such as pH, turbidity, etc. These practical difficulties all tend to make molluscicide application to natural waterways on a national scale a somewhat impractical and extremely expensive undertaking. A possible solution lies in congregating the scattered populations into villages when proper water facilities can be provided. This however, is not an undertaking to be embarked upon lighly, but where it so happens to be Government policy, full advantage should be taken of it to improve the living standards by the provision of piped water, for domestic and recreational purposes, failing which, the increased human population density and resultant increased water pollution will increase the amount of bilharzia.

It has often been said that the advantage of molluscicides is that they can be applied without the co-operation or consultation or interference of other Government bodies or even of local individuals, also that they can be applied without interfering with the general welfare, habits or customs of the local population. None of these claims are strictly true. In the first place molluscicides kill fish. This at once involves numerous organizations and private individuals especially in countries which are becoming increasingly nature conservation conscious; in the second place proper molluscicide application on a national scale involves numerous government departments and local authorities largely in clearing up the mess which they have left behind them and in creating better conditions in future so that molluscicides can be applied to maximum advantage; in the third place interference with the traditional habits of indigenous populations is seldom applicable today because of the already existing widespread interference in these habits as a result of normal development which often, in some countries, has gone so far as to provide a piped water supply for domestic purposes for congregated Bantu communities. It is not a very great step from this to provide water for recreational purposes as well and to prevent access to nearby natural waters which are potentially dangerous and so obviate to a great extent, the need for molluscicides.

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