

The Developing Problem of Schistosomiasis in Domestic Stock in Rhodesia

BY

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INTRODUCTION

Schistosoma mattheei in domestic stock, especially sheep and to a lesser extent cattle, has been studied by a number of workers at Onderstepoort, both at the time of the outbreak at Humansdorp in 1926, and subsequent to the outbreak in Zululand in 1963. A great deal of valuable detailed information has emerged from this work, especially on the pathology of the condition and on the behaviour of the parasite. However it appears that the condition is not as yet one of great economic significance in the Republic of South Africa. Outbreaks of clinical disease have been reported at very irregular intervals, and are very scattered. In Rhodesia, although the known losses due to schistosomiasis have been slight on a national basis, the outbreaks of 1967 did evoke a considerable interest in the veterinary profession and the farming public as they gave some idea of the losses that might arise under certain circumstances, as yet undefined. We in Rhodesia are therefore in a favoured position to contribute to this seminar an account of some of the circumstances in which outbreaks have occurred and to relate this to the changing pattern of agriculture in an attempt to forecast the future importance of the parasite.

HISTORY

Schistosoma mattheei was first recorded in Rhodesia in sheep and cattle in 1930¹ and from then on has been noticed periodically by anyone who cared to look for it. Although vague suspicions as to its pathogenicity may have been entertained it was not considered to be of any real significance. This attitude was reinforced by a survey carried out on the condition in slaughter cattle in 1959.² An overall incidence of infestation of 69 per cent. in 2,500 cattle at Salisbury, Fort Victoria and Bulawayo abattoirs was revealed, the incidence at Salisbury being 92 per cent. in 1,239 head, yet there was no evidence that the condition of cattle was of great economic significance. No observations on the incidence or effects of the parasite in sheep were reported until Thorburn noted, in 1966,³ incidental to a dosing trial for *Stilesia*, that

sheep showing lesions in the liver and intestine due to schistosome eggs did not gain weight at the expected rate. A survey is now in progress on the incidence of liver lesions due to schistosomiasis in sheep at the Salisbury abattoir. In 1967 the first cases of fatal schistosomiasis in sheep were diagnosed at Gwelo, and since then fatalities attributable to schistosomiasis have been reported in nine sheep flocks and two cattle herds.

DETAILS OF OUTBREAKS

Four of the outbreaks have been selected for discussion to illustrate the circumstances under which the parasite can cause severe disease in sheep and cattle.

Farm A

Sheep and cattle had been run on this tobacco farm as a sideline for a number of years. The sheep, numbering 150-200, were treated regularly for internal parasites and were kept away from a permanent river and watered from a borehole. The cattle watered at the river which was heavily infested with snails, and they were treated regularly for *Fasciola*. In November, 1966, it appears that the herd boy took the sheep to graze near the river for two weeks and in early 1967 the condition of the flock began to deteriorate, deaths commencing about the end of January. *Post-mortem* examination of a number of sheep revealed schistosomiasis as the cause of death. Deterioration of condition and mortality in the flock were so severe that the survivors were salvaged for slaughter and sheep abandoned as an enterprise. No trouble was reported in the cattle, although quite a heavy infestation was noted in some animals dying from unrelated causes the following year.

Farm B

A small dairy herd and a small flock of sheep had been run on this tobacco farm as a sideline for a number of years. In the winter of 1965 the animals were allowed to graze in an area that had been free from livestock for some years previously. Large pools on a small permanent stream formed the water supply for the livestock and these provided a very suitable habitat for snails. Regular treatment of sheep and cattle was practised for *Fasciola*. Early in 1967 the owner noted a marked deterioration in the condition of his sheep and a number died and this was attributed to a moderately heavy schistosome infestation. Only about 25 per cent of the flock was severely affected, and some of the clinically ill animals did eventually recover, both with and without treatment. At the same time the owner complained

that, in spite of apparently adequate feeding, the milk yield of his dairy herd was declining and some cows were in very poor condition. One fat cull cow from the herd was examined at slaughter and was reported as showing a very heavy schistosome infestation. The cows returned to normal after a few months.

Farm C

This is a farm on which a herd of 600 cattle constituted the main enterprise. A flock of 200 sheep was run as a sideline. Water supplies for the animals were several small dams which sometimes dried up in the winter, and a reservoir and troughs fed from a borehole. The animals watered mainly at the troughs, which were infested with snails. Between April and June, 1967, many ewes after lambing showed a rapid and severe loss of condition and mortality was heavy. Yearling sheep were also very severely affected, while barren ewes and older heifers remained in quite good condition. *Post-mortem* examination revealed a very heavy infestation of schistosomes in both fat and thin animals. The flock was salvaged for slaughter. In July the owner became concerned at the severe drop in condition of his cattle and *post-mortem* examination revealed heavy infestations of schistosomes and quite severe lesions of schistosomiasis. Forty head died between July and November. About 120 of the worst affected were treated with antibilharzial drugs which appeared to halt the fall in condition. The condition of the animals improved with the advent of the following rains.

Farm D

This is a tobacco farm with extensive vleis and small streams which had been virtually free from cattle for ten years until 1965, when 100 heifers were introduced. In 1967 at the beginning of summer a system of high intensity grazing was implemented, the farm being divided into small paddocks which were heavily grazed for two weeks and rested for two months. Most of these paddocks included an area of vlei. In January, 1968, the owner became concerned at the general falling off of condition in his cows, which was at first attributed to the grazing system. Four animals died and *post-mortem* examination revealed a heavy infestation of schistosomes. It is not certain that schistosomiasis was the only disease factor present in the herd, but the parasites were very numerous and there was damage to lung, liver and intestine attributable to them. The management system was altered to provide ample palatable grazing and supplementary feed and the cows gradually improved. Treatment of a

group of animals with an effective schistosomicidal drug had no effect on their weight improvement but did reduce the degree of anaemia in comparison with untreated controls.

SUMMARY

The circumstances leading to the outbreaks were:

Farm A — accidental exposure of highly susceptible sheep to a river heavily infested with snails at which cattle watered.

Farm B — concentration of sheep and cattle on pools infested with snails over a period of 18 months.

Farm C — concentration of sheep and cattle on water troughs infested with snails over a long period.

Farm D — intensive concentration of cattle for 4 months on vleis infested with snails.

CONCLUSIONS

What general conclusions can be drawn from these experiences regarding the likely causes of outbreaks of schistosomiasis?

1. Contact with snail infested water is obviously essential.
2. In the three outbreaks involving sheep there was simultaneous contact of sheep and cattle with snail infested water. We surmise that cattle carrying parasites were the source of infestation for the water but were generally much less severely affected by the heavy challenge that ensued.
3. In the two outbreaks resulting in mortality in cattle there was some degree of nutritional stress — poor winter grazing on Farm C, high density stocking on Farm D.
4. In three of the four outbreaks there was a direct association with a change in management — deliberate heavy concentration of livestock on small water bodies on Farms B and D, accidental exposure of sheep to infestation on Farm A. There was however no change in management on Farm C, and this is true of other outbreaks that have occurred.
5. There was no association with any recent developments in water conservation.
6. There was no association with unusual climatic factors. 1966-67 may have been a very suitable season for snail population growth due to reduced flooding of rivers, but it was not unusually so.

7. One would expect that in circumstances favourable for a build up of trematode parasites the pathogenic effects of *Fasciola* would overshadow those of *Schistosoma*. In these outbreaks this did not occur and the incidence of *Fasciola* infestation was very low. On two farms, A and B, this might be attributed to regular treatment of the animals for *Fasciola*, but on Farms C and D where no treatment was practised some other factors must have been responsible. Such factors might have been that the water bodies were more suitable for *Physopsis* than for *Lymnaea*, although this is not very likely, or that the *Fasciola* cercariae did not encyst where they would be consumed by the animals.

From consideration of the circumstances which resulted in the outbreaks described we conclude that clinical schistosomiasis in domestic animals is not a phenomenon which is to be expected only following an unusual combination of predisposing conditions which rarely occurs. We consider that outbreaks of clinical disease result when the build up of parasites is so great or so rapid that the animals are unable to attain a state of equilibrium with them. The circumstances leading to such a situation may vary considerably and are not sufficiently clearly understood to make possible any attempt at forecasting if or when an outbreak is likely to occur on any particular farm.

THE FUTURE PROBLEM

We consider that schistosomiasis is just one factor in a problem of increasing trematode infestation, but the one which may tend to become the most important. *Fasciola* can be controlled fairly effectively by anthelmintics. Paramphistomes only cause disease at one stage of their development and although they are occasionally responsible for mortality in sheep and cattle the pathogenic effects tend to be more transient than those of the schistosome. The schistosome is difficult to treat, in terms of routine mass treatment on the farm, and its effects can be devastating. Even in the bovine, which seems to be a much more tolerant host than the sheep, it can be a cause of severe loss of condition and at the very least a contributory cause to mortality in adverse conditions.

The development of the problem of trematode infestation in Rhodesia must be considered in relation to three trends which are apparent in agriculture today.

1. Increased Water Conservation

In the past ten years the number of dams in the country has increased by 82 per cent. from

3,562 in 1958 to 6,491 in 1967. The size of the dams being constructed has also increased so that, excluding Kariba, the storage capacity has risen by 243 per cent. from 194,000 million gallons to the present total of 667,000 million gallons.

Apart from the untold benefits to agriculture and the nation this has also been of untold benefit to the snails, providing them with more stable water bodies in which to wax fat and multiply.

2. Increased cattle population

The total number of cattle in the country has increased by 7.5 per cent. from 1958 (3.58 million) to 1963 (3.85 million) and by 18 per cent. from 1963 to 1968. There has been proportionately greater increase in the well-watered highveld than in the lowveld. Apart from the overall increase there is a tendency for a very great local increase on farms experimenting with the Savory system of high intensity grazing.

More cattle and more snails means more parasites — *Fasciola*, paramphistomes and schistosomes. Statistical evidence of this increase is provided by the number of adult bovine livers totally condemned on account of fascioliasis at the Salisbury abattoir, which has doubled from 18.9 per cent. in 1958 to 38.8 per cent. in 1968, this in spite of the development of more effective, safer and reasonably priced remedies.

3. Increased sheep population

The total number of sheep in the country has increased by 33.4 per cent. from 1958 (290,000) to 1963 (387,000) and by 54 per cent. from 1963 to 1968 to 596,000. Sheep appear to be particularly susceptible to infestation with the trematode parasites.

The trends revealed by these figures all favour an increase in the incidence of serious outbreaks of trematode infestation.

The problem of the trematode parasites is, happily, not an insoluble one.

The principles of control of these parasites by breaking the life cycle are well understood. All that is required is the education and the economic incentive to implement them. If our forecast is correct this incentive may become more and more obvious to the farmer as time goes on, and the problem, from its severity, may become self limiting. What it may cost the country in the interim is impossible to estimate.

REFERENCES

1. Report of the Director of Veterinary Research, Southern Rhodesia, for the year 1930.
2. CONDY, J. B. (1960). *Cent. Afr. J. Med.*, **6**, 381.
3. THORBURN, J. (1966). Personal Communication.

DISCUSSION

Dr. Browne: What drugs were used to treat affected stock?

Dr. Lawrence: Stibophen and Lucanthone. We found the former very effective, easily given by injection, and cheaper in cattle, but ineffective in sheep.

Lucanthone was moderately effective in sheep; Ambilhar ineffective at the dosage used, but this should probably have been higher.

Mr. Evans: 1967 was a year of drought and a lot of cattle were moved from Matabeleland, where the grazing had given out, to Mashonaland. Were any of these cattle present on the four farms described? If they came from a bilharzia free area they would have no resistance.

Dr. Lawrence: The cattle on all three farms had been there from the start; i.e. were probably born in the areas under consideration.

Dr. Harwin: Are Mashonaland farmers going in for sheep on a bigger scale?

Dr. Lawrence: The number of sheep increased from 290,000 in 1958 to 596,000 in 1968. The majority of the increase is on European-owned farms.

Dr. Shiff: I think that there must have been an underlying common factor on these four farms. We ought to study the ecology quite intensively to find out this factor.

Dr. Lawrence: I agree there should be a common factor. From our studies we were unable to find one. But our study was not as intensive as perhaps it might have been.

Prof. Reinecke: The outbreak studied by Kruger and McCully was at the height of a drought, and animals were forced to go to definite watering points. They even found snails shedding cercariae in troughs.

