

STRONGYLOIDIASIS IN DURBAN

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Strongyloidiasis has always been difficult to eradicate from the body and has tended to be overlooked as a cause of disease in the past. Vogel,²¹ for example, thinks infestation by strongyloides worms is relatively unimportant, and fatalities are very rare, while Gelfand¹⁰ considers strongyloides to be quite harmless. In the temperate parts of the world this infestation may also occasionally be found, but its significance may not be appreciated by the clinician; in fact strongyloidiasis may even be missed altogether on routine examination of the patient.

The purpose of this paper is to emphasize the importance of strongyloides infestations and to compare the results of certain specific therapies in these cases.

PRINCIPLES AND METHODS OF STUDY

Fülleborn⁸ noted the high oxygen requirements of the larvae of *Strongyloides stercoralis*, and Costello and Grollman³ demonstrated the marked sensitivity to cyanides of the cytochrome system in *S. papillosus*, a close relative to *S. stercoralis*. It was therefore decided to test the efficiency of potassium-thiocyanate therapy in cases of human strongyloidiasis, hoping thereby to attack the worm during its passage through the body. This drug was chosen for investigation because it was less toxic than a cyanide (being in fact a detoxification product of cyanide in the body); it readily diffuses throughout all tissue fluids and has a generalized effect on all tissues of lowering their metabolism.^{5,16}

All the cases were European and Coloured patients from Durban. They were kept under strict supervision in hospital during treatment. Apart from a thorough examination on each patient (including a battery of liver-function tests and eosinophil counts, both being repeated serially throughout the investigation) serum levels for thiocyanate were checked in every case where this drug was given.

Since the strongyloides worm starts ovipositing after about 2 weeks from the time of initial infestation,¹⁷ it was considered advisable to give all specific therapies for a minimum period of a fortnight. All dosages were given according to those recommended in the British Pharmacopoeia (dithiazanine—Partel—tablets were given in the dosage recommended by the manufacturers). Stools were repeatedly examined for larvae after completion of the specific therapy over a period of at least 1 month. A minimum of 6 stool examinations were made, direct smears and concentration methods being employed each time, and no case was considered to be cured

TABLE I. CLINICAL ANALYSIS OF CASES OF STRONGYLOIDIASIS

	Race, sex (a)	Nutrition (b)	Other disease (c)	Other helminths (d)	Therapy (e)	Comments
1.	EF	G	DM	—	nil	No follow-up
2.	EF	M+	—	—	nil	Died (mesenteric thrombosis)
3.	EF	M	—	Tri. Ent.	Hex.	Improved by diet
4.	EM	M+	Emp.	—	Hex.	Improved by diet
5.	EM	G	Pn.	—	Hex. Thi.	Pneumonia resolved No worm cure
6.	CM	M+	B'sis	Ts. Asc.	Thi.	Improved by diet
7.	CF	G	—	—	Thi.	Cured
8.	CF	M+	—	Tri. Asc.	GVo Thi.	No cure Cured
9.	CM	M+	—	Tri. Ank.	Thi. Di.	No cure Cured
10.	CM	M	—	Tri. Asc.	Thi. Di.	No cure Cured
11.	CF	M	—	Ank.	Di.	Cured
12.	CF	M+	Atel.	Tri.	Cort. Di. GVi	Died
13.	CM	G	—	Tri. SM	Di.	Cured
14.	CF	M+	—	Tri.	Di.	Cured
15.	CM	M+	—	—	Di.	Cured
16.	CM	M+	—	Tri.	Di.	Cured
17.	CF	M+	—	Tri. TS Ank.	Di	Cured
18.	CF	G	—	Tri.	nil	No cure
19.	CM	M+	Pn.	Tri. Asc.	GVo	Pneumonia resolved Improved by diet
20.	CF	G	Pn.	Tri.	GVo	Pneumonia resolved Cured
21.	CF	M+	Atel.	Tri.	GVo	Improved by diet

(a) G=Coloured. E=European. M=male. F=female.
 (b) G=nutrition good. M=malnutrition. M+=severe malnutrition.
 (c) DM=diabetes mellitus. Emp.=emphysema. Pn.=pneumonia. B'sis=bronchiectasis. Atel.=atelectasis.
 (d) Tr.=Trichuris. Ent.=Enterobius. Ank.=Ankylostoma. Asc.=Ascaris. TS=*Taenia saginata*. SM=*Schistosoma mansoni*.
 (e) Hex.=hexylresorcinol. Thi.=thiocyanate. Di.=dithiazine. GVo=oral gentian violet. GVi=intravenous gentian violet. Cort.=cortisone.

if larvae could be found during this post-treatment period. Duodenal aspirates were not examined for larvae, reliance being placed entirely on repeated stool examinations over a long period of time.

Several patients were also infested by other species of worms and had been given various forms of specific treatment (Table I).

RESULTS AND DISCUSSION

Although the majority of the cases showed multiple helminthic infestation, only the effect of therapy on strongyloides is considered in Table I. These effects are mentioned in greater detail in Tables IIA and IIB.

TABLE IIA. RESULTS OF TREATMENT FOR STRONGYLOIDIASIS (NUMBER OF CASES)

Specific therapy	Apparent cure	Failure	Total treated
Dithiazanine	8	1	9
Thiocyanate	2	4	6
Gentian violet orally ..	1	3	4
Hexylresorcinol	0	3	3

TABLE IIB. RESULTS OF POTASSIUM THIOCYANATE THERAPY

Case	Average blood level of thiocyanate, mg. %	Comments
5 EM	4.0	Unsuccessful
6 CM	10.0	Unsuccessful after 21 days
7 CF	6.0	Cured after 18 days' therapy
8 CF	4.0	Cured after 27 days' therapy
9 CM	10.0	Unsuccessful after 18 days
10 CM	8.0	Unsuccessful

In this small series of cases there were 2 deaths, one of which may be directly attributed to heavy parasitization by strongyloides worms. As a cause of death, strongyloides has been reported previously by Grové and Elsdon-Dew¹¹ from Durban; it cannot therefore be considered as a harmless parasite in the body. It is virtually impossible to assess accurately the degree of infestation among the various populations of Durban, but Elsdon-Dew^{6,7} mentions the presumptive rates among Native and Indian communities (see Table III), and suggests that the degree of parasitization is directly related to economic conditions. Galliard⁹ also thinks that fatalities from strongyloides infestation are always in patients in poor physical condition.

During the present investigation it was noted that diet alone produced a marked improvement in the patients' general condition even though the infestation had not been eliminated (Table I). Obviously this should be considered only as a general supportive measure and not as a specific form of therapy. It seems unnecessary, therefore, to assume a hyper-virulent change in the strongyloides worm as postulated by Galliard.

The advantages of dithiazanine (Partel) in the treatment of intestinal worms have been discussed by several authors,^{1,18,19,22} and have been confirmed in this present series for strongyloides—provided the drug is given in adequate dosage over a long enough period of time. The only failure in this series occurred in a very debilitated patient who died before any therapy could become effective. Partel unquestionably seems to be the drug of choice for the eradication of strongyloides worms.

TABLE III. STRONGYLOIDIASIS AMONG VARIOUS COMMUNITIES (ABSTRACTED)

Authority	Geographical area	Personnel examined	Infestation rate %	Comments
Eldson-Dew ⁶	Durban, S. Africa	Indians Africans	8.2 1.67	Hospital cases only
Eldson-Dew ⁷	Durban, S. Africa	ex housing estate	1.0	Lower income groups
Jiménez-Quiros <i>et al.</i> ¹²	Costa Rica, S. America	Students; male Students; female	1.6 0.6	Random sampling
Kuntz <i>et al.</i> ¹³	Egypt	Villagers	0.85	Random sampling
Present series	Durban, S. Africa	Europeans and Coloureds	1.0	Hospital cases only

The effects of thiocyanate therapy were disappointing, only 2 out of 6 cases being cured. Thiocyanate, which is potentially poisonous to the patient, had no effect on any other worm. The thiocyanate ion, being readily diffusible throughout the body, must have a direct effect on the migratory stages of the worms in the tissues of the host, but where this actually took place was not determined. During therapy there were no obvious symptoms referable to the lungs or to the liver; there was no marked variation in the eosinophil count; and no abnormal results of liver-function tests could be attributed to this infestation. All larvae excreted in the stools were still viable.

There have been conflicting reports about the value of specific treatments for strongyloidiasis in the literature. Deschiens and Bénex⁴ recommend a bismuth-subnitrite mixture as an alternative method of treatment for this condition. Torres²⁰ and McFadzean and Smithers¹⁴ both consider heterazan and piperazine salts valueless. Corrigan² noted a temporary remission of symptoms and death of larvae with hexylresorcinol but that gentian violet (orally or intravenously) was quite unsuccessful in clearing up pulmonary strongyloidiasis. Palmer,¹⁶ on the other hand, agrees that oral gentian violet is useless, but that this drug is a satisfactory therapeutic agent when given intravenously. With the exception of intravenous gentian violet, all these forms of treatment attempt to eradicate the infestation from the gut. Oral thiocyanate, however, may have a limited part to play in attacking the worm elsewhere in the body.

Palmer¹⁶ noted that the eosinophilia may disappear in approximately 25% cases after cure. In the present series, no reliance could be placed on eosinophil investigations because the patients were continually being re-exposed to fresh helminthic infestations once they were fully convalescent and back home; even during the course of treatment there was no change in the eosinophilic response that could be correlated with the change in the clinical condition of the patients. The only adequate criterion of cure is repeated failure to demonstrate larvae of strongyloides; all ancillary investigations are of general clinical value only.

CONCLUSIONS

Strongyloidiasis is a relatively common disease in Durban; it is frequently associated with malnutrition and with other helminthic infestations. It is a general disease, insidious in its manifestations, and carries a mortality. It should be considered as potentially serious.

Adequate well-balanced diets are capable of producing a general improvement in severe cases of infestation, but no effect is observed on any of the other helminths which may also be present, and viable strongyloides larvae continue to

be excreted in the faeces. A cure for strongyloidiasis cannot be expected from diet alone.

Dithiazanine (Partel) is an excellent therapeutic agent for strongyloidiasis; the action of this drug takes place in the gastro-intestinal tract. A partial success is claimed for thiocyanate therapy. Unlike dithiazanine, this drug has its effect in the body and not in the lumen of the gut, but the site of action of the drug was not determined. There was no effect noted on any other worm. Potassium thiocyanate is not as potent a vermicide as dithiazanine and is considerably more dangerous to use.

No reliance can be placed on eosinophil counts either as a guide during therapy or as a check for total eradication of this parasite. It is emphasized that the only satisfactory test of cure is repeated examinations for actual larvae.

SUMMARY

Strongyloidiasis is relatively common in Durban and deaths are known to occur from heavy infestation.

A small series of cases were treated by a variety of specific drugs. It was confirmed that dithiazanine (Partel) was the drug of choice, but other drugs may play a minor role in the elimination of this worm. A brief discussion is given on the value of thiocyanate therapy in this condition, and its difference from dithiazanine as regards site of action is commented on.

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