

ANCHYLOSTOMA DUODENALE: *

Is it widespread in India, Assam and Ceylon, and is it a harmless or a harmful parasite?

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I WOULD refer to the following extracts from Surgeon-Major Dobson's and Dr. McConnell's Reports:—

"Even in cases of so-called beri-beri is the presence of the anchylostoma in them convincing evidence that they alone cause the disease and in the way suggested? I think not."—Surg.-Major Dobson, *Assam—Report, 1892, p. 66.*

"I altogether doubt the existence of any specific disease to which the term anchylostomiasis can be justly applied. * * * I maintain that it has yet to be shown that the presence of these parasites gives rise to a specific disorder or disease due, *i.e.*, exclusively or even principally, to their occurrence in any quantity or numbers in the bowel, and to which therefore the term anchylostomiasis may be applied."—*Letter 263 of 29th July 1892.* Dr. McCONNELL, *Med. Inspector of Immigrants, Calcutta.*

The opinions of these two officers appear to have had more weight with the authorities than that of the very large number of medical men—official and private—in this and other countries, who hold, and have expressed, a different opinion.

It is therefore a matter of the utmost importance, from a public health point of view, that these questions, which may concern the health, and hence the labor and life of thousands, nay millions, of the inhabitants of India, Assam, Burmah, and Ceylon, should be carefully considered by the members of this Medical Congress, and if they are not prepared to endorse the opinion that it is a harmless parasite, that they should say so with no uncertain sound, and that they should record what steps should be taken to limit its spread and to mitigate its effects.

Is it possible, after the experience of the havoc caused by this parasite amongst the St. Gotthard Tunnel workers, amongst the brickmakers at Cologne, in Brazil, Japan, Cochin, Borneo, Egypt, &c., and after all that has been written on the subject by Dubini, Griesenger, Bilharsz, Weucherer, Lutz, Leichenstern, Sonsino, Hirsch and many others, to now doubt that a specific and fatal anæmia is caused by this parasite *when present in large numbers for a sufficient period of time?* Is it possible for anyone who has seen the parasite and admits that it is a *blood sucking leech*, and who has ever, at a *post-mortem* in a case dead from anæmia, seen them in hundreds fixed to the intestinal walls by their teeth so firmly that it requires some force to pull them off, and who has seen their recent bites on the intestinal walls, and the scars of what manifestly are old bites—is it, I ask, possible for any such person to argue that these are *harmless intestinal parasites?*

I propose therefore to ask this Congress to express its opinion as follows:—

(1.) The anchylostomum, or dochmius duodenale, is one of the most harmful and dangerous of human parasites.

(2.) When present in the intestines in large numbers and for a certain period (both of which may vary in inverse proportion to each other, and in proportion to the presence or absence of other parasites, diseases or states) it produces a specific and dangerous anæmia.

(3.) This anæmic state should be known in future by the name "anchylostomiasis" so as to distinguish it from true beri-beri, which is characterized by the presence of neurotic symptoms.

Gentlemen, if you agree with me that this is not a harmless but a baneful human parasite, I will now invite your attention to the evidence that exists as to its widespread distribution, and to the harm it does by its destruction of life and labor.

That it is widespread in India and Assam is amply proved by the two distinguished officers I have quoted from. Surg.-Major Dobson examined the fæces of 1,249 natives of India who came from 35 districts of 9 provinces, and he found the anchylostoma present, though only *in small numbers*, in 944, *i.e.*, in 75.58 per cent. of them: Dr. McConnell, in his most interesting article in the *Lancet* of July 1882, also demonstrated its extensive prevalence in India: Surgeon-Major Giles, Surgeon-Major Neil Campbell and almost all the Assam medical officers have shewn how widespread the parasite is on tea estates and also to a lesser extent amongst villages in Assam (*vide Assam Report, 1892, pp. 99 to 108*).

As regards Ceylon, Dr. Kynsey, the Principal Civil Medical Officer, in his Special Report of 1886 on "Anæmia or Beri-beri of Ceylon" (an unfortunate term) and in his pamphlets and Annual Reports of the years since has shown how prevalent it was, and is. Dr. Macdonald in the *Ceylon Medical Journal* has done the same in his footnotes to his translations of Lutz, Leichenstern, Eichorst, Erni, &c., with which he has favoured us, and for which we in Ceylon owe him much thanks, and the Ceylon Medical Report for 1893 shows 1,760 treated in the various hospitals (with 395 deaths) and 2,364 cases treated at the dispensaries.

These Ceylon numbers I am aware are comparatively small, but it must be remembered that there are undoubtedly provinces and districts where the parasite and its consequent anæmia are not to be found, at least extensively, and also that many medical officers still return cases of this disease as malarial cachexia, diarrhoea, debility, anæmia, dropsy, &c., according to the most prominent symptom, but without having examined the fæces for anchylostoma ova or adult parasites, and in many cases without

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reflecting or knowing that the cause of these symptoms might be referred to the presence of this parasite.

The presence of the anchylostoma is not yet sufficiently examined for, in cases where marked anæmia is present, or its existence would, I am satisfied, be much more frequently recognised as a cause of that anæmia. From September 1892 to the end of December 1893 I caused the fæces of all cases where there was marked anæmia, treated in the hospitals of the Uva Province (population 160,000) of which I then had charge, to be examined with the microscope for ova, and we found the anchylostoma in 783 cases in such numbers as, combined with the state and condition of the patients, warranted us in diagnosing and returning the cases as anchylostomiasis.

I am satisfied that the parasite is equally if not more prevalent in other provinces of the island, especially in provinces where immigrants from India are employed on tea estates.

It must not, however, be imagined that the parasite and its resulting anæmia are confined to immigrants from India. Whether the disease existed amongst the Sinhalese in past times or not, I can only say that it is now widespread amongst them in the Uva and other provinces of Ceylon, apparently mostly in the provinces where immigrants from India are employed, for instance, amongst the 783 cases alluded to above the nationalities were—

European and Burgher	...	...	Nil.
Sinhalese	...	...	231
Ceylon Tamils (Indigenous)	...	...	45
Immigrants Tamils (Estate Labourers)	...	...	470
Moors	...	...	35
Malays	...	...	1
Others	...	...	1

The age and sex distribution of these 783 cases were—

Adults	...	655	Males	...	572
Children	...	118	Females	...	211

I also examined the fæces of patients under treatment for other diseases, and found the anchylostoma in a considerable number of them.

Dr. Sandwith in his pamphlet written for the 1894 Medical Congress at Rome, and which is published and reviewed in the July Number of the *Indian Medical Gazette*, and Sonsino in his article in "Davidson's Diseases of Warm Climates" have shown how prevalent and destructive the parasite is in Egypt, a country in which it is estimated that one-quarter of the population is seriously affected by it, and where Dr. Sandwith says that it is "sapping the life of the peasant class:" he states also that 3.3 per cent. of the *adult* males of Upper Egypt and 6.2 per cent. of those of Lower Egypt, *i.e.*, 9.5 per cent., were rejected as being unfit, from *advanced anæmia*, to serve in the army, adding the remark "the recruiting officer who is an Englishman only rejects those who are obviously

too anæmic to serve with the colours, accepting many who are already the hosts of the blood-sucking worm," and he shows that in one province, Menoufieh, as many as 13.9 per cent. of the adult males were rejected for this anæmia.

From my own experience of the prevalence of the parasite amongst the women, children and *aged males* in Ceylon I feel satisfied that the percentage of rejections amongst the adult Egyptian males if *doubled* would certainly not overstate the percentage of cases amongst the entire population.

If these figures represent the numbers of *advanced* cases only, it can be imagined what the numbers must be of cases in the primary and less advanced stages, and hence how prevalent and destructive of health, life and labour the parasite is in Egypt.

Drs. Dobson and McConnell have shown that the parasite is very prevalent at least in certain districts and provinces of India. Giles and the Assam medical officers have shown that it is as prevalent amongst the tea estate coolies in Assam, and that it is not unfrequent amongst the villages of Assam in the vicinity of estates, and at page 66 of the Assam 1892 Report Dr. Dobson says: "The indigenous population of the Dhubri District seem to have the parasite equally prevalent amongst them," and the Ceylon Returns and Reports show the same prevalence amongst the estate labourers and villagers.

Even if it can be shown that it is not *at present* equally as prevalent or destructive to life and labour in India, Assam and Ceylon, as it is in Egypt, is there any reason to conclude that it will not become so, unless steps be taken to limit its spread, and is it not therefore the duty of this large and important Congress to urge on the Government the necessity for such steps being taken and to indicate what those steps should be? In this connection I wish to quote the words of the *British Medical Journal* of 7th October 1893 when reviewing Dr. Dobson's remarks as published in the Assam Reports and in the *Indian Medical Gazette* of December 1892, and January, February, March, and August 1893. It says:—

"But we submit that the anchylostoma is not the innocuous parasite Dr. Dobson's remarks tend to make it out to be: that, on the contrary, as the researches of many able men in Egypt, Europe and America have established, it is the cause when present in large numbers, and in particular circumstances, of a distinct disease, and that it is a powerful contributor to the mortality in such countries as India. * * * We think therefore * * * that he goes too far in minimising the pathological rôle of anchylostoma duodenale, and we trust that his views on this point may be received with caution and may not be allowed to interfere with the prophylactic and therapeutic measures his researches so plainly indicate."

I wish, too, to make some remarks on Dr. Dobson's figures and statements in the Assam Reports for 1891 and 1892. In that for 1891 at page 52 he says: "These results were astounding

as they prove beyond doubt how very extensively the anchylostoma is distributed over India *and with practically no bad results.*" And at page 63, "where 65.38 per cent. of the cream of the imported population is literally teeming with the parasite," and on same page he asks, "why should not the anchylostoma prove equally fatal in other parts of India?"

On these I would remark that Dr. Dobson was dealing in Assam only with those immigrants from India who had left their villages and were on their way to Assam to labour on estates. He saw therefore only those who, when they left their homes, were well enough to travel. I do not say that he infers, but it is certainly left open, at least for the uninitiated, to infer that the coolies he inspected represented the average state of health, as regards effects from this parasite, of all the inhabitants of the villages in India from which they came. I submit that this is misleading. I submit also that the more correct and reasonable conclusion is that in the villages, where these infected immigrants came from, there were many other cases affected with the parasite and, hence as they were living in an affected area, some more, probably many, were, or would soon be, infected with larger numbers of the parasite, and that they either had, or would soon reach that stage of infection when, from large numbers or from long residence in their intestines of smaller numbers, the characteristic anæmia and debility had, or would appear, and I cannot but think that had Dr. Dobson followed up his researches by proceeding to some of these districts and villages of India from which these "healthy coolies," these "cream of the population," came, he would there have found numbers in far advanced stages of anæmia and debility, and in them not 5, 10, 50, 100 or 150 anchylostoma, but hundreds or thousands, and abundant evidence of the bad results, *viz.*, such sickness and mortality as all experience shows does result from them.

In the Assam 1892 Report he says at page 66: "In true beri-beri (he is here talking of anchylostomiasis) it is often found in trifling numbers and again in absolutely healthy persons it is found in great numbers."

With regard to the first part I would remark that Dr. Dobson should have quoted actual cases and given their medical history and particulars as to the number of examinations made of their fæces, and whether his remarks were based on estimation of the numbers of the parasites present from microscopical examination of the fæces for ova, or on the finding of parasites in the fæces after only one administration of thymol. However, even supposing that his examinations were often repeated, even in a fair number of bad cases, still this would not warrant a conclusion that the condition was not due to the anchylostoma, for it is well known that the

severity of the symptoms in many cases bears no relation to the number of the parasites present *at any particular time*, and that the number of the parasites found to-day gives no indication as to what numbers were present previously. This has been adequately proved by Lutz, Leichenstern, Giles and others.

With regard to Dr. Dobson's remarks and his tables giving the results of the examinations of hundreds of healthy-looking coolies, and other persons, and the finding in them of anchylostoma, I would remark that in the vast majority of the cases he gives the numbers of the parasites present as under 50, a number altogether too small to have any deleterious effect. In many others the numbers range from 50 to 100 and in only seven do the numbers reach or exceed 100. I will, however, admit that had the numbers been estimated from the ova, or had these cases been treated with thymol more than on one day, or had the fæces been examined in the first, second and third days after the thymol, much larger numbers of the parasite would have been found. Yet I say that Dr. Dobson is not justified in inferring, or in asking the authorities to infer, as apparently he does, that because these coolies appeared healthy, notwithstanding the presence of the parasites even in large numbers (100 to 230), that therefore these parasites are harmless, for he has omitted to state or to take into consideration *the length of time during which these parasites were in the intestines of these coolies.* Surely, it is manifest that two points must be carefully determined and considered, *viz.*:—

- (1) The minimum number of parasites that will cause any symptoms after a *protracted* sojourn in the intestines.
- (2) The length of time in the intestines that is necessary for even a large number of the parasites to produce anæmia or other serious symptoms.

Lutz—*vide* page 30 of Dr. Kynsey's monograph—says: "Should the patient on exposure be slow in acquiring the disease (*i.e.*, the parasites) the number of the anchylostoma may for a considerable time be limited and their presence give rise to no symptoms whatever. * * * It may be said that adults in the absence of any complication, and in whom the disease runs a tolerably quick and uniform course, do not begin to show symptoms until the number of anchylostoma passes into the hundreds, so that when pronounced general symptoms are present 300 to 500 parasites may be set down as present in the duodenum. In severe cases I have not found over 1,000 present, but in the Gotthard Epidemic 2,000 and even 3,000 were found." Leichenstern—*vide Ceylon Medical Journal*, January 1892, pages 9 and 14—gives a case of a man, Freischmidt, who died of phthisis exactly four weeks after he was infected with anchylostoma, and in whom 253 were found *post-mortem*, yet he says "the patient who died of phthisis pulmonum never had any intestinal symptoms and no signs of any special anæmia," and Giles makes similar remarks in the *Indian Medical Gazette* of July 1892.

I submit therefore that no inference as to the harmlessness of these parasites can be drawn from Dr. Dobson's cases, nor from any cases,

even when hundreds, say even 500 or more, are proved to be present, *unless it be shown that they were present for a period of, I should say, 6 to 12 months at least.* I submit it is manifest that small numbers may be present even for long periods, and large numbers for short periods, without causing serious or any symptoms, though of course the effects produced will vary according to the state of health of the host, *i.e.*, even a small number may produce serious symptoms, even in a short time in an already debilitated host.

Dr. Dobson's figures, however, do show that the parasite is most widely distributed, and thus shows that these large numbers of persons affected with it had been, were, and would be, a source of danger to others, as they were sowing the ova of this parasite, whereby others would be infected or themselves still further infected, for no matter how few parasites are present in any one, such person's stools must contain thousands of the ova, and if they passed their stools on the surface of the ground, and no doubt Dr. Dobson's apparently healthy coolies did, they were undoubtedly spreading the parasites to others, and of course those left behind in the villages were doing the same.

PREVENTION.

Gentlemen,—If you agree that this parasite is harmful and that it is widespread, and that it is at present causing great misery and impoverishment by widespread destruction of life and labor, you will also, I think, agree that it is incumbent on you to say whether any further steps should be taken by Government to mitigate its ravages and to limit its spread.

In his opening address to the 1891 International Congress of Hygiene—*vide* page 12 of Vol. I. of the Transactions—the illustrious President H. R. H. the Prince of Wales said:

"Where is there a family in which it might not be asked, 'if preventible, why not prevented?' I would add that the questions before the Congress, in which all should take personal interest, do not relate only to the prevention of death or of serious diseases, but to the maintenance of the conditions in which the greatest working power may be sustained." At page 30 of the same volume Sir J. Fayrer says: "Preventible disease still kills yearly about 125,000, and considering the large number of cases for every death it has been calculated that 78½ millions of days of labor are lost annually, which means £7,750,000 per annum." At page 343 of the same volume Dr. Sonsino writes: "Thus in conclusion anchylostoma, filariæ and bilharzia are veritable scourges to mankind—scourges of a kind that do not destroy at once like cholera or plague, but decimate slowly and deteriorate entire populations like malaria. To these scourges particularly I wish to call your attention with a view to deriving means for their prevention."

In this article on anchylostomiasis, translated by Dr. Macdonald and published in the April 1890 number of the *Ceylon Medical Journal*, Dr. Sonsino says: "I do not exaggerate in saying that it is a social plague, only second to malaria and pellagra. Fortunately in the gravest form it is limited to certain workers. It is also

easily dealt with and may be prevented by simple means. I may also say that it would not be impossible to destroy the foci altogether: let us do what lies in our power to attain this object, and I request your valuable assistance in this direction. Do not consider me a revolutionist if I say to you that in every free country, the leaders of the State are guided by public opinion, and in this case who can interpret (influence)? public opinion better than a Society like ours."

In my Report for the year 1893, printed at at page 15 of the Ceylon Medical Administration Report, 1893, I wrote:—

The prevalence of *anchylostomiasis* is not to be judged of by the comparatively few cases (*viz.*, 660) that have been seen, and have been recognized and treated as such at the hospitals and dispensaries during the year: it is only when in the advanced stages of the consequent anæmia, dropsy, diarrhœa, or general debility that those suffering from this disease come for treatment.

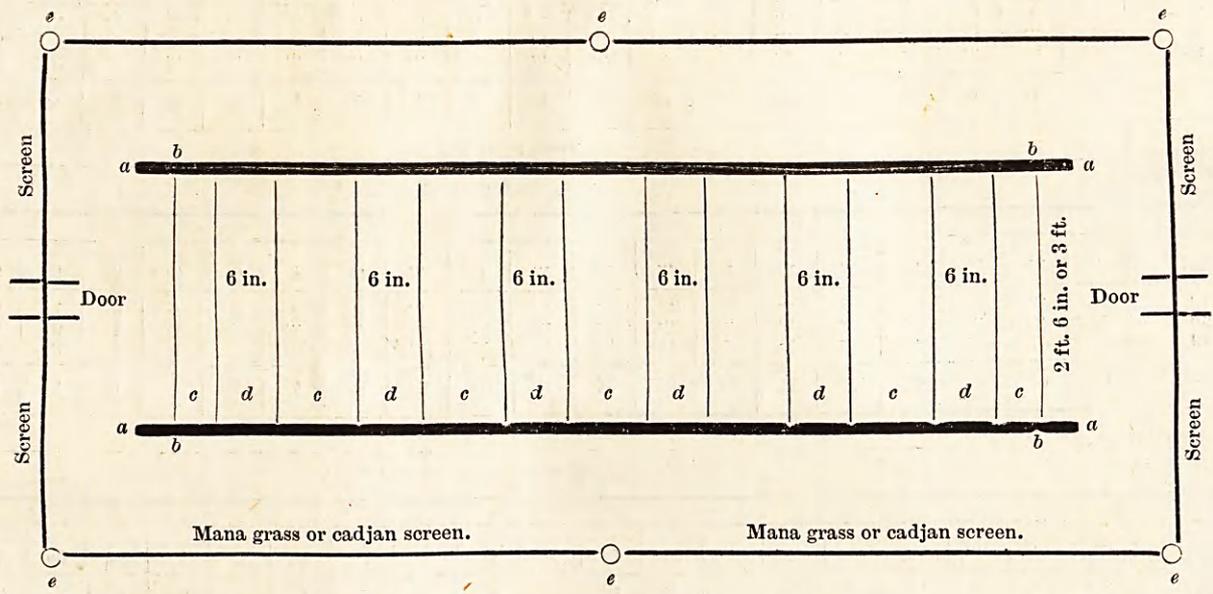
I am satisfied that this disease as regards extensive prevalence and destruction of life and labour is second only to malarial fever, and that it is in a way almost more important, as it is extensively and most prevalent in places comparatively free from malaria, *i.e.*, such places as estates and bazaars and the larger villages, where the greatest number of people are resident, *i.e.* in the higher portions of the province and the less malarious places to which people have gravitated to escape from the deadly malaria of the low-country.

It may therefore be said that malaria (in most cases combined with anchylostomiasis) is the terribly destructive and depopulating disease of the sparsely populated low-lying unhealthy divisions, and that anchylostomiasis takes its place and is almost equally prevalent and destructive in the higher portions of the province which are comparatively free from malaria.

With regard to the prevalence of and loss of life and labour caused by anchylostomiasis (*Aochlmis duodenale*), and the measures necessary and desirable to check the same, I would refer to my evidence printed at page 38 of the 1893 Cooiy Mortality Commission Reports, and at page 18 of the Principal Civil Medical Officer's 1892 Report. I think it is time that some real action was taken to check the widespread destruction of life and labour due to this preventible cause. The writing and printing of reports will not do it; this has been done; it is now time they were acted on, and the only effectual method adopted, *viz.*, the prevention of the pollution of the ground about dwellings on estates and in towns and villages by the provision and proper cleansing of sufficient and suitable latrine accommodation being rendered obligatory, and by their use being insisted on, the committing of nuisances being rendered penal and being punished.

In proposing any measures, we must remember the ignorance and prejudices of the people who are to be benefited, but we must not allow these to become a bogey to deter us, or have recourse to them as a convenient cant phrase to cover us in shirking the difficulty of tackling and dealing with this question. The sanitary and other measures which we recommend should, however, be the very minimum that science, reason and experience indicate as necessary to limit the spread, and mitigate the evils of this terrible disease—a disease in comparison with which I believe that cholera sinks into almost insignificance, for it is *always* present, not like but with the poor, so that the expense to Government and the interference with the people and their habits may also be the minimum actually necessary.

PLAN OF SIX-DIVISION PIT LATRINE.



- a a* = Old railway rails.
 - b b* = Pit 20 ft. or 25 ft. deep, with sloping sides and top edges built with brick or stone for 18 in.
 - c* = Iron foot plates bolted to rails (old Sirocco plates or old buckle plates), about 2 ft. wide—1 ft. for the two end ones.
 - d* = Latrine spaces, 6 in. wide (one for each eight or ten persons in each line).
 - e* = Jungle posts to carry thatched or cadjan roof.
- For the sake of privacy, cadjan screens should be hung at the centre of each foot-plate (*c*),

Table shewing the number of doses of *Male Fern* or *Thymol* or *both* that were given to 327 cases (including all the cases that died) because the ova were still found in the faeces after the previous dose.

NATURE OF SPECIFIC TREATMENT.	TOTAL NUMBER TREATED.																				Total treated with each Specific Drug.	Percentage of total treated.
	Number of Doses.																					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20		
Male Fern ...	55	33	16	7	3	2	5	1	...	...	...	...	...	...	1	...	1	...	...	...	124	37.92
Thymol ...	57	39	13	5	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	116	35.48
Mixed ...	...	25	19	13	14	4	5	3	...	2	...	1	...	...	1	...	...	...	...	...	87	26.60
Grand Total ...	112	97	48	25	18	7	10	4	...	2	...	1	...	...	2	...	1	...	...	...	327	.....

NATURE OF SPECIFIC TREATMENT.	TOTAL NUMBER CURED.																				Total treated with each Specific Drug.	Percentage of total treated Cured.	Percentage of total Cured.
	Number of Doses.																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20			
Male Fern ...	16	11	6	2	2	...	2	1	...	..	...	...	...	...	...	...	...	...	...	...	40	32.90	38.83
Thymol ...	11	11	6	4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	32	27.58	31.06
Mixed ...	...	9	8	4	6	1	1	...	...	1	...	1	...	...	...	...	...	...	...	...	31	35.63	30.09
Total ...	27	31	20	10	8	1	3	1	...	1	...	1	...	...	...	...	...	...	...	...	103	31.49	.....

NATURE OF SPECIFIC TREATMENT.	TOTAL NUMBER RELIEVED OR NOT IMPROVED.																				Total treated with each Specific Drug.	Percentage of total treated, relieved or not improved.	Percentage of total relieved.
	Number of Doses.																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20			
Male Fern ...	27	16	8	5	1	2	3	...	...	...	...	...	...	...	1	...	1	...	...	...	64	51.93	34.97
Thymol ...	32	25	6	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	65	56.03	35.51
Mixed ...	...	15	11	9	7	3	4	3	...	1	...	...	...	1	...	...	...	...	...	...	54	62.07	29.50
Total ...	59	56	25	15	9	5	7	3	...	1	...	...	...	1	1	...	1	...	...	...	183	55.93	.....

NATURE OF SPECIFIC TREATMENT.	TOTAL NUMBER DIED.																				Total number that died.	Percentage of total treated died.	Percentage of total died.
	Number of Doses.																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20			
Male Fern ...	12	6	2	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	20	16.13	48.78
Thymol ...	14	3	1	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	19	16.38	46.34
Mixed ...	...	1	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	2.29	4.87
Total ...	26	10	3	...	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	41	12.53	.....

Whether there be a rhabditic stage or not, whether the larvæ are introduced into the intestines directly from the soil or from water, matters little as regards the steps that should be taken to prevent the spread of this parasite. If the infection is caused chiefly from the water (which I do not think it is), then as the water is infected from the soil, the proper step is to prevent the soil being infected; similarly, if the infection is direct from the soil, either by encysted larvæ in the free stage, or by the parasite in a rhabditic stage, the only possible step is to prevent the fæces of persons infected with the parasite being scattered over the surface of the ground. This can be done only by the use of latrines.

Trench latrines I fear are not suitable either for villages or for estates. They do well enough for an army on the march, or for temporary gatherings of people, but I doubt much if they would do for a fixed and permanent population. The space required would be too large to admit of their being put and kept sufficiently near to the houses of those who would be expected to use them, nor is it reasonable to think that the trenches would be covered over daily with earth, or that the fæces, especially of children, would be passed into them alone and not on their edges or on the ground round about them. I fear, therefore, that "Trench latrines" and "enclosed spaces" are useless for villages or estates, or even worse, for if adopted they would, I fear, merely lead to a concentration in their neighbourhood of anchylostoma ova and larvæ, which would simply still more ensure that the larvæ, or rhabditides if they exist, would be carried on the feet of the frequenters, and of fowls, dogs, &c., into the houses of the inhabitants, and during rainy weather the contents of the trenches would surely be washed out on to the surrounding ground, and possibly into the water-supply.

The ordinary permanent bucket latrines are too costly in construction and in maintenance for us to expect that they could be widely adopted for villages, to say nothing of the supervision, and staff of latrine coolies they would require to ensure that they were kept clean and fit for use.

The only alternative is the pit latrine. I am aware how undesirable cesspits are, but in this case it is simply a question of "of two evils choose the least."

I have lately advised the introduction of pit latrines on tea estates in Ceylon where this disease is prevalent; in an appendix, I give a sketch of the latrine, which is simply a long, narrow, deep pit, with old railway rails, and iron footplates over the top. This plan and my remarks regarding it and the necessity for it have been printed and are being circulated by the Ceylon Government to tea estates.

Similar pit latrines should be constructed by Government in sufficient numbers at all villages and hamlets, or at least in all villages and hamlets where cases of anæmia possibly due to anchylostoma, were found.

If these latrines were constructed in sufficient numbers so that they would not involve too much trouble to the inhabitants to go to them, and if kept clean, which can easily be done as no daily emptying is required, I have no doubt they would be largely availed of. I do not expect that they would be universally used, but if only one-half, or even only one-quarter of the inhabitants use them, surely even this would be an enormous improvement and advantage, and would to that extent limit the spread, not only of this, but of other diseases, such as cholera, typhoid fever, &c.

The people should be led and induced, rather than compelled, to use them. Power should, however, be created to punish anyone found committing a nuisance within one hundred yards of his own or of any other house, and also to punish the owner or occupier of any land within one hundred yards of any house found habitually polluted with human fæces, *but such powers should seldom be used.*

It is needless for me to say that the water-supply, at its source, along its course and where delivered, should be protected from pollution, but I do think that even still greater efforts should be made to induce the natives to boil all water before drinking, as such would be beneficial, not only as regards the prevention of parasitic diseases, but also of cholera, malarial fevers, filariasis, &c.

Sonsino at page 342, Vol. I. of the 1891 Congress of Hygiene, recommends:—

"Microscopical examination of the fæces in the case of workmen before their admission into such works as tunnels and mines,—an examination which must be repeated at regular intervals in order to eliminate from these places of labour those that are found infected, and to cure them before re-admission."

Sandwith, at page 25-26 of his Pamphlet, says: "Lastly, the Government, especially with its recruits for the army, the police and public works labour, might have all peasants examined more carefully than is at present done for the early symptoms of the disease. Early cases of anæmia can be recognised by a doctor before the patient is aware that he has a definite illness, and one dose of thymol can prevent the chronic pernicious anæmia which drags a man to the hospital one, two or three years after he begins to feel ill."

All recruits for the native army and police, and all Government coolies and native employees of all kinds, all children in Government schools, all estate laborers and factory hands, should be examined carefully for anæmia, and if it existed in any marked degree all sufferers should be detained and their fæces be examined with the microscope for ova, and if found then the village or possible place of infection should be registered, and each such person should either be detained for treatment or be furnished with a ticket,

which should ensure that treatment would be carried out either *en route* or at his destination.

Inspections should be made as far as possible of the inhabitants of these villages, and if cases of anæmia were found the sufferers should be similarly examined and treated, and pit latrines should be constructed, and special steps taken to ensure that the sufferers at least did use them.

Numerous dispensaries, to be placed in charge of subordinate officers specially made familiar with this disease and the use of thymol and male fern, should be opened, even temporarily, in all villages and places *known to be centres of this disease*, and the inhabitants should be urged to have themselves treated, and it should be made a condition of continued employment with all Government native employees, and with all estate and factory hands known to be infected, that they *did* submit to the treatment.

In this connexion I would wish to add a few remarks regarding the difficulties and dangers of treatment by thymol and male fern. I annex tables giving the results in 327 cases of this disease that were treated under my immediate observation either with thymol alone, or with male fern or with both (given of course on different days).

The first thing that strikes one is that the anchylostoma may survive even many doses of these drugs. Thus it will be seen that the ova were still found in 47 cases even after 4 doses, in 29 after 5 doses, in 22 after 6 doses, in 8 after 7 doses, in 6 after 9 doses, in 5 after 10 doses, in 4 after 11 doses, in 3 after 12 doses, in 3 after 14 doses, and in 1 after even 16 doses.*

As no case was marked as *cured* until no ova were found in the fæces on careful examination on at least four different days, the recorded results may be regarded as fairly accurate as a test of the relative efficacy of the drugs: 103 of the 327 cases were discharged as *cured*, and these 103 had been treated as follows:—

With Male Fern alone	40	<i>i.e.</i> ,	32.90	cured.
" Thymol	32	"	27.58	"
" Mixed, <i>i.e.</i> with both,	31	"	35.63	"

These figures would indicate that alternate doses of the drugs would ensure the best results, and that male fern is superior to thymol; the results, however, are too close together to furnish data for preferring one drug to the other.

Thymol is a most disagreeable drug; its horrible taste and the burning, excitement, giddiness, fainting, and even vomiting which it not un-

frequently produces, render patients loath to take it, and in fact many absolutely refused to do so, and would I am sure have left the hospital rather than do so; it is besides dangerous. Leichenstern records one case of fatal collapse after it. Sandwith records two, Dobson one or two, and I must now add three fatal cases to this record, though in each case the patients were in hospital, and I know were closely watched and every precaution taken, none being far advanced cases or in which there was any reason to suspect that thymol would be exceptionally dangerous.

I would wish to add a word of caution regarding the administration of thymol in spirituous solutions, and as to the giving of brandy or other spirits shortly after its administration. One of the fatal cases was a man who had received 30 grains of thymol suspended in water at 7 A.M. He experienced no special symptoms after it, and at 9 A.M. the nurse gave him the second dose of 30 grains. As this man was supplied with arrack as an extra, and as in such cases a portion of the arrack was usually given at 9 A.M., the nurse gave it to him just after giving him the second dose of thymol. The result was that intense collapse set in almost at once, and notwithstanding all efforts the man died within 24 hours, the collapse manifestly being due to the arrack dissolving the thymol, which was thus absorbed.

(To be continued.)

MEDICO-LEGAL NOTES.

CASES OF GUNSHOT WOUNDS AND OTHER SERIOUS INJURIES AT THE BARISAL HOSPITALS.

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1. SONAMUDDEE, a Mahomedan male, aged about 25 years, and cultivator, was admitted on 24th March 1895, with two gunshot wounds on the right back and a little above the middle, each measuring about $\frac{1}{2}$ inch in diameter and having inverted edges. There was charring around the wound. The wounds proceeded obliquely upwards and outwards and terminated one in the right armpit and another one and half inch below the first. The wounds of exit had everted edges. The wounds of entrance were quarter of an inch in diameter with inverted edges, while the wounds of exit were larger and had everted edges as is usual in gunshot wounds. The presence of charring shews the gun was fired quite close.

Treatment.—The wounds were washed with perchloride of mercury solution, drainage tubes

* By *dose* I mean 60 grs. of thymol, or $1\frac{1}{2}$ drachms of male fern, half or quarter only of these being given to children or to weakly adults. The thymol was given in divided doses of 30 grs., triturated and suspended in water.—H. T.