On the endemic haematuria of the south-east coast of Africa / by the late Vasy Lyle ; with an introduction by John Harley ; communicated by John Harley.

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ON THE

ENDEMIC HÆMATURIA

OF THE

SOUTH-EAST COAST OF AFRICA.

BY THE LATE

DR. VASY LYLE.

WITH AN INTRODUCTION

BY

JOHN HARLEY, M.D. LOND.,

LECTURER ON GENERAL ANATOMY AND PHYSIOLOGY AT, AND PHYSICIAN TO, ST. THOMAS'S HOSPITAL.

COMMUNICATED BY DR. JOHN HARLEY.

Read November 14th, 1882.

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(Received March 9th—Read November 14th, 1882.)

INTRODUCTION.

IN my last communication on this subject, printed in the fifty-fourth volume of the Society's 'Transactions,' I referred to Dr. Vasy Lyle, of Durban, as an observer of the endemic hæmaturia from whom we might expect the fullest information concerning its origin and development.

Unfortunately, death has deprived science of this boon, and, what is very remarkable, Dr. Lyle died of hydatid disease of the liver. This event happened nearly three years ago at Prætoria. After practising eight years at

Durban, Dr. Lyle was induced to accompany Sir T. Shepstone to the Transvaal as one of his personal staff. He was present at the annexation of that territory, and, on the formation of a Government staff, accepted the post of Minister of Education.

Since 1864, when I first drew the attention of this Society to the parasitic origin of the hæmaturia of South Africa, Dr. Lyle had taken the most active interest in the elucidation of the disease, and up to the time of his death was making observations and collecting information from every available source respecting its origin and spread. During the whole of this time I have been in frequent communication with Dr. Lyle, and I know that it was his intention to offer the results of his observations and inquiries to this Society. It is some little satisfaction to me that in his absence I am instrumental in doing this. For the means, I am indebted to Dr. Lyle's brother, Dr. Robert Vasy Ash, of the Army Medical Department.

In placing Dr. Lyle's MS. in my hands, Dr. Ash writes to me as follows:—"Among my late brother's letters I found many of yours, and his own notes on the *Bilharzia hæmaturia;* they were evidently intended for you. I am sorry to say that all his microscopical drawings from life are lost." On looking through the MS. I find the information so carefully and systematically arranged that I have not thought it necessary to make any alteration, and I have no doubt that the form in which the Society will receive the communication is exactly that in which Dr. Lyle intended to offer it to us, and I feel sure that the Society, while it appreciates the labours of which the present communication is the fruit, will share in the deep regret which I feel that so able an observer as Dr. Lyle has not been permitted to complete an inquiry for which his extensive knowledge of the diseases of South Africa and his scientific acquirements so eminently qualified him.

Bilharzia hæmatobium. Physical Characters of Infested Country. Extent of Country Infested.

Hæmaturia associated with the presence in the urine of the ova of *B. hæmatobium* has been ascertained by Bilharz and by Griesinger to prevail among the people inhabiting the valley of the Lower Nile, and Dr. John Harley has shown that in the Cape Colony a similar or very kindred helminthiasis exists; my experience proves its existence among the peoples inhabiting Natal and the neighbouring Zulu country to the north. Southward in the Amaponda country I have been unable to determine its existence; the only case coming under my observation being that of a native Kaffir catechist who had contracted the disease in Natal on the Umhloti River. From him and from the European missionary under whom he worked, I have since learned that the disease is unknown among the Amaponda Kaffirs; the district, however, to which their inquiries had been limited is not on the coast but in the uplands.

I have not yet ascertained if this peculiar helminthiasis prevails in the coast country between the latitudes of St. Lucia Bay south, and Egypt north, of the equator; I trust before long to be in a position to supply information on this point, but I suspect it will yet be proved that the *Bilharzia*, whether of one or more species, infests the whole eastern littoral of Africa, from the Nile delta to the Cape of Good Hope.

Of the West Coast of Africa I know nothing personally, but inquiries I have made of those who have for many years together lived in the tropical parts, go to prove that the disease is there altogether unknown.

Inland I have ascertained that hæmaturia prevails midway between Maritzburg and Durban in the neighbourhood of a stream called "Sterk spruit,"[1] and in the town of Maritzburg, situated on the second terrace rising above

[1] See Dr. Harley's second communication, 'Med.-Chir. Trans.,' vol. lii, p. 385.

the sea line and about fifty miles from the coast. Beyond this point I am as yet unable to ascertain the existence of endemic hæmaturia, although I have made inquiry; and particularly as regards the elevated plains beyond the Kahlamba Mountains, the Orange River, and the Transvaal Republics.

In the colony of Natal the *B. hæmatobium* is too common, but the country principally infested is on the coast where the rivers for the most part are sluggish and their courses obstructed with vegetation; in this district, however, a certain degree of immunity is observed in people living on the banks of streams flowing rapidly over a rocky bottom.

Since writing the above I have continued to pursue my investigations on this subject, and with some success, inasmuch as I am now able to assert—not as a mere idea, but as a fact all but completely proved—that the *B. hæmatobium* infests the whole eastern littoral of Africa from Egypt to the Cape, and that the entozoon found amongst the people of the Nile Valley is identical with that found in South Africa.

That the entozoon exists in the neighbourhood of St. Lucia Bay I have ascertained from a case coming under my own observation; my first inquiry was consequently directed to ascertain if in the vicinity of Delagoa Bay cases of this peculiar hæmaturia are common; unfortunately my inquiry had to be addressed to a layman, Señor de Paiva Raposa, the Government secretary there. This gentleman replied to my letter with promptitude, but his evidence is entirely negative, for he says (under date 13th February, 1873), "I beg to tell you that the worm which affects people on the districts of Eastern Africa is not known in the country around Delagoa Bay." Indirectly I have learnt that this information is incorrect, that the district around Delagoa Bay is infested, but I give the statement of Señor de Paiva Raposa as I received it.

My next inquiry was addressed to a practitioner long resident at Mozambique; from him I have as yet received no reply.

With Dr. Kirk of Zanzibar I have been more fortunate and from him I have obtained valuable information. By letter dated 7th October, 1872, he writes: "Regarding your inquiries, I can state that between the years 1858-63, I travelled up and down the Coast between this and the Zambesi mouths, and lived for years in the interior, passing all the Zambesi to above the Victoria falls and on the Shire to Lake Nyassa. I then frequently saw the disease which I now know to be caused by the *B. hæmatobium*. Its symptoms were to me new and I classed it as an endemic form of hæmaturia, different from any then described. . . . . I knew nothing of the pathology of this peculiar disease until, in London, Sir T. Watson called my attention to Dr. Harley's paper in the 'Medico-Chirurgical Transactions.'[1] I then at once recognised the disease I had seen so much of.

"It was peculiarly common on the lower part of the Zambesi at Shorganga and Senna, where the natives name it '*Tanda moropa*' or 'the passing of blood.' To them this term signifies a specific disease.

"I treated several cases and found gallic acid gave relief from the symptoms but saw no cure, although, at the same time, I saw no case fatal. The disease exists though less common in south latitude 18°. I have been now upwards of six years stationed at Zanzibar, but am now engaged as the British agent. My opportunities of observation are therefore very limited, but I have no doubt from what natives tell me that the disease exists on the mainland. It seems to me to follow rivers and low marshy lands and to be absent from mountains, but it must be kept in mind that a traveller has few opportunities of getting information on such matters. I should not have known the disease existed on the lower Zambezi, had not the servants who followed me been from that part."

[1] Vol. xlvii, 1864.

Dr. Kirk's letter proves the existence of the disease on the mainland of eastern Africa, at a point which may be said to be midway between Egypt and the Cape, but indirectly I have ascertained that it also prevails in the country around Inhamban. I have no doubt more accurate observations than those as yet available will prove its existence wherever, on the Eastern littoral of Africa, shallow, sluggish-flowing streams traverse an inhabited country.

Up to the present time my observations go to prove that the interior plateau of South Africa is free from this particular form of helminthiasis. I am informed by Mr. Wilson, who was a companion of Livingstone in his earlier travels, and who has resided twenty-two years in the interior, about Lake Ngami in Damaraland, Namaqualand, and north-west of Lake Ngami on the Teoghe river where there is much swamp and the water-courses are impeded with vegetation, and also in the upper part of the Zambesi above the Victoria falls, that he never heard of the disease. Five years also he passed in the district of Walwich Bay, and there the disease was unknown. My informant added: "Livingstone is still remembered by the people of the districts he travelled through, but always by a name meaning 'the doctor.' As I was with him during these journeyings I am looked upon as in some sort a doctor to, and am continually applied to for medicines. I speak the languages of the natives, and am certain if the disease you describe prevailed it would have come under my notice." Another traveller (Mr. Higgs), who had also passed many years in the interior, entirely corroborates Mr. Wilson's statements.

In support of the opinions already advanced respecting the prevalence of the disease in Natal, I quote from a letter received from the Rev. John Allsopp, a missionary, resident here for many years, a competent observer, and cautious in drawing conclusions. He says: "I find it (hæmaturia) almost everywhere along the coast, and have heard of some cases as high up in the colony as Mooi river. It is more common with boys than girls; I account for it

thus: the boys (speaking of the 'natives') are out all day herding cattle, they get together in threes and fours, play in and about the smaller streams, and of course drink a good deal of the water; the girls bathe but seldom, and when they do it is generally in the larger rivers." In respect to Europeans: "I have not met with a single case in youths confined to town life and accustomed to drink rain-water. I am persuaded that the water of small streams running through vegetation and over stones of varied kinds is more calculated to produce the disease than the water of rapidly flowing and sandy-bedded rivers."

Mr. G. J. Cato, of Cato Manor, whose acquaintance with the natives of Natal, their language, and their habits, makes him a good observer, writes: "I am of your opinion that both sexes are subject to the disease, and certainly those are most so who use water from marshes, pools, rivers with shaly beds having marshy banks or sources; on the contrary, the inhabitants of the valleys of sandy-bedded rivers with the same surroundings seem free.

Mr. Cato criticising a remark of Dr. Dunsterville, of Port Elizabeth (quoted in Dr. John Harley's second communication, 'Med.-Chir. Trans.,' vol. lii, p. 380), to the effect that "they have not nearly so much of the disease as formerly," further remarks: "I account for this as follows:—Port Elizabeth, or rather the town, is situated at the base of a hill, and formerly water was very scarce there, for wells had to be dug wherever a damp place could be found, and I have known water from such pits—'good water' it was called—retailed at prices varying from a farthing to a halfpenny the bucket, or at a fixed sum the month; but now nearly everyone, at least all who can afford it, drink rain water, which is collected and stored in tanks."

I trust you will pardon me for being thus particular—verbose I may say—in laying this evidence before you, for I wish you to form your own conclusions, not simply to adopt mine. Beyond this, it appears to me, that it is only after rightly appreciating the causes of a disease and

its peculiarities of occurrence that we can recommend a sensible prophylaxis.

Description of the Entozoon.

The description of the *Bilharzia hæmatobium* given by Cobbold ('Entozoa,' p. 197) appears to me correct, and agrees, in all but minor details, with the results of my investigations.

The following are the facts observed by me:

November 21st, 1872, I obtained the bladder of a patient who had suffered from the endemic hæmaturia, from the Durban Hospital.

The internal surface of the viscus was healthy near the neck, but was crossed diagonally by fungous-looking growths from near the cervix to the fundus. One protuberance was pedunculated and as large as a hazel-nut. The abnormal mucous membrane presented superficial ulcerations, and there were many ova, some granular and some fully developed, embedded in the adherent mucus.

A black line was observed and dissected out. It proved to be a *female* Bilharzia. It was one inch long and filiform. Ova were contained in the hinder part of the body, and these were granular; the pointed end was not always in one direction, but generally opposite the outlet; they were arranged mostly in single file. The intestine divides into four gradually diminishing canals, which soon reunite to form a broad central sacculated tube, which extends down to the middle of the body, and terminates in a *cul-de-sac*. The characteristic spine of the egg was always terminal.

I obtained the posterior fragment of a *male* specimen, December 5th, 1872. The body was roughly tuberculated and tapered to a conical tail, reminding one of the crocodile. The alimentary canal presented anastomoses, and the gynæcophoric canal was continued to the tail.

I have elsewhere mentioned that I have not yet met

with a case where death could be directly attributed to the presence of *B. hæmatobium* in the human system. This appeared to me singular so long as I accepted as correct the statements of Cobbold, Bilharz, Griesinger, and others, that the habitat of the worm is in the "portal system of blood-vessels," "in the veins of the mesentery, bladder, and other parts;" for, I could never understand why the worm or its products should not be occasionally carried along the blood current, and eventually by obstructing some of the smaller vessels give rise to serious if not fatal results. Nor will I deny the possibility of the occurrence of such accidents; I can only assert that none such have as yet fallen under my observation. But since I have ascertained that the worm resides in the cellular tissue surrounding the bladder, and principally in that between the bladder and rectum, I can understand why the *Bilharzia* is usually so harmless to life. In time and after increase it may migrate and invade the ureters, the kidneys, and the blood-vessels, but as yet my dissections have not verified this opinion.

Symptoms and Progress of the Disease, with Illustrative Cases.

There do not appear to be any symptoms marking the introduction of the *Bilharzia hæmatobium* into the human body; at least up to the present time nothing of the kind has been recognised. The earliest indication that the individual is the host of this entozoon occurs when the worm is sufficiently mature to shed fertilised ova, and at this time the patient begins to pass urine the last few drops of which are mixed with blood. An examination of this bloody urine with the microscope has, even in the earliest stages of the disease coming under my observation, revealed the presence of many fertilised ova of the *B. hæmatobium*. The detection of these ova is most important, giving certainty to the diagnosis; hæmaturia may arise from many causes, but

its association with the eggs of this entozoon removes all question as to cause in any given case. There are characters about the hæmaturia itself sufficient to call the attention of an experienced observer to the real nature of the case; it presents this peculiarity—only the last few drops of urine are mixed with blood; the bulk of the urine voided is perfectly free from all unnatural colour. The explanation of this peculiarity rests with the fact that the last part of the urine is expelled mainly by the action of the muscular coat of the bladder; any minute ulcerations or tunnels made by the worms are thus subjected to a disturbing influence and rendered liable to bleed.

In this, the earlier stage of the disease, there is singularly little general distress. Some patients complain of lumbar or of perineal pain, described as a dull aching sensation, occurring only occasionally and, according to my observation, noticeable in but few cases.

The quantity of blood lost in the earlier stages is small, amounting only to a few drops at each act of micturition; in some cases this may never materially increase, it may lessen, become irregular in occurrence, and eventually disappear so entirely that blood is not to be detected in the urine with the unaided eye; the patient then flatters himself he has got rid of the parasite; he is, however, mistaken, for long after the subsidence of all visible bleeding the eggs of the entozoon may be detected in the urine, and remote consequences arise. Dr. John Harley was the first to call attention to this important fact in his paper read before the Royal Medical and Chirurgical Society,[1] and I am able to corroborate his statement; as an example I call attention to the following case.

Case 1.—April 4th, 1872.—H. F—, æt. 20, planter's son living in the valley of the lower Umhloti, Co. Victoria.

Within the last three months he has had three attacks of lumbar pain, affecting principally the left side, but occa-

[1] First communication, vol. xlvii, p. 65—7.

sionally the right; the pain strikes toward the genitals and is accompanied with faintness and nausea. He says he does not pass blood in his urine, but years ago used to do so with the last few drops; at this time he was eight years old. This symptom soon disappeared and has never returned.

Examination of urine.—Urine amber coloured, clear, but with minute floating flakes (of mucus). Sp. gr. 1023. Rendered turbid by heat, but the deposit dissolves with effervescence on the addition of hydrochloric acid.

One of the flakes of mucus was examined by microscope and observed to contain many ova of *B. hæmatobium*, some mature others immature, containing sarcode granules. The ova were elongate-ovate with the characteristic pointed end; there were also noticed epithelial cells from the bladder full of oil globules, many blood discs and mucous cells.

Subsequently (September 21st, 1872) I had an opportunity of examining this patient during one of his nephritic attacks; the symptoms were such as already described, but very severe, the prostration was extreme. The symptoms yielded rapidly to anodynes and warm baths.

It is not always that so little disturbance as that described follows the introduction of the entozoon; occasionally amongst all classes, and I may say, very frequently, among the weakly Indian immigrants, the bleeding goes on increasing until the quantity of blood lost at each act of micturition is considerable, and voided not only mixed with the urine but in clots. As may be expected, in such cases there is anæmia and debility, and at times much difficulty in passing urine from the mechanical obstruction offered by the clots. Now, the perineal distress and the lumbar pain become marked and a true vesical catarrh occasionally sets in, a complication not easily cured, as its cause is to a great extent beyond the reach of our remedies. Grave as is this picture I must, however, state that I have not yet met with a fatal case of *B. hæmatobium*, whether arising directly or indirectly from the presence

of the entozoon. This latter statement I must, however, qualify, for I do not yet know to what extent the parasite may be a factor in the production of suppurative inflammation of the liver, the worm or its ova passing by the portal circulation to the liver, and thus affording a point of origin for inflammatory action.

Dr. Cobbold ('Entozoa,' p. 35) obtained a male specimen of the *B. hæmatobium* from the portal vein of an African monkey, *Cercopithecus fuliginosus*, which died at the Zoological Society's menagerie. I have myself observed great enlargement of both liver and spleen to occur in patients harbouring the *B. hæmatobium*.

Apart from what has now been mentioned, it seems to me probable that in the future very serious results will be traced to the presence of the *B. hæmatobium* in the human system, and the accidental entrance of itself or its products into the circulation.

Incidentally I have already mentioned the occurrence of nephritic colic in patients who have for a long time been the victims of the *Bilharzia*. These attacks are of such common occurrence in old-standing cases that I have come to look upon them as marking a third stage: a consequence, if not invariable, at least very frequent. The attacks seem to me to be sometimes caused by the passing of a clot of blood, more often by renal calculus, sometimes phosphatic, but more frequently oxalate of lime. The occurrence of crystals of oxalate of lime in urine is, it seems to me, more common in Natal than in Europe. I am therefore disposed to think the more frequent occurrence of this particular form of calculus associated with a history of a particular helminthiasis is accidental, and not immediately depending on the presence of the entozoon; certainly, reasoning from pathological conditions, it is the phosphatic not the oxalic calculus one would expect to find as a consequence of the parasitism under discussion.

As is shown in another part of this paper, the parts of the human body most liable to the invasion of the parasite

are the bladder and the structures connected with it; the earlier symptoms of the helminthiasis are consequently referable to this viscus. As the disease progresses these symptoms increase in degree, and complications arising out of continued local irritation may occur; lastly, and as a remote consequence, renal irritation may set in, and as a result calculi are formed.

How it is that the kidneys are eventually involved in the spread of this disease I cannot as yet tell; it may be that irritation spreads to the pelvis of the kidney by continuity, or it may be that the entozoon actually travels there along the ureter or burrows its way along the surrounding cellular tissue. This with many other questions respecting the propagation and habits of the *Bilharzia* and its remoter effects on the human system remain for future investigation.

Case 2.—1870, June 18th. Maquaka, a lively, well-nourished Kaffir girl, æt. 7, came under observation in consequence of a large wart affecting the left of the labia majora. During examination I ascertained that in voiding urine the last few drops were invariably tinged with blood; this symptom had been noticed for one month, no other deviations from health observed. She drinks water drawn from a pit in the soil, not in the rock, and is accustomed to bathe in the Umsindusi, an affluent of the Umhloti river.

Examined under the microscope the urine was observed to contain blood and many ova of the *B. hæmatobium*. Santonine was prescribed in doses of one grain and a half every morning.

September 6th.—She again presented herself; the drug had been irregularly taken, and some benefit appeared to have resulted, as the bleeding was reported to be less.

28th.—I was informed by letter there was a marked improvement, the child only occasionally passing blood. (No later information.)

1870, June 18th.—The Kaffir girl whose case is shortly

related above was accompanied by her father, a powerful-looking fellow, apparently thirty years of age, and by a relative who, having visited England, speaks our language well, and on this occasion acted as my interpreter. The father said, "I know that men, girls, and boys suffer from the disease we are talking about in the district where I live; women may suffer from it also, but of course I do not know. I have suffered from it since my boyhood; I still do so, and am always worse if I walk a long journey. Our people have medicines which they give for this complaint, but I have never heard that anybody was made better by taking them. When first I observed I passed blood with my urine I was living on the Umfolosi (a river flowing into St. Lucia Bay). The people of my village used to draw water from the Umfolosi, and I used to bathe in it. I am aware that a great many people in Zulu, as well as in Natal, suffer from this disease. I know too that calves suffer from a similar disease, never oxen or cows. I never saw dogs suffer from anything like it."

Tye, my interpreter (a Kaffir), says:—"I too have had the disease; I first noticed it when I was about fourteen years of age, and whilst I was living near the Tongaati river. The water we used was drawn from a hole in the ground. We bathed in the Tongaati. The disease lasted about three years, and then went away after living a time at Durban, where I always drank rain water. Many people at the Tongaati suffer as I did; for my part I have now been quite well eight years. I have seen calves suffer from a similar disease."

Causes of Bilharzia hæmatobium.

The manner in which the entozoon is introduced into the body of the host has not yet been demonstrated, everything I have read on the subject is conjectural, and I regret to say in the following remarks I can offer nothing different.

My attempts to rear the larvæ of *Bilharzia* have hitherto been unsuccessful: a result similar to that attained in the more experienced hands of Dr. Cobbold and Dr. John Harley.

I have never had any difficulty in obtaining the well-developed ciliated animalcule, and have observed the various shapes it assumes under different circumstances, but know of nothing which points the way to a recognition of the next form in the metamorphosis.

According to Cobbold ('Entozoa,' p. 199) it appears Griesinger conjectures "that the young of *Bilharzia* exist in the waters of the Nile, in the fishes which therein abound, or even in bread, grain, or fruit." That they do exist in the waters of infested countries I have no doubt, but from the facts I am about to relate I have equally no doubt they are not in Natal introduced into the human system in the manner supposed; bread, grain, and fruit are consumed equally by the population of town and country, whether European, Kaffir, or Indian, yet the population of the town of Durban remains as yet free from the pest. The Kaffirs scrupulously avoid eating fish and yet they are affected. It appears to me one must seek for a more universally employed agent of introduction, and that is afforded in the water used for domestic purposes. In the town of Durban rain-water is used, or water drawn from wells; elsewhere in the colony, with very few exceptions, the nearest river or pond supplies all that is needed.

The above remarks will apply with greater force, as will be illustrated further on, to Cobbold's own suggestion that "certain gasteropod mollusks" are the intermediate bearers and vehicles for introduction.

I confess my own observations lead to nothing definite, they, however, seem to point out the direction our precautions should take to avoid contracting the helminthiasis whilst residing in or travelling through an infested district.

In his papers read before the Royal Medical and Chirurgical Society, Dr. John Harley recognises the possibility

of the disease being contracted by drinking or bathing in the impure waters of infested districts, and my observations go to support this conclusion; but in the last of his published papers which I have seen he goes further, and his attention having been drawn to the existence in Natal of a peculiar ulcerous affection of the skin, locally known as "Natal sores," he suggests that this may be a local phenomenon arising from the reception of the *Bilharzia* in one stage of its growth, and may mark the first stage of its introduction into the system.

My acquaintance with the so-called Natal sores has been extensive, and I soon ascertained that the term is used by the laity to mean any ulcerous affection whatever of the skin. But there is a disease prevailing in the colony, from which immigrants so frequently suffer, to which the term "Natal sores" has been generally attached. This disease seems to me a form of ecthyma, of a chronic nature and for the most part occurring in people just landed, or others who, though not recently arrived, have undergone privations, whether incident to position or to travelling. "A local expression of general debility," is a formula of words suited, in my opinion, to convey the physical condition of the sufferer, a general debility induced by privations on shipboard, or after landing, or in travelling, or by intemperance, or it may be through local debility from overaction of the skin in an almost tropical country; but, as far as I can find, it is in no way connected with the hæmaturia endemic to South Africa. It is notorious that immigrants recently arrived are more frequent sufferers than old residents; so much so is this the case that it is here looked upon as in some measure an acclimatizing process, erroneously so I think. These being the facts relating to this affection, it can hardly be concluded that the occurrence of Natal sores and of hæmaturia from the presence of *B. hæmatobium* have any connection; indeed, I have been unable in any one instance to connect the two diseases, although my inquiries have been specially directed to this point since I first read Dr.

Harley's paper. In corroboration of these statements, I should mention that Natal sores are common among the different peoples inhabiting this colony, and equally among the populations, urban and rural, whilst hæmaturia, as is elsewhere shown, is not.

During the many years I have been engaged in practice in Natal, and notwithstanding diligent inquiry, I have been unable to meet with a case of hæmaturia arising from the presence of *B. hæmatobium* in a person who has principally resided in the town of Durban. One case has come under my observation occurring in a man living in the inland town of Maritzburg, where this peculiar form of hæmaturia is said to be prevalent. In the case now mentioned the first signs of the disease were noticed at ten years of age, up to which time my patient had never left the vicinity of the camp and town.

The disease is, however, by no means rare among people residing in the rural districts of the infected country, and as far as my observations go, those are most frequently affected who from occupation or carelessness are most likely to use impure water. Thus adult European women, and particularly those of the better classes, are but little affected. I have not yet met with a case occurring in a *lady* of European birth who had attained puberty before coming to this country.

Men of European birth are affected, but they are those who are hunters or travellers, or overseers of labour—the latter accustomed to be for the whole day in the field with their men—and all from the force of circumstances likely at times to have to use impure water, both for drinking and for bathing.

Once a series of cases came to my notice corroborative of the foregoing statements. I was consulted by a gentleman living in the neighbourhood of this town, in a district where rainwater is used for all house purposes, and requested to ascertain the cause of the hæmaturia with which two of his boys were afflicted. Having satisfied myself that in both cases the bloody urine was asso-

ciated with the presence of many of the eggs of the *B. hæmatobium* I paid a visit to the house to inquire into the circumstances of the origin of the *hæmaturia;* on inquiry I was told that nothing but rainwater was used for cooking, washing, or drinking. I remarked that the circumstances of the origin of the parasiticism upset all my previous conclusions, stating at once what they had been. The mother of the boys then told me that she had first noticed the hæmaturia a short time after she had permitted them to go with the children of S— to bathe in a rivulet flowing through a swampy valley at the foot of the hill. Not long afterwards I was consulted about the cases of the other boy bathers, and ascertained that they too suffered from hæmaturia and passed with the blood the eggs of the *B. hæmatobium.*

Kaffirs of both sexes are affected, and they recognise the characters of the districts where the disease is engendered, and are influenced thereby in choosing the site of a settlement; nor, curious as it may seem, are they altogether ignorant of the immediate cause of the bleeding. Their habits are such—on the supposition that the parasite is introduced into the human body through an intermediate bearer—as should protect them, for they scrupulously avoid eating fish or "gasteropod mollusks" or frogs, nay, a pure-blooded Zulu will eat nothing which in his way he cannot understand; he will rather starve. He will not eat what he considers grotesque, whether animal or vegetable; and so it is that in the whole colony of Natal there is only one fish-eating class, despised too for it by the others; it inhabits a sea-bordered corner into which it was driven during the wars which prevailed before European rule was established. But all these Kaffirs drink where they can when they are thirsty, and bathe too if a hot skin prompts.

The manner in which a Kaffir drinks from a stream is peculiar; he flings the water with his hand to his mouth, and tells you, if you ask the reason, it is to avoid introducing small floating things.

Natives of India—immigrants to this country—are affected by the parasite, and it appears to me, more frequently than either Europeans or Kaffirs; their methods of cooking protect them from the too common *tænia* of South Africa, but they seem to me to suffer from the *B. hæmatobium* more generally and more severely than any race inhabiting Natal, neither age nor sex appearing to afford protection. But if there is any truth in my observations respecting the localities in which the entozoon most prevails, Indian immigrants more than any other class in Natal should be subject to its ravages, for they are employed for the most part on sugar and on coffee estates. These are situated in the littoral and infested districts, where the streams are frequently sluggish, flowing through swampy valleys, and hold much organic matter in suspension. To afford facilities for bathing and for procuring water for cooking purposes and for drinking, the cottages—hovels I ought to call them—of the labourers are placed as near as convenient to a watercourse or, it may be, to a marshy pool; the available water, previously impure from locality and causes which for convenience may be called natural, is frequently rendered still more impure by the intermixture of drainage from the sugar manufacture or coffee works. I confess the suspicion that this constantly increasing impurity of the water has an influence in increasing the frequency of diseases associated with *B. hæmatobium* has arisen in my mind. I am intimately acquainted with one locality where the aspect of the river valleys on the estate is such as I am accustomed to find where the disease prevails. I resided there for many years, bathed in the waters of the streamlets, and with my family and servants drank of them; we had no other water—and yet during the eight years I lived there I found but very few instances of the disease, and its origin was for the most part to be traced to other localities. No instance of the disease has occurred in my own family. Subsequently a large sugar mill and a distillery were established on the estate, the drainage from which necessarily flowed into the

river above the point where the coolie village was established. In time this estate became as notorious as others for the occurrence of *B. hæmatobium* among its people, and is now one of the worst infested.

I have already mentioned the reputed difference between the towns of Maritzburg and Durban as regards the chances of infection; this difference is I believe real, and its explanation may be found in the fact that at Maritzburg water has been brought into the town and flows through open channels on each side of the principal streets, whilst at Durban, no such facilities for water supply occurring, the inhabitants use rainwater collected from the roofs of their houses and stored in tanks.

When the question of water supply for towns in South-eastern Africa after the European fashion comes to be discussed, an important element in the inquiry will be, Can river water be used with safety?