A case of filaria sanguinis hominis nocturna / by Charles Williams.

A Case of

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Filaria Sanguinis Hominis Nocturna.

BY

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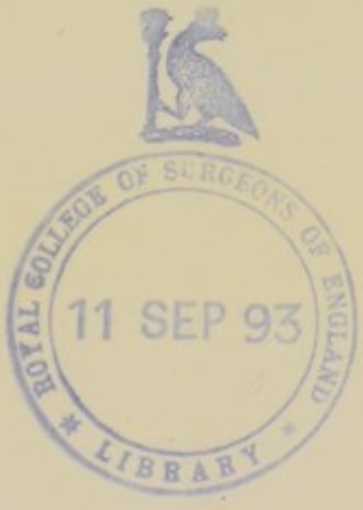

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1893.

A CASE OF

Filaria Sanguinis Hominis Nocturna.*

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THE drop of blood, placed for your inspection on a glass slide under the microscope, was taken from the arm of a gentleman suffering from chyluria. It contains some minute nematode worms, which, on examination, soon after removal, were seen to be alive and moving very actively among the blood corpuscles.

These microscopical worms were found in the blood of man by Dr. T. R. Lewis, in 1872, and named by him *Filaria sanguinis hominis*. They are the embryos of a much larger worm discovered by Dr. Joseph Bancroft, of Brisbane, Australia, in 1876, and named after him *Filaria Bancrofti*.

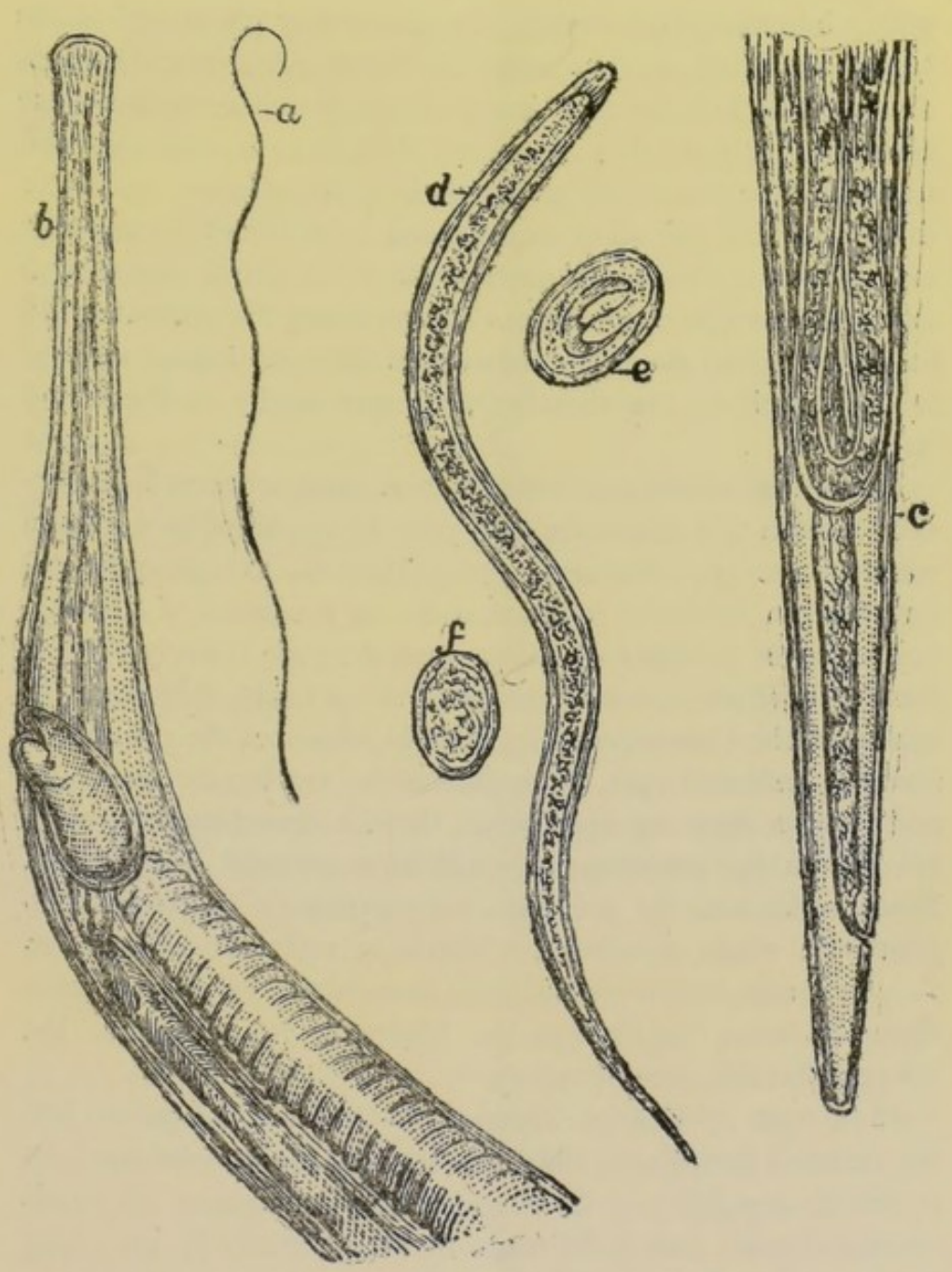
The embryo filariæ are long, slender, gracefully shaped worms, of uniform thickness, with a rounded cephalic extremity, and a pointed caudal extremity, the average breadth being $\frac{1}{3153}$ of an inch by $\frac{1}{75}$ in length. They appear to be of homogeneous and semi-transparent structure, and contain a collection of very fine granular matter lying along the centre of the body.

* Read at a meeting of the Norwich Medico-Chirurgical Society, May 2nd, 1893.

When a drop of blood is quickly transferred to the microscope, the embryos are observed to make vigorous movements: These consist of repeated coilings and twistings, the caudal extremity being most actively engaged, and with a lashing kind of movement. They are enclosed in a delicate sheath, which is scarcely visible when the embryos are recently removed from the body, but as the movements get less vigorous it becomes more apparent, the worm withdraws either its head or its tail from the extremity of the sheath, leaving this empty and flaccid. This subject will be referred to again. These worms usually remain alive and move about on the slide from one to three days.

This Hæmatozoon is the non-sexual embryo of a mature nematode worm, the *Filaria Bancrofti*, the female of which measures $3\frac{1}{2}$ inches in length by $\frac{1}{100}$ of an inch in breadth, and is a long slender parasite, having very much the appearance of a delicate thread of cat-gut, is very animated, and has a sort of wriggling movement; a narrow alimentary canal runs nearly the whole length of the worm, the remainder of the body being entirely occupied by reproductive organs. Under the microscope, fully-formed embryos can be seen constantly escaping in countless numbers from the vagina. The parasite is therefore viviparous. The male is considerably smaller. The two worms live together, and are always to be found in a lymphatic vessel, which they make their habitat, and which by their presence they indeed effectually block, the consequence of this is, that stasis of lymph occurs, and a collection of it takes place in parts on the distal side; for instance, if the worms have taken up their abode in one of the lymph vessels or glands of the scrotum, in course of time enlargement of this part will occur, and on its surface vesicles usually of small size will periodically form and discharge lymph, in which filariæ in great abundance are to be found. This affection is known by the term, Lymph-Scrotum.

The parent filaria, lying in a lymphatic vessel, emits her



a, Filaria Bancrofti, female, natural size. *b*, Head and neck, showing œsophagus and vagina; magnified 55 diameters. *c*, Tail of same, showing fold of tuba, and termination of intestine; magnified 55 diameters. *d*, Free embryo; magnified about 400 diameters. *e*, Intra-chorional embryo; magnified 300 diameters. *f*, Egg; magnified 360 diameters. After Dr. Cobbold.

young into the lymph-stream ; along this they are carried to the lymphatic glands, as they are only about $\frac{1}{3500}$ of an inch in diameter, no broader than many of the lymph corpuscles that accompany them, they have no difficulty in entering and traversing the minute vessels into which the afferent lymphatic divides. For the same reason, and by virtue of its vigorous movements, it passes the parenchyma of the gland, and emerging into the efferent vessels, is borne along the current until, having traversed gland after gland and their connecting vessels, it finds itself in the thoracic duct, and finally in the blood itself.

A point of remarkable interest has been observed in connection with this nematode embryo. If the blood of a man in whom these parasites exist be submitted to microscopical examination, it will be found that during the hours of the day, unless under peculiar circumstances, they are entirely absent, that at about six or seven o'clock in the evening they begin to appear in the blood, gradually as night advances their numbers increase until midnight, when the number reaches its maximum, and then as morning approaches they become fewer, by eight or nine in the morning they will have entirely disappeared. From nine a.m. to six p.m. very rarely is it possible to procure a single specimen, whereas at midnight as many as 120, 170, and 260 severally have been noticed under separate slides by such observers as Dr. Myers, of Formosa, and Dr. Patrick Manson, late of Amoy.*

In a case of Filarial *Hæmaturia-Chyluria*, admitted into the London Hospital in 1882, Dr. Stephen Mackenzie† tried the ollowing experiment: he reversed the usual hour of movement and rest ; that is, he made the man remain up all night, and go to bed during the day. His meal times were correspondingly altered; his breakfast was taken at 10 p.m., his

* The blood of one-third of the dogs in China is infested with filariæ, and the same law of migration has been found to obtain in them.

† "Pathological Society's Transactions," vol. 33, 1882.

dinner at 3 a.m., and he took a slight meal at noon. The effect of this inversion of his habits was an inversion of the filarial migration. The maximum number of embryo filariæ was now found in the blood at noon, and few, or absolutely none, at midnight, after undergoing this inversion of habits for nearly three weeks, the man was allowed to return to his usual mode of living. On resuming his ordinary ways of life, the periodicity of filarial migration returned to its original order, the filariæ appearing in the blood at night and disappearing in the daytime. This experiment has been repeated by Dr. Manson and with the same result.

In order to ascertain how far the periodicity of migration was dependent on the time at which the patient took food, his meal hours were changed from breakfast at 6 a.m., dinner 12 noon, and tea at 4 p.m., to breakfast at 10 a.m., dinner 3 p.m., and supper at 12 midnight. This change carried out for one month had no effect on filarial migration. It appears, then, that the periodicity of migration is dependent on the moving or resting condition of the individual, and is, therefore, independent of the time when the chyle reaches the circulation. This remarkable phenomenon is as yet wholly unaccounted for. Some have thought the spleen might harbour the filariæ during the day, or perhaps the lungs or the liver might do so; none have been found collected in any of these organs. A very suggestive explanation has been offered; that probably nature adapts the habits of the filaria to those of the mosquito, the insect, as we shall see, ordained by Nature to perpetuate the species. The embryos are in the blood just at the time the mosquito selects for feeding. Such then, being the case, it can only be at night that the embryo has an opportunity of advancing in its development; it cannot advance in this so long as it remains in the blood of one man, the embryo never becomes the parent—the *Filaria sanguinis hominis* never developes into the *Filaria Bancrofti*—in the blood of one person, the parasite reaches its full development,

in the blood system of another man, this is the only way of continuing the species, the embryo must leave the original host. It has been estimated that at least two millions of filariæ exist in the blood of an infested individual; were these to attain the size of the *Filaria Bancrofti*, the death of the host would certainly be involved, this means the extirpation of the species, as both parent and offspring would be sacrificed. There is no provision in the structure of the embryo by which it can escape from the body, and as this escape must be effected, it seems that some outside influence must bring this about, and the only influence that can accomplish this is by something that can abstract the blood in which they exist. In 1887, Dr. Patrick Manson discovered that the mosquito was the insect that liberated the parasite. After much research he found that there was only one species that possessed the necessary qualifications—the *Culex Mosquito*—and that it was the female of this particular species that proved to be a most efficient intermediary host for the *Filaria sanguinis hominis*. The male takes no part in this operation, as he is incapable of piercing the skin. The female is a dark brown insect, has no markings on her abdomen, thorax, or legs, her head is small and dark, and she carries a proboscis two-thirds the length of her body.

About sunset, the mosquitos leave their retreat, and for an hour or two wheel about in the air, when in a house, then near the ceiling. They then descend in search of food, and the female greedily avails herself of the blood of the first animal in which she can fix her proboscis, be it man or beast. About two minutes suffice to fill her stomach. She then retires to some shady place, if possible in the vicinity of water, and for the next four or five days is occupied in digesting the meal and maturing her ova. When these two processes are accomplished she betakes herself to the water, and on the surface of it deposits two little boat-shaped masses of eggs. After effecting this she dies.

If a female of this particular species of mosquito pierces the skin of a filaria-infested subject, the proboscis, buried in the blood-stream, is speedily beset by the embryos, and the construction of the proboscis seems to be especially adapted for drawing the worms out of the capillary blood-vessels. The filariæ are transferred in abundance, along with the blood, to the stomach of the insect,* where some are digested or are expelled in the fæces. A few survive and enter on a singular and interesting metamorphosis. In a short time the body of the parasite becomes marked by delicate transverse striæ; it gets broader and shorter, and filled with a fluid containing granular matter. The extreme tip of the tail shrinks and looks like an appendage stuck on the mass. The sheath disappears, minute cell-like bodies appear and arrange themselves in a line, one end opens near the tail, the other end is forming something like a mouth. Growth now commences, and very vigorous movements are noticed. It has attained $\frac{1}{30}$ of an inch in length, with a visible alimentary canal; rudiments of generative organs can be traced. Its head is seen to be crowned with three or four nipple-like papillæ, supposed by Dr. Manson to be a form of boring apparatus. This subject will be referred to again.

By the time this metamorphosis—which occupies four to six days, and these are the days the mosquito is in her shady retreat—is completed, the life of the mosquito is concluded; her stomach is empty but for these few formidable guests; her ova have been deposited on the water; her life-cycle is finished; and she dies, falling into the water on which her eggs were laid.

I have just mentioned that the head of the insect is armed with a boring apparatus, and as it is now possessed of sufficient strength and activity to wield this efficiently, it bores its way through the dead and sodden body of the mosquito to find

* Fifty have been counted in the stomach of one mosquito.

itself in the water, a medium most likely to afford it an opportunity of gaining access to its final host. There it lives as a short wriggling sort of worm, similar to the larva of the common gnat, and there it remains until captured by some animal, or perhaps swallowed by man himself.

Once in the human stomach it soon bores its way into the thoracic duct or some lymphatic vessel, and working up-stream, in obedience to instinct, pierces the glands, and finally arrives at its permanent abode in some distant lymphatic vessel.* It is soon followed by one of the opposite sex. The couple grow, and for years live together and breed, the progeny passing along the vessels through the glands and into the blood in the manner already explained, there to await the chance of a mosquito to help them, as it had done their parents, towards maturity.

This is an exact amount of the life-cycle of the *Filaria sanguinis hominis*. It moves along with the lymph, and being no broader than the corpuscles readily passes the glands, and enters the general circulation. Here it gives rise to no trouble, and it circulates as easily as the blood cells. Dr. Manson asserts that there is nothing in it or its relations to the human host incompatible with the perfect health of the latter. Nevertheless, it does become in some cases a source of grave disease and danger. A filaria-infested individual may suffer from frequent attacks of fever, characterised by well-marked stages of rigor, pyrexia, and diaphoresis, resembling ordinary

* Helminthology supplies us with many illustrations of this faculty of travelling towards, and selection of, a suitable habitat possessed by these lowly-organized animals. The same instinct guides the *trichina* to the muscles, the liver-fluke to the gall-ducts, the giant strongyle to the pelvis of the kidney, the *bilharzia hæmatobia* to the veins of the bladder, the *filaria immitis* to the right ventricle of the dog, the *filaria sanguinolenta* to the œsophagus, the *filaria corvi torquati* to the pulmonary artery of the crow, the *filaria picæ mediæ* to the semilunar valves of the magpie; and a similar instinct brings the sexes together in these dark corners. —Dr. Manson.

intermittent fever, but differing from it in the irregularity and length of the interval, often weeks or months between the attacks, and also in the greater length of the paroxysms. Some individuals, in addition, suffer from lymphangitis, or get varicose groin-glands, which inflame during these attacks of fever. Others, again, have lymph-scrotum. Some suffer from elephantiasis of the leg, or scrotum, or both. Chyluria, or chyle in the urine, is a common disorder, and so is hydrocele containing chylous fluid and filariæ. Hydrocele, with clear fluid contents; varicocele; elastic tumour of the groin or axilla; acute orchitis; lymphangitis of the upper or lower extremities; abscess of scrotum, or of the glands of the neck, of upper arm, thigh, or pelvis;* hæmaturia; anæmia from chyluria and hæmaturia; tuberculosis following chyluria; and sometimes cerebral disorders, such as abscess, and not improbably leprosy. All these diseases, and no doubt many others, are due to morbid changes exclusively resulting from the presence of *Filaria Bancrofti*, or its progeny, within the human body. Blood taken from individuals who were the subjects of the diseases just named, was carefully examined, and without an exception, filariæ were discovered in all.

It is scarcely possible to believe that a disease of such magnitude as elephantiasis should be produced by the presence of filariæ in the lymphatic system, but such is the case, and the rationale of it is this: In a case of lymph-scrotum there is periodic discharge of lymph from vesicles on the surface of the scrotum caused by a block in the lymphatic system of that particular part, and this block, produced either by the presence of a large number of embryo filariæ entangled together in a sort of ball, or more generally by ova, in a lymphatic vessel, some of the lymph escapes into the cellular tissues and becomes organized into a low form of texture, hence the thickening and swelling

* Several cases of abscess are recorded by Dr. Bancroft in "Pathological Society's Transactions," vol. 29, 1878.

of the scrotum. After several years the periodic discharge ceases, and the scrotum gradually assumes the characteristic appearance of elephantiasis, and acquires, in some individuals, so enormous a size as almost to touch the ground.

You will readily comprehend how great is the practical importance of this subject, when it is known that this insect is capable of producing so frightful a disease. It is an established fact that in whatever part of the world elephantiasis is endemic this particular parasite is to be found; and yet it is completely within our power to prevent the access of the filaria to the tissues of man, and thereby annihilate the many virulent diseases which now affect the inhabitants of warm climates. This end may be accomplished by the perfect filtration of water before use. On this point Dr. Manson observes, "If people in countries where the filaria is endemic would but cover their wells or water-jars with a netting sufficiently fine to keep out the mosquito, or if they filtered or boiled their drinking water, they would never get filariæ or the diseases it produces."

The particular form of lymphatic disease, and the part affected, will depend upon the position occupied by the parent worm. For instance, if we locate her in the lymphatics of the leg, the ova will be carried to the inguino-femoral glands, and when these have been plugged, more or less completely, anastomosis will carry the ova by the scrotal and neighbouring lymphatics to the inguinal glands of the other side; and when these have been effectually plugged, there must then be complete stasis of lymph in both legs and in the scrotum—a lymph-scrotum is formed. If the worm is located in the scrotum, the same effects will ensue. If she is in a lymphatic trunk of the pelvis or lumbar region, then the stasis caused by the ova involves the lymphatics of the kidneys, ureters, and bladder, oozing of lymph takes place into the kidney, sometimes with blood, giving rise to hæmaturia. If draining of lymph takes place into the bladder from a block in the lymphatics of that organ, then chyluria is produced—urine

charged with chyle and generally full of filariæ. If the block is in the lymphatics of the spermatic cord, hydrocele occurs, the fluid of which is similar to milk, and from that circumstance, termed galactocele.

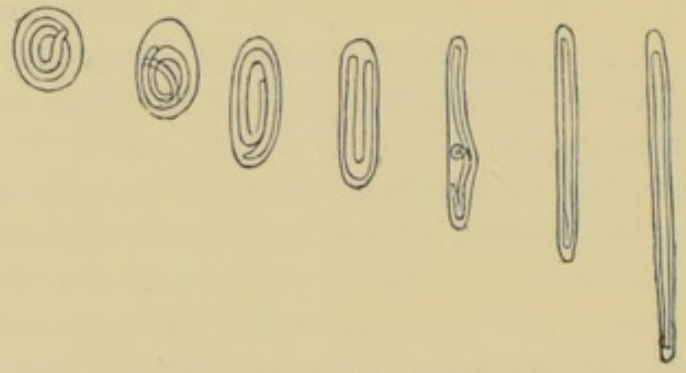
A filaria-infested subject is very liable to occasional attacks resembling ague, but they differ in that they do not obey the ordinary laws of periodicity, they occur sometimes at long intervals, as may be noticed in the case which has been under my observation. Dr. Manson supposes that these attacks of fever are produced by some irregularity in parturition; that the parent filaria has miscarried, and he thinks this may be brought about by the exposed position which the worm often occupies in the legs or scrotum; its liability to injury from mechanical violence, by the sicknesses of the host, his fever and blood-poisoning; the miscellaneous foods he consumes, some of which may act on the uterus of the worm as they act on that of the human subject.

When abortion takes place, the ova leave the parent as ova, not as fully formed filariæ; and as the diameter of the ovum is five times greater than the breadth of the fully-formed embryo, it follows that lymphatic vessels smaller than the ovum get blocked, and embolism must take place. The result of this is lymphatic obstruction, œdema, and oozing of lymph from the surface, be it skin, mucous, or serous membrane, then disease follows, especially tumefaction of skin, which, in course of time, assumes the character of elephantiasis. On this point Dr. Manson truly observes, "Enough has been advanced to show in what way all the phenomena of elephantoid disease may be explained by the theory that the parent parasite is the prime cause; premature birth of the ovum the second; and infarction of the lymphatic glands by the ova the immediate cause."

I will now refer to the subject of the sheath which encloses the body of the embryo filaria, and which plays an important part in the history of the parasite. It forms a

transparent delicate envelope, which closely fits the worm, not unlike the covering of a sausage, within which it can elongate or shorten itself.

Dr. Lewis, in describing the process of the development of the embryo filaria in the uterus of the parent, observes that the immature animal does not burst its envelope or sheath, but that it stretches this, so that after a time, and before it escapes from the vagina of the parent, the shell becomes the sheath. As the embryo nears the vaginal end of the uterine horns, by dint of vigorous movements, it gradually separates the poles of the ovum ; and before it emerges from the parent it has extended them so far that the originally round or oval sac has become converted into a sheath closely applied to the body.



It retains this sheath whilst in the blood of man, and only loses it when it gets into the stomach of the mosquito. In the stomach of this insect the filaria is enabled to escape from the sheath. It then begins to grow and to develop in the way already described, and is prepared to bore its way through the tissues, of the dead mosquito.

Dr. Manson has recently discovered that by chilling the slides of blood containing the filariæ, and then thawing them, he can make the parasite leave the sheath, in which under normal conditions it is enveloped.* The explanation he gives is that

* "British Medical Journal," April 15th, 1893. I take this opportunity of acknowledging my indebtedness to Dr. Manson, for much information derived from his several papers on the subject of Filaria.

by chilling, the hæmoglobin leaves the red corpuscles, and is diffused through the plasma, which in consequence becomes thick and viscid ; and that the gastric secretions in the stomach of the mosquito act on the hæmoglobin exactly in the same way, and so bring about the necessary thickening of the blood which provides a mechanical condition that enables the filaria to quit its sheath. In other words, the thickened plasma offers a resistance to the sheath, whilst the filaria is making vigorous efforts to burst through, which at last it accomplishes. It is not improbable that the gastric secretion may also act in softening the sheath.

After the loss of the covering, and by careful watching of the head, Dr. Manson has made out that the animal is provided with a thick stumpy tongue or proboscis (a, Fig 1),

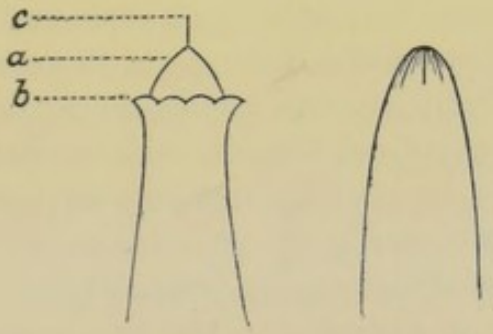


FIG 1 FIG 2

which is alternately covered and uncovered (Fig 2) by a six-lipped retractile prepuce (b, Fig. 1), that occasionally a short and extremely delicate filament (c, Fig. 1) is shot out and retracted from the tip of this tongue-like organ. He considers the filament (c) is a feeler of some sort ; the tongue (a) a borer ; and the lipped prepuce (b) a dilator and hold-fast, and that they operate in this manner : When a weak point in the tissues of the mosquito has been discovered by the sense filament, the tongue is thrust out and a shallow pit formed ; the tongue is then withdrawn, the prepuce being slipped over it. The prepuce-covered tongue is then thrust into the shallow pit, and the

prepuce forcibly opened out and drawn back in such a way that the little lips with which it is provided hook on to the circumference of the hole in the tissues, and thereby provide a firm purchase by which the animal may draw its body forward and further expand the hole, and also afford a firm foot-hold for further ramming and drilling by the tongue ; and as the parasite becomes more developed, it is the more enabled to use this organ with vigour and effect.

The gentleman from whom the specimens of blood were taken is 53 years of age. He came under my notice in June, 1892, suffering from irritation of the bladder and chyluria. In 1874 he was residing in a very damp part of the Bengal Presidency, where mosquitos were abundant. He thinks it is quite possible that he may have drank some tank water, or may have swallowed some whilst bathing. At all events, in 1877, he noticed that a hydrocele was forming on the right side. He came to London and placed himself under the care of Mr. George Pollock, who says, in a letter, dated July 9th, 1878, "Mr. —— consulted me last year soon after his arrival in England, for an enlarged condition of the lymphatics of the spermatic cord combined with hydrocele. The hydrocele was at once tapped, but soon refilled. On a second occasion it was tapped and injected with iodine, and it has not returned, but the condition of the lymphatics continues. This condition more or less influenced or caused the hydrocele ; for the contents of the latter, instead of being as is usually the case, transparent and of a light yellowish tinge, was of an opaque white colour of the consistence and appearance of milk."

In 1879 Mr. ——— returned to India, and was posted to a much drier district in Western Bengal. In February, 1884, he had an attack of what he considered to be ague, accompanied with pain and swelling of the right side of the scrotum. This condition passed off in a few days. In February, 1886, he had a similar attack of fever with inflammation of the same

side of the scrotum as before. After some days an abscess formed and emitted a copious discharge. This healed quickly, and since that time he has suffered no further trouble with the right side of the scrotum. In October, 1889, the fever recurred, followed by several other attacks, one of which, in December, was succeded by pain and swelling of the left side of the scrotum. Iodoform was freely applied; in a few days the inflammation was reduced and the disorder apparently cured. In March, 1890, Mr. ——— again had an attack, followed by the usual results; another in April, on board ship at Marseilles; one in July, at St. Leonard's; and one in October, in London. Since that time Mr. —— has had two or three similar attacks, all of which were associated with inflammation of the left side of the scrotum.

When an attack is about to come on he generally feels chilly and depressed, the pain and swelling of the left side of the scrotum soon follow, then the hot fit, which passes off after perspiration. Once or twice he has noticed that the local inflammation has preceded the fever; but, as a rule, the fever appears first. The feverish state does not usually last more than a few hours, and the tenderness of the scrotum soon goes off under the influence of iodoform; but it takes about four days to reduce the swelling, which is effected by the application of blue ointment. He considers that the attacks are getting weaker.

When seen by me in June, 1892, Mr. —— was suffering considerable irritation of the bladder, which would not retain more than two or three ounces of urine at one time, and which necessitated frequent micturition during the day and night. The urine was normal in quantity, thick, and deposited a deep layer of what appeared to be muco-pus, was acid, had no particular odour, contained no stringy mucus, and the specific gravity 1022. On boiling, it became cloudy, but threw down no deposit; on cooling, it became almost clear, no casts could be seen, only lymph cells in great abundance, and a few blood corpuscles.

His health was not good; he was pale, had no desire for food, became depressed towards evening. His heart, lungs, liver, and spleen were healthy. Mineral acids, with steel and quinine, greatly benefited him. The amount of urinary deposit was reduced, and there was less frequency of micturition. Examination of his blood shewed examples of the *Filaria sanguinis hominis*, but only in blood taken after 9 p.m., not one could be found in blood taken during the day. From six to twelve filariæ were generally seen in every drop, and on one occasion twenty-five.

At the present time (May, 1893) the condition of Mr. —— is this: He is in fairly good health, can walk long distances, is able to ride, micturates not more than four times during the day, and only once in the night, and sometimes not at all. The quantity of urine is normal, it throws down a trifling deposit of chyle as compared with what it did; its specific gravity is 1022. No filariæ can be detected in it.

This improved condition may have been brought about by the administration of thymol, a remedy recommended by Surgeon-Lieut.-Col. Laurie,* who believes that by its means he succeeded in curing two cases of chyluria, depending upon filariæ in the blood. Mr. —— began with three grains a day; three weeks later it was increased to six a day; a month later to nine grains a day, three weeks later to twelve a day, a week after to fifteen a day, with this result, that the filariæ are still alive and very active. Sometimes very few are seen, at other times several. They seem to be in nowise influenced by the long course of thymol which Mr. —— has taken very regularly for five-and-a-half months, and certainly without affecting his general health or comfort. Dr. Manson informs me that he does not regard thymol as in any way a cure for filaria. He believes that from its balsamic properties it may have some influence on the cystitis associated with chyluria, and possibly it may have a topical tonic influence on the

* The "Lancet," February 14th, 1891.

lymphatics of the urinary tract, just in the same way that copaiba or cubebs might have.

No remedy has yet been discovered capable of destroying this very remarkable parasite. A medicine that would kill the embryos and not the parents would be useless. It is the *Filaria Bancrofti* that we have to deal with. By the destruction of this worm the safety of the life of the host is ensured. A rational method of treatment would be extirpation of the infected glands, and with them the mature worm which inhabits them. This procedure was adopted, and carried out by Surgeon-Major Maitland, in March, 1889.* He dissected out two enlarged and dilated glands from the right groin of a Hindu, and with complete success. Unfortunately the glands affected by these parasites are not always accessible to the knife, and in some individuals several pairs of worms may exist in different parts of the lymphatic system. This, without doubt, must have been the case in the man reported by Dr. Mackenzie, who computed that in his patient by counting the number of filariæ in 10 cubic m.m. of blood, and estimating the quantity of the man's blood at $\frac{1}{15}$th his body weight, that he had from 36,000,000 to 40,000,000 of embryo filariæ in his blood at night. In the case of Mr. ——, I do not believe that more than one, or at the most, two pairs exist in his lymphatic system; and I judge this to be the case from the small amount of general disturbance, from the few specimens of filariæ seen in each drop of blood, the normal size of the scrotum, and the absence of any enlarged inguinal glands. In him their habitat is, no doubt, the lymphatic vessels of the spermotic cord, or of the walls of the bladder, and in one or both of these places have they enjoyed life for sixteen years, if we date from the time of the galactocele, and as the parasite continues to live for years after its host has quitted the endemic area, the probability is that, unless some untoward event or accident should occur, such as would produce an abortion, and so lead to a block by embolic ova, followed by suppuration in a vital part not easy to get at, that

* "Indian Medical Gazette," October, 1891.

Mr. —— may live to old age. It has been shown that in China and elsewhere, a large number of persons whose blood is infested with filariæ, appear to enjoy excellent health, and live many years. At the same time, it is difficult to believe that a parasite so low in the scale of the animal kingdom should attain to the average age of man. There surely must be a limit to the life of the *Filaria Bancrofti.* Further observations are necessary to elucidate the life history of this "unbidden guest."

Dr. Manson has discovered two new species of *Filaria sanguinis hominis* which he found in the blood of four negroes from the Congo, and which presented characters sufficient to distinguish them from the *Filaria sanguinis hominis* of Lewis, and from each other. He characterizes them by the adjectives, "Nocturna," "Diurna," and "Perstans."

The "Nocturna" of Lewis, as is well known, can only be found in the blood between dusk and dawn, and is most numerous about midnight. The "Diurna," on the other hand, is found only in the day and not at night. The "Perstans" exhibits no such periodicity, it can be found at any hour of the day or night in equal numbers.

The "Diurna" is about the same size as the "Nocturna," and only differs from it in having a more delicate sheath, and no granular aggregation can be observed about the middle of the body. The intermediary host is the mangrove fly, a small black midge-like insect, which bites by day.

The "Perstans" presents many points of difference, in that it has no sheath, and is much shorter, measuring $\frac{1}{125}$ of an inch in length by $\frac{1}{5500}$ in breadth. The "Diurna" and "Perstans" forms of filariæ have been met with together in the same negro; the latter is supposed to give rise to a very singular complaint called "Negro lethargy," or the "sleeping sickness of the Congo," the mortality from which in its native haunts is enormous. When once developed death from it in a few months is inevitable. The intermediary host of this filaria is at present unknown.