seen for the first time with a well-marked unilateral swelling of the neck, looked like a form of aberrant mumps, but careful examination showed that the parotid gland was not affected, and the children had no pain in closing the jaws or in eating; besides, some of the cases had previously suffered from mumps. It has been suggested that the disease might be a peculiar form of influenza; but as a rule in recent years, when abnormal types of that protean disorder occurred, we were able to diagnose them as due to the influenza poison from the fact that in the same house or locality other ordinary forms of that disease were detected. None of these usual forms of influenza occurred in the houses where the cases I have described were seen. I believe the cases were true examples of that acute epidemic infectious fever in which there is primary inflammation of the lymphatic glands. The poison of glandular fever is probably microbial, and the present extraordinary atmospheric conditions may present precisely those factors necessary for the growth of the infective germ which causes the disease. Some have suggested that infection is through the intestine; in the cases seen by me, it seems more likely that the invasion was by the throat.

Since writing this article I find that in a family where the children suffered from the ailment I have described, two of the adults developed a follicular tonsillitis, but in them although the glands of the neck were tender there was no palpable enlargement.

NOTES ON THE DISTRIBUTION OF CANCER IN THE FREEBRIDGE LYNN RURAL DISTRICT.*

By CHARLES B. PLOWRIGHT, M.D., F.R.C.S.,
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the Division.

THE following notes are an epitome of a special report on the subject recently laid before the above district council.

The district in question consists partly of a chalk plateau covered in places by beds of boulder clay, glacial and post-glacial gravels and sand, and partly of the lower greensand; there is also a considerable area of alluvium. Each parish was visited, and the actual house, or its site if it had been pulled down, in which the patient lived, made out. During the forty-one years 308 deaths from cancer were registered; from these were eliminated those which were obviously due to sarcoma, and they were further corrected for immigration and emigration. As thus amended, 241 were found to have lived upon the various geological formations as given below, for a period of not less than three years preceding their death.

	Deaths.
Glacial and post-glacial gravels and sands	88
Lower greensand	75
Boulder clay	26
Chalk	25
Chalk marl	16
Post-glacial clay	6
Alluvium	5

Of 265 deaths traced to their altitudes, one-half were found to have resided below 50 ft., and less than one-tenth between 100 and 300 ft. above sea level. The disease was more frequent in the western than in the eastern half of the district in the proportion of 3.1 to 1.8 per cent.

Some of the villages have suffered much more than others, and, furthermore, certain parts of some produced more cases than other parts. Especially was this the case in water-logged places where the water supply is derived from surface wells. There was evidence of the disease being more frequent amongst those who used certain wells. For example, in one village in which there were 10 deaths, 4 of them occurred in a small cluster of cottages around one shallow well from which they all drew their water supply; there were nineteen other wells in the parish. In another village there were 3 deaths all using the same surface well; in this parish there were twelve other wells. In another there were 3 cases amongst the users of one well out of a total of 5 cases; there were twenty-three other wells in this parish.

When the yearly deaths of each parish were "charted," in many cases a tendency to fall into groups was observable, a point quite hidden when the whole series of deaths in the

district was treated in a similar way. This falling into little groups or miniature epidemics, when it occurred, was very striking. There were 5 instances of husbands and wives dying from cancer and 2 instances of the first and second wives of the same husband. In 13 instances 2 cancer cases occurred in the same house, in 10 of which both cases died in the house.

Woodland seems to have had no effect on increasing the number of cases, for the six parishes with the most woodland (2,635 acres) averaged 1.0 case per cent., while six other parishes without any woodland averaged 2.4 per cent. Neither had beer drinking any observable effect.

Respecting the geological formations most liable to cancer, it is interesting to note that they are the same in West Norfolk as those which produce most calculus,¹ namely, the gravels and sands, where the percolation of water is rapid, not upon the chalk, the deep wells of which yield water of great organic purity.

REFERENCE.

¹ On the Distribution of Calculous Disease in Norfolk, by C. B. Plowright, BRITISH MEDICAL JOURNAL, November 7th, 1885.

A NOTE ON DR. PRIMROSE'S PAPER ON FILARIASIS.

By SIR PATRICK MANSON, K.C.M.G.,
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IN his interesting article on filariasis,¹ Dr. Primrose, of Toronto University, gives the details of a case of lymph scrotum associated with embryo filariae in the blood. Two months after removal of the scrotum, in which an adult filaria and several fragments were found, the filarial embryos had disappeared from the circulation. Dr. Primrose concludes that the subsequent absence of embryos from the blood was attributable to the removal of the parent worm.

On January 29th, that is twenty-four days after the operation, embryos were still in great abundance in the blood, as many as 1,764 having been found in 1 c.cm. at 9 p.m. Dr. Primrose's assumption, therefore, postulates that the life of an embryo filaria is at least twenty-four days. I take the liberty of dissenting from Dr. Primrose in his interpretation of the facts.

Dr. Primrose states that his patient, forty-six days after the operation, suffered from an attack of elephantoid fever, accompanied by much inflammatory swelling at the root of the neck; the swelling was incised, and a mass of sloughy broken-down tissue was removed. I attribute the disappearance of the filariae from the circulation, not to the operation on January 5th, but to the attack of lymphangitis on February 19th.

The infection in Dr. Primrose's case was so severe that it could not have been produced by two or three parental filariae. We do not know how many adult filariae it would take to produce a stock of embryos such as he describes, but I think if we regard a minimum infection (that is, the product of one pair of parental filariae) to be five to ten embryos in a drop of blood (and this I consider an over-estimate), such an infection as Dr. Primrose describes would require ten to twenty, or even more, female adult filariae to produce. The scrotum must therefore have contained more parent filariae than were found in it, or there must have been parent filariae in some other part or parts of the body. The latter is my view, and I conclude that the main body of parental worms was destroyed during the very severe attack of lymphangitis on February 19th.

In 1892 and for several years subsequently I frequently saw a gentleman the subject of filarial varicose glands in the groin. His blood contained large numbers of embryo filariae—300 to 400 per drop at 10 p.m. About this time I was endeavouring to find out what became of the embryo filariae during their daily absence from the blood, and what might be the duration of the life of the individual embryo filaria. To settle these points, or at all events to throw some light upon them, I had arranged with the gentleman I refer to to have some of his blood transfused into two monkeys, my idea being that the embryos would continue to live in the monkey pretty much as they lived in their human host, and that by periodical examination of the blood I could watch their disappearance, and so get a key to their life-span. I also hoped from this experiment, should the embryos exhibit their usual periodicity of appearing and disappearing in the general circulation, that by killing one of the monkeys during

* Read at the Autumn Meeting of the West Norfolk Division of the East Anglian Branch of the British Medical Association.

the day, and subsequently examining its tissues, I should be able to ascertain the place of their retreat.

At an examination of the patient's blood on October 22nd, 1903, the embryo filariae seemed to be fewer in number than formerly (thirty-nine to the slide at 9 p.m.). Three days subsequently he had a severe attack of lymphangitis, but by November 18th had recovered his usual health, and the transfusion agreed upon was arranged for, Sir Victor Horsley having kindly consented to operate. Before commencing, I thought it prudent to examine the patient's blood so as to get some idea of the number of embryos present in the blood we proposed to transfuse. I was astonished to find that the worms had practically disappeared, only one or two in a slide being met with. Of course the operation was not carried out, as it would have been hopeless to expect results with so small an infection.

Subsequently, from time to time until July 16th, 1894, examinations of this patient's blood were made at night. Up till that date filarial embryos could still always be found in small numbers—from one to eight at 10 p.m. On July 16th he came to me suffering from a feverish attack apparently associated with lymphangitis. I examined the blood, and found four filariae per drop; next day I found six at 10 p.m. I did not see him again till November, when I found no filaria. I examined his blood many times subsequently, and although the glands in the groin were still varicose there were no nematodes in his blood.

The disappearance of embryos was manifestly a sequel of the attacks of lymphangitis. This is not the only case in which I have seen permanent disappearance of embryos follow an attack of lymphangitis, but I have never before or since had a chance of watching a case so closely and completely. There can be little doubt that the death of the parental filaria produces lymphangitis or vice versa; the circumstances are associated.

I therefore consider that in Dr. Primrose's case, although some diminution in the stock of embryos doubtless resulted from the removal with the scrotal tissues of one or two females, the great bulk of the infection was got rid of at the time of the subsequent lymphangitis.

In discussing the subject of filarial infection, Dr. Primrose refers to Drs. Dutton, Annett, and Elliot's opinion as regards the specific identity or the reverse of *filaria nocturna* and *filaria diurna*. These gentlemen submit that the weight of evidence is on the side of identity of these two forms, and I see their views frequently quoted. I recommend the student to be careful in committing himself to such an opinion. The precise evidence I was at one time able to collect under very favourable circumstances leads me to the opposite conclusion. Recently I had an opportunity of examining the blood of one of the cases of sleeping sickness now in Paris. The examination was made about midday, and the blood was full of embryo filariae. Of course the circumstance that filariae were present in such great abundance during the day may be explained by the sleeping habit of the patient, but I was struck with certain features of the parasite in dry films which forcibly reminded me of observations on *filaria diurna* many years ago. These features were (1) the awkward position, so to speak, assumed by the parasite, the body flexures being more in angles than curves, as is generally the case in dry specimens of *filaria nocturna*; (2) the tenuity of the extreme end of the tail; (3) the acute flexion of the tip of the tail on the body in a majority of the embryos. It is a dangerous thing to attempt to diagnose species from embryos, but there are slight differences which, taken together with the marked difference in periodicity, justify in my mind the conclusion that *nocturna* and *diurna* are specifically distinct, and that in this Paris case we were dealing with *filaria diurna*.

I notice in Drs. Stephens's and Christopher's newly-issued admirable work on *Malaria and other Blood Parasites* that they quote Dr. Christy and Professor Firket as holding that there are several species to which the name of *filaria perstans* has been applied. I do not know what Dr. Christy's evidence may be on this point, but I have had an opportunity of seeing Professor Firket's preparations, and from these it is evident how he comes to the conclusion that the name *filaria perstans* covers at least two pieces of small, non-sheathed, blunt-tailed blood worms. In any slide of blood unevenly spread and containing filarial embryos it is always possible to find marked differences in the size of the filariae. This depends on the thickness or thinness of the film of blood and the rate at which the different areas of blood film dried. Moreover, *filaria perstans* possesses in a remarkable degree the power of extension and

contraction; an embryo which died when fully extended would present very different measurements and appearances from one which died when contracted.

REFERENCE.

¹ BRITISH MEDICAL JOURNAL, 1903, II, p. 1262.

THE LIFE-SPAN OF THE GUINEA-WORM.

By ARTHUR POWELL, B.A., M.Ch.,

Surgeon, Police Hospital; Professor of Biology, Grant Medical College Bombay.

A PAPER on this subject, by Sir Patrick Manson, appeared in the BRITISH MEDICAL JOURNAL of July 4th, 1903, p. 10. In Sir Patrick Manson's cases the time of possible infection extended from February to June. In the cases under consideration the period of exposure in the endemic area was only two days. I am indebted for the particulars to Messrs. M. Cursetjee and Fazalbhoy Chinoy. A party of sixteen gentlemen, with five servants, all residents of Bombay—a city with a good artificial water supply, where guinea-worm is only seen in patients from the country, chiefly from the Deccan—left Bombay, and reached Mahad on April 20th, 1902. They all stopped there for two days, drinking unfiltered the water of a well. They returned to Bombay on April 22nd, 1902.

On April 2nd or 3rd, 1903, the first worm made its appearance in the leg of one of these gentlemen. Up to the first week in July worms to the number of nine continued to be discharged from his body. Doubtless owing to injection with mercury perchloride the exit of some of these worms was delayed, as they were killed and came away piecemeal, causing a good deal of suppurative cellulitis.

The next patient was delivered of a worm on May 1st, 1903, five other patients between that date and May 20th, 1903. Seven patients in all were attacked, six of the party of sixteen and one of the five servants. Nineteen worms in all were extracted. None have come out since the first week in July up to the present date, October 3rd, 1903. The shortest period in these cases was 345 days, the longest 435. The great majority of worms appeared a year and two or three weeks after the date of infection.

The estimation of the life-span of this worm in its human host is a matter of importance in prognosis in the case of persons exposed to infection. Thus I had no hesitation in informing the ten gentlemen who have not yet been infected that they have little reason to fear the appearance of worms, a matter of considerable concern to some of them.

Inquiries were made among the inhabitants of Mahad as to the prevalence of the worm in the district. The replies indicate that about half the population suffered from guinea-worm this year.

There is frequently considerable fever a few days before the worm becomes palpable. Two of these cases suffered from fever, with swelling of the face and hands. The sensation of swelling and tension to the patient is greater than the appearance to the surgeon seems to warrant. This swelling of the face and hands seems independent of the situation of the parasite, and I have frequently observed it when the worm was in the lower extremities.

The origin of this fever may be suspected from the absence of malarial parasites and an increase in the proportion of the eosinophile corpuscles in the blood. In a paper¹ recently read before the Bombay Medical and Physical Society I described six cases of guinea-worm infection in which examination of the blood showed 4.75, 5.5, 7.5, 7.5, 8, and 12.25 per cent. of eosinophile corpuscles respectively. The pus from one sinus contained 19 per cent. eosinophiles.

REFERENCE.

¹ Examination of the Blood in 3,400 Cases of Fever, *Transactions of the Bombay Medical and Physical Society*, September, 1903.

REQUESTS AND DONATIONS.—The Duke of Northumberland has given £1,000 for the building fund of the proposed new infirmary at Alnwick, and has offered the choice of two sites in the neighbourhood of the town.—Under the will of the late Mrs. Eliza Darling, of Phillimore Gardens, Kensington, £1,500 has been bequeathed to the Broadstairs Convalescent Home of the Victoria Hospital for Children at Chelsea; £2,000 to the Victoria Home for Invalid Children at Margate; £1,000 to the National Society for the Employment of Epileptics; and £500 each to the London Fever Hospital, the Brompton Hospital for Diseases of the Chest, King's College Hospital, and St. Thomas's Hospital.