tuberculosis to which they refer, the effect of the tubercle on the leukaemia was seen in a reduction of the leucocytes. In Lichtheim's patient the numbers became normal, and he adds that no one would have dreamed from the state of the blood that there ever had been leukaemia. A. Sturmdorf³ mentions that as febrile temperature from phthisis came on the myelocytes decreased and polynuclear cells multiplied. Baldwin, however, gives an instance where the advance of tuberculosis failed to check the increase of leucocytes in general. The addition of septic or other infection usually causes a marked reduction, though the improvement may only be temporary. Elsner and Groat refer to instances of typhoid, sepsis, and influenza where this has been seen. In Kraus's case of pneumonia as a complication there was a fall from 393,000 leucocytes to 4,000 in a few days' time,⁴ and M'Crae⁵ gives a list of similar instances. Thus a lymphatic case with staphylococcus infection showed a fall from 89,000 to 6,000, and a second from 220,000 to 6,000 in a few days, also an acute leukaemia under Muller in a child with staphylococcus infection, where 109,600 cells were reduced to 6,800. M'Crae notices also a similar fall, often seen before death, and probably owing to terminal affections, but he remarks that in all reported cases where the leucocytes have been reduced by a second infection the effect is only temporary, and the number has risen again if the patient has survived. Thus in Eisenlohr's patient an attack of typhoid reduced the numbers to normal, but only during the fever. In no instance has a permanent cure of leukaemia resulted.

During such a temporary suppression of the blood signs it may be impossible to recognize leukaemia, and the question naturally arises whether my own patient's leukaemia did not exist in this latent form at the time of his operation. It is clear that splenic trouble had existed for some time, and even if the phthisis had no definite effect, such periods of latency have been noted in other cases after taking medicine, or without any known cause. M'Crae's patient in a single twelve months twice showed typical blood symptoms of splenic leukaemia, and twice the blood appeared absolutely normal, without any superadded infection.

We can hardly regard the history of the injury J. L. received as a mere coincidence, though how the disease is caused by a blow is entirely unknown. The same effect of an injury as a determining cause occurs, however, both in malignant disease and in the infectious fevers such as pneumonia, and to one or other of these two classes leukaemia has been referred by most pathologists. Muir thinks that the occurrence of an injury as the starting point of the disease is quite exceptional, and apparently regards it as a mere coincidence, but this opinion is not shared by all authorities, Ewing and Ebstein for instance.

Looking at the above-mentioned results of a second infection, it is only natural to inquire whether any curative measures might not be based upon an imitation of the process. So far little success has attended such attempts. Henck⁶ brought about a reduction of the leucocytes by injecting tuberculin, and Jacobs reported an improvement for a time after injecting splenic extract, and Richter after injections of spermin. A more rational method would seem to be W. Hunter's treatment of pernicious anaemia by vigorous intestinal antiseptics. There are noticeable periods of gastrointestinal irritation in the course of the disease which were evident in the present case, and often a peculiar condition of the mouth, together with an increase of iron in the liver, which show some analogy to the symptoms of pernicious anaemia. Indeed, one disease has replaced or been substituted for the other after a time in one or two instances. Yet the differences are wide and important. In leukaemia there seems to be an over-stimulation of the cell-producing organs; in pernicious anaemia a destruction or paralysis of them, at least in the later stages. It would be interesting to trace the effects of acute intercurrent disease on this anaemia. Stengel finds that the sufferers react to fresh diseases in a most uncertain manner, but I find no histories of the effects on the blood count.

Possibly the gastric troubles may lead to the origination of leukaemia in another way. As Mathes points out, there is a remarkable amount of deuto-albumose in the blood, and this may act by over-stimulating the cell-producing organs, but the attempts to produce the disease by injecting pep-

tones have been against this, for they only resulted in a leucocytosis just as the superadded infections mentioned above may do, and not in an increase of the myelocytes.

One other point of interest must be referred to briefly. Phthisis is rarely found in gouty subjects. Can its rare occurrence in leukaemia be due to the excess of xanthin bodies in the blood, which several observers have held to be characteristic of the disease? This excess of xanthin bases is probably only secondary to the breaking up of the numerous white cells, but it may act, nevertheless, as a preservative against phthisis by rendering the ground less suitable for the growth of the bacillus. Where a chronic form of phthisis was in existence, as in this patient, very little inhibitory effect could be expected.

It is not necessary to discuss the pseudo-tuberculous lung affections sometimes found in leukaemia, for the previous existence of phthisis and the presence of bacilli suffice to prove the tuberculous origin of the lung trouble in the present case.

NOTE.—The patient appeared to be improving slowly till the second week in February, when cardiac symptoms reappeared, and death took place rather suddenly on February 15th.

REFERENCES.

- ¹ *Tageblatt der Naturforscher. u. Aerzte in Heidelberg*, 1889, p. 405.
² *American Journ. of Med. Sci.*, 1901, vol. i, p. 275. ³ *Ibid.*, vol. ii, p. 166.
⁴ Ewing, *Diseases of the Blood*. ⁵ *BRITISH MEDICAL JOURNAL*, March 31st, 1900. ⁶ *Deut. med. Woch.*, 1891, p. 747.

THE BLOOD IN CASES AFFECTED WITH FILARIASIS AND BILHARZIA HAEMATOBIA.

By ALFRED C. COLES, M.D., B.Sc.,
Bournemouth.

I WAS particularly interested in Dr. Lovell Gulland's contribution to the *BRITISH MEDICAL JOURNAL* of April 5th, 1902, on the above subject.

Through the kindness of Dr. W. H. Best, medical officer to the Lagos Hospital, I have from time to time received dry blood films of malaria and on two occasions of filariasis. As the filaria can only be found in fairly thick film preparations, very little attention was paid to the variety of leucocytes present in the first set of specimens dated June 10th, 1901. In November of that year some more films containing filaria from a case of lymph scrotum arrived, and I was at once struck by the enormous proportion of eosinophile cells present. I looked up the literature on the subject, and found no mention of eosinophilia in the blood of this condition. As soon as I saw Dr. Gulland's paper I made a differential count of the leucocytes present in the specimen dated June 10th, and found a similar enormous increase in the number of these cells. In this, the earlier specimen, these leucocytes did not stain as conspicuously as in the last case, partly owing to the fact that they had been subjected to a prolonged staining with haematoxylin after treatment with eosine.

The following figures show the percentage of the leucocytes found in both cases, and also that found in normal blood:

	Case I. June, 1901.	Case II. Nov. 1901.	Normal.
	Per cent.	Per cent.	Per cent.
Multinucleated leucocytes...	34	43	60 to 75
Lymphocytes	44	33½	24 to 30
Large uninucleated	7	6½	3 to 6
Eosinophile cells	15	17	2 (not above 3)

It is interesting to note that Da Costa in his recent book on Haematology states that "the relative percentage of mononuclear non-granular leucocytes is somewhat higher than normal, with a consequent decrease in the proportion of polynuclear neutrophils. The eosinophiles either remain at a maximum normal percentage or may be distinctly in excess of this figure." In three cases of filaria he found the eosino-

philes 3.4 per cent., 9.5 per cent., and 4.33 per cent. respectively.

I may add that I find that in films stained with eosine for about one minute, and then in Delafield's haematoxylin for any time from five minutes to seven hours—the longer the better—the internal structure of the filaria is exceedingly well brought out.

After the above note was written, it occurred to me that eosinophilia might also be found in those affected with bilharzia haematobia.

I therefore examined the blood of a patient of mine on April 16th, 1902, who was, I knew, suffering from this disease, and I was not surprised to find that the eosinophile cells in the peripheral circulation were enormously increased. The examination was made at a time when he—an otherwise healthy athletic Englishman—was still engaged in his usual occupation, and was in his usual health.

His general blood condition was good, as he had for some time been taking iron as a tonic after a somewhat recent attack of influenza. The number of red blood corpuscles and the percentage of haemoglobin were practically normal, as was also the number of the leucocytes. The percentage of the leucocytes counted in films stained by eosine and haematoxylin, Jenner's and Leishman's stains respectively was as follows: Multinucleated leucocytes, 46 per cent.; lymphocytes, 27 per cent.; large uninucleated leucocytes, 7 per cent.; eosinophile cells, 20 per cent.

An increase in the number of eosinophile cells has been found in the blood of various forms of helminthiasis—for example, ankylostomiasis, infection with *ascaris lumbricoides*, *oxyuris vermicularis*, *taenia mediocanellata*, and especially in trichiniasis.

Dr. Gulland's observation, which I am able to confirm (*vide supra*), now includes filaria. My observation on the occurrence of eosinophilia in bilharzia haematobia is, as far as I can find, not mentioned in any of the literature relating to the subject.

I hope at some future date to give a detailed report of the blood in this interesting and rare condition.

CASE OF "INFECTIVE ENDOCARDITIS" TREATED WITH ANTISTREPTOCOCCUS SERUM.

By H. M. COOPER, M.B.LOND.,

Hampton-on-Thames;

WITH SOME REMARKS BY

CYRIL OGLE, M.B.OXON., F.R.C.P.LOND.,

Assistant Physician to, and Lecturer on Therapeutics at, St. George's Hospital.

THE following case, although it had a fatal termination, is of interest on account of the results of a bacteriological examination of the blood and the effects of treatment:

History.—The patient, W. C. L., a man, aged 26, came under observation in the beginning of August, 1901. He gave a history of rheumatic fever four or five years ago, and said that for the last six months he had been feeling out of sorts; but the date of the onset of his present condition could not be fixed.

State on Examination.—He was markedly anaemic, wasted, and obviously very ill. His tongue was rather dry, and coated with a brown fur. No abnormality was detected in the lungs. His heart presented the usual signs associated with aortic regurgitation, an increase of size of the left ventricle, and a well-marked aortic diastolic murmur. In the mitral area there was a systolic murmur, heard also at the angle of the left scapula. The pulse was collapsing, the wave being of comparatively small volume. The liver and spleen were not enlarged. The urine was high coloured, and contained a little albumen.

Progress.—He was put to bed, and given stimulants freely, plenty of good food, and small doses of iron, arsenic, and strophanthus. A few days later the urine became porter-coloured, and there was evidently a considerable amount of renal bleeding, possibly due to infarction. He next had an attack of fairly copious haemoptysis, which lasted for three or four days. This was followed by an acute pain in one side of the head; he became heavy and stupid for a time, but without loss of consciousness, and with no evidence of aphasia or of motor paresis. He had also one or two attacks of diarrhoea. The temperature for the first three weeks was of a regular hectic type, rising to 101° or 102° in the evening and falling to 97° or 98° in the morning. No change took place in the aortic diastolic murmur, but the sounds at the apex varied in character: sometimes there was a suggestion of a presystolic in addition to the systolic murmur. No petechiae, and no clubbing, redness, or tenderness of finger-ends appeared, or any sign of joint inflammation. The pulse-rate was usually about 116 to 120 at night, and 104 to 110 per minute in the morning.

Diagnosis and Bacteriological Examination.—The condition was regarded as one of infective endocarditis, and search was made for a possible source of infection, but none was found, except it might be from two

carious teeth. No history of wound, otorrhoea, or gonorrhoea could be obtained. Although the patient rallied considerably in the earlier days of August, he subsequently became gradually weaker, and the question arose whether serum treatment would be of any avail, considering the obviously desperate condition of the patient. Dr. Cyril Ogle met me in consultation on September 5th. He agreed with my diagnosis, and was able to get a specimen of blood from the median basilic vein, which was at once mixed with sterilized bouillon and incubated not long afterwards. A pure culture of streptococci was found, and this was confirmed by Dr. H. Spitta, the Assistant Bacteriologist at St. George's Hospital.

Treatment.—Treatment by injections of antistreptococcus serum was at once begun (September 10th). Every other day 10 c.cm. were injected beneath the skin of the abdomen. The total amount used was 110 c.cm. in twenty-seven days. A solution (5 per cent.) of nuclein was also administered, in 1-drachm doses, by the mouth. The injections were always followed in a few minutes by a considerable quickening of the pulse and by feelings of faintness. On one occasion stimulants had to be freely given.

After-Progress.—The effect of the injections, after 30 or 40 c.cm. had been given, appeared to be most marked. The dry, cracked, brown tongue became moist and clean; the sordes disappeared from the teeth and fauces; the temperature on the day following the injection was considerably lower in the evening; food was well taken and a general improvement was manifest; the patient also said that he felt much better. The feebleness and rapidity of the pulse, however, remained a marked feature. Copious sweating often, but not always, followed the injections. No local inconvenience at all resulted from the injections. After the patient had had 100 c.cm. of serum the temperature became normal and remained so for seven clear days; the blood and all trace of albumen disappeared from the urine, but the pulse-rate did not diminish (120 to 130 per minute). Every effort was made to keep the heart stimulated, as it was thought that if the patient could rally from the past effects of the poison he might recover. Raw beef, parapeptone, plasmon and milk, strychnine and brandy were freely given and well taken. After the seventh day of normal temperature another evening rise took place, which was met by an injection of another 10 c.cm. of serum—for during the time the temperature had been normal the injections had not been given. The temperature again kept down for three days. The patient, however, was certainly weaker, and died quite suddenly on October 10th, after an illness of over two months. No necropsy was obtained.

Even although the result of the case was fatal, it seems worth recording for the following reasons: (1) That streptococci were definitely found in the blood, and that therefore the indication for treatment seemed clear; (2) that the serum undoubtedly did good, and certainly did no harm; (3) that if the treatment could have been begun in the earlier stages of the disease a good result might have been obtained.

Two series of serums were used. The second series seemed to have more effect than the first. This may be due to the fact that the second was more inimical to the particular kind of streptococcus in the blood, as I believe that Messrs. Burroughs and Wellcome, from whom the serum was obtained, prepare it from cultivations of mixed streptococci.

REMARKS BY DR. CYRIL OGLE.

Although with an unsuccessful result, I also think that this case worthy of being recorded, on account of the certain nature of the disease and of the organism associated with it. Dr. H. Spitta was so good as to make subcultures, and pure colonies of streptococci were obtained.

Many cases have been published of recovery under serum treatment from the gravest conditions of sepsis with living streptococci free in the blood stream; there are even a few where the same state of blood was most probably associated with valve implication, a condition which, one might say, would have been otherwise inevitably fatal, and one, no doubt, constituting a severe test of the value of the serum.

As regards the good effects in the present instance, Dr. Cooper is the more competent to speak, as he saw the patient once or twice daily; there certainly seems to have been an influence upon the temperature, and this, together with disappearance of discomfort, cleaning of the tongue, and increase of appetite, are fairly constantly observed in the accounts of this treatment by other observers.

It would have been of interest to have determined, by a second examination of the blood, whether the streptococci had disappeared when the temperature had been standing at a normal level for some days, as one is inclined to attribute the rather sudden death of the patient to exhaustion of the heart from free aortic regurgitation, combined with prolonged fever and poisoning.

Although the patient was extremely ill and very sensitive when the blood was taken for examination, the process did not apparently cause much more discomfort than an ordinary hypodermic injection.