Remarks

ON

"PYREXIA" OR "TRENCH FEVER."

BASED UPON TWELVE MONTHS' EXPERIENCE
WITH A FIELD AMBULANCE.By JOHN MUIR, B.Sc., M.B., Ch.B. GLASG.,
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MUCH has yet to be ascertained regarding the nature, cause, and means of spread of the numerous cases of short fever—as yet undefined, therefore unnamed—which have occurred and are occurring, amongst the troops on our Franco-Belgian front. Until more is known about the cause of the disease the question of its nomenclature had better be left in abeyance, but already several names have been applied despite our ignorance regarding many points concerning the disease. This may at first seem a very trivial matter, but a hastily-accepted "label" may seriously prejudice the consideration and study of later cases.

It is unnecessary to go into detailed description of the cases to which I refer, since that has been done recently in a most interesting and valuable contribution to the subject by Captain J. W. McNee and others in the *BRITISH MEDICAL JOURNAL* of February 12th, 1916. In so far as their conclusions are based solely on observation of cases admitted to a casualty clearing station, there will be found later in these notes some criticism of their views and difference from their opinions, since a large percentage of the cases which occur never reach a casualty clearing station.

The object of publishing the present notes is to put on record the special experience gained regarding those cases as seen in a field ambulance, and to register some deductions from the incidence of the disease in a division during twelve months of active service in the north of France.

In the ambulance concerned we have commonly classed the cases as "pyrexia," either unqualified or "of uncertain origin" (P.U.O.). We were quite aware that we thereby laid ourselves open to the charge of the old army days that "to make a diagnosis of pyrexia is a confession of ignorance"; indeed, that is largely why we make it.

The symptoms met with in practically all the cases are precisely those classically grouped as a definition of "pyrexia" from any cause, and nothing more. There is the general feeling of lassitude, headache, pains in back and limbs, flushed face, coated tongue, and, later, free perspiration; there is loss of appetite with constipation, at times very obstinate; pains are commonly most severe behind the eyes and in back of head and neck; the somewhat characteristic "shin pains" generally occur later; there is usually slight congestion of the pharynx, but little or no discomfort from it.

At one time—in August, 1915—a considerable number of cases developed severe urticaria, but this was probably an accidental coincidence. Absence of complications or sequelae other than atonic muscle (heart and other) has been a striking feature throughout.

Thus the symptoms are those of "pyrexia," and so far no other diagnostic, much less pathognomonic, feature has been pointed out.

The diagnosis or "label" is admittedly provisional and has at least the merit of being non-committal.

Before any case is thus classified as "pyrexia" or "P.U.O." careful search must of course be made for other signs or symptoms that may be present. If such are found and still no definite diagnosis be arrived at, the case would rightly be classed as "N.Y.D." (not yet diagnosed), or a provisional diagnosis made and qualified by an interrogation. To class any case as "pyrexia" without any such attempt at definite diagnosis, or in presence of additional signs or symptoms, is quite unjustifiable.

A certain percentage of error is unavoidable and must be allowed for in estimating total number of cases, such errors arising from hurried "labelling" or from the appearance of diagnostic symptoms after the case has left the field ambulance. So far as we have been able to ascertain such percentage of error is a very small one.

In the present notes no deduction is made from the total number of cases, but much stress is laid on the incidence of the cases relative to other factors affecting the troops. The import of the numbers being thus proportional, the deductions drawn are unaffected by a possible percentage error common to the series.

At first, before we became familiar with those cases, the majority came to us labelled "influenza," on account of their superficial similarity to some cases of that heterogeneous group previously met with in civil practice, and commonly, though very loosely, spoken of as "influenza." Some medical officers in charge of units still send in the cases so labelled, and a few advocate retention of the name.

Such nomenclature is, however, worse than "confession of ignorance": it expresses a bald error in diagnosis, for there are marked, if not very obvious, distinctions between these cases and true cases of influenza—a classical entity.

The two principal features differentiating the cases from influenza are (1) the absence of any symptoms of catarrh in the respiratory tract (or elsewhere), and (2)—probably allied to (1)—the absence of all complications such as so commonly follow attacks of influenza. In the early months of 1916 many cases came in with catarrhal symptoms in nasopharynx and bronchi, but those symptoms were, in practically all cases, pre-existent and the "pyrexia" was superimposed—a point to be remembered in considering the etiology of the disease.

In the article already referred to Captain McNee describes "two clinical types of the disease: (a) A short fever of about a week's duration, followed frequently after a few days by a short single relapse; (b) a longer illness, characterized above all by the number sharpness, and periodicity of the relapses."

Of the latter ("long") type we have, owing to our circumstances, practically no experience. In a very few cases relapses occurred while with the field ambulance or after return to duty, but on this occurring those cases were at once evacuated to a casualty clearing station, so that we had no opportunity to observe them further. Such relapses in cases treated with ordinary care have been extremely rare; although, as noted later, a relapse is readily provoked during several days immediately following the return of the patient's temperature to normal.

On the whole the cases treated to a conclusion in the field ambulance are of shorter total duration than cases of the "short" type as described by McNee. The range of temperature is commonly lower. McNee says "the fever varies in intensity, ranging up to 103° F. or 104° F. in the first day or two." Such a high range of temperature is altogether exceptional in our cases, 102° F. being the maximum in the vast majority of cases and 101° F. in a large proportion.

Both of these differences are probably due to the fact that the cases reach the field ambulance at an earlier stage and are saved the disturbance of the further transport to the casualty clearing station. A field ambulance in ordinary circumstances must maintain its mobility, and the retention or evacuation of a case is decided according to the prospect of an early or delayed recovery and return to duty. In certain circumstances of stress, existing or anticipated, all cases of sickness are evacuated at the earliest opportunity; but when circumstances allow an option, the milder cases likely to recover more quickly are retained with the ambulance, while cases threatening to be of longer duration are evacuated to the casualty clearing station without delay. Conversely, the casualty clearing station, unless in times of stress, will receive few of those milder and shorter cases.

At times, as when the division is in rest, all cases so far as possible are treated to a conclusion in the field ambulance; only specially prolonged cases or cases with serious relapse being evacuated. It is thus evident that experience at a casualty clearing station does not by any means embrace all the cases that occur.

As regards the course of the disease in any given case, much depends upon how soon the patient comes under treatment—that is, how soon he is admitted to a place where he can rest in comparative comfort. The longer a man is going about after his temperature has risen above 99° F. the longer will be the duration of his fever after treatment begins; and any disturbance during the early

days of his illness, or within the first few days after his temperature has become normal, will cause marked exacerbation or relapse of his temperature and accompanying symptoms.

This feature, common in a degree to most illnesses, is strikingly marked in this disease, and should be remembered when considering later the factor of fatigue in relation to the incidence.

McNee's suggestion that "the duration of the malady with its relapses may be inversely proportional to the severity and duration of the initial attack" is not borne out by experience of cases treated in the field ambulance. Amongst the "short" cases so treated without disturbance the probable duration of the attack may safely be estimated as directly proportional to the severity of the initial attack. This, of course, is not the whole question raised by McNee, but, so far as has been noted, relapses are not more common in cases with shorter and less severe initial attacks. The evidence on such a point is, however,

CHART 2.

admittedly incomplete, owing to considerations already stated, and it is with hesitation that even the above negative statements are made.

Charts 1 A, 1 B, and 1 C show typical cases as treated in a field ambulance: A and B are from cases admitted in early stages from infantry battalions; C from field ambulance personnel, therefore from first onset. The characteristic remission of temperature is shown on the third and fourth day, after which the temperature rapidly falls to normal again. After two normal evening temperatures such cases are usually allowed up for a little, in more severe cases proportionately later. For several days the temperature is registered morning and evening while the patient is allowed progressively more

CHART 3.

liberty, and usually about seven or eight days after admission the patient is transferred as convalescent or discharged to "light duty" if the circumstances of his unit are such as to render that possible in more than name.

Chart 2 is from a more severe case in a R.A.M.C. orderly—registered from the first day of illness.

Chart 3 is from the case of an infantry private admitted later in the course of the disease (fourth day of illness). The period of pyrexia is lengthened, and in such cases a longer convalescence is necessary before return to duty.

As already explained, owing to circumstances of local

military significance affecting the mobility or capacity of the field ambulance, many mild cases have to be evacuated sooner or later to a casualty clearing station, where they constitute the "short" type, described as occurring there, along with a

smaller number occurring amongst the R.A.M.C. personnel. The point to be remembered in comparing the type of cases seen in the two places is that the additional movement of the case, even in the comparative luxury of a modern motor ambulance, affects the course of the illness, directly aggravating the temperature and symptoms, and prolonging the total duration of the case. This doubtless accounts for the discrepancy of experience mentioned above.

Chart 4 shows the effect on the temperature chart of a patient moved with the field ambulance within two days of his temperature falling to normal after the typical remission. This is a common experience, and, to avoid it, such patients are preferably handed over for a few days to the relieving field ambulance.

Chart 5 shows a relapse due to the patient injudiciously, and owing to a misunderstanding, taking a bath too soon. This is no isolated case, but a typical result of too early exertion on the part of the patient.

Treatment.

Treatment mainly consists of rest and attention to the bowels, which are almost invariably constipated, sometimes obstinately so. Phenacetin, phenazonum, sod. sal., and acid. acet. sal. have been used to relieve pains in the head and limbs, and at times they have proved helpful in varying degree and order of preference. For the later shin pains, most troublesome at times, 10 grains acet. sal. at bedtime, and repeated if necessary two hours later, has proved a useful measure in most cases.

In cases seen at, or very soon after, the onset of illness the period of pyrexia has frequently been cut short and the patient's discomfort diminished by the administration of two powders, each consisting of morphine acetate gr. $\frac{1}{4}$, caffeine citrate gr. j, phenacetin gr. 8; one given immediately the patient gets to bed and the second two hours later.

This is admittedly mere symptomatic treatment and not reliable in every case, but its effect has been observed over several series of cases with parallel series of control

CHART 4.

CHART 5.—B. Bath at 2 p.m.

cases not so treated, and the beneficial effect is beyond dispute.

Charts 6 A and 6 B show the effect of this treatment on

CHART 6.—P. Powders containing morphine acetate, caffeine citrate, and phenacetin administered.

the temperature. In 6 A, from a comparatively mild case, the typical remission is not apparent, although the case was otherwise true to type; in 6 B, from a more severe case, the remission is slight and the after-course accelerated.

The patients themselves were in no doubt as to the beneficial effect of the treatment—evidence worthy of some consideration when so little can otherwise be done to relieve the patients' discomfort.

Prophylaxis.

It is astonishing to realize the total number of days of unfitness that have been caused during twelve months in one division by this comparatively mild disease, and prevention of even part of this would repay much time and labour. In the army it ought to be the first duty and aim of all the medical service to "keep the men fit." Towards that end the observations here recorded have been focussed while striving to get a clearer understanding of the disease and particularly of its etiology.

As a possible step towards elucidation a record has been kept of the incidence of the disease in the personnel of a division during a period of twelve months—March, 1915, to March, 1916.

By analysis of the "Admission-and-Discharge" books of each of the three field ambulances of the division the total number admitted from the division as suffering from the disease during each week of the above period has been obtained. From these figures a chart or graph has been constructed (Fig. 7). Its main interest appears when it is considered in relation to the disposition and occupation of the troops of the division at different periods.

For the first two months of the twelve under consideration there was a relatively low incidence of the disease, even if allowance be made for a percentage of cases escaping true classification. During that time the division was variously employed—in sections undergoing instruction, in reserve, or taking part in several so-called "small shows"; but it was not until June that the division was kept as a whole in the trenches for any length of time.

After those early months, however, on looking at the completed graph one's attention is arrested by the successive maxima of incidence occurring in July–August, October–November, and January–February, with the marked intervening minima.

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The first climax is not so marked; this is to be accounted for by the fact that periods of stress and rest were not at that time so clearly defined and separate. Despite that modification, however, this early and protracted maximum agrees in its features with the two later which are sufficiently striking in character.

Each of these maxima of incidence is found to correspond to the later days of a prolonged and trying spell in the trenches. The division in each case had been depleted in numbers by casualties during the earlier weeks of the spell, and increasing strain was thus thrown on the remaining effectives, who became progressively more fatigued as the time passed.

The marked and rapid decrease in incidence which succeeds each maximum corresponds to the withdrawal of the division into "Corps Rest Area," an area occupied by troops during such time as they are withdrawn from the trenches. During that term the men were placed in comparatively comfortable billets; and though they were not exactly allowed to remain idle, they were removed from the constant strain and exposure of the further advanced positions.

There is no evidence whatever of the influence of any special type of weather conditions on the incidence. During the period leading up to the first maximum, the weather was very hot, dry, and dusty; during the second period rain fell almost daily, usually in torrents; during the third period it was wet and cold in the earlier weeks

and later dry and frosty. Severe weather of any kind would have some influence by increasing the effects of the exposure to which men were subjected, but only thus indirectly. The only factors common to the three periods were the extreme strain and exposure in the trenches or of other activities necessarily associated with "holding the line."

At first sight this might seem to justify the term "trench fever" as applied to the disease in question, but from later notes the fallacy of this assumption will be realized.

The incidence in the last period of "Corps Rest," in February–March, 1916, is most interesting in this connexion. During that period the first week "in rest" shows the expected drop in the curve, but this is not maintained, and the appearance of the unexpected rise is explained by the following circumstance.

After the first week a scheme of "Brigade training" was entered upon, and each brigade went in turn for a week to a training area where a strenuous course of manoeuvres was carried through. This involved heavy marching and other special exertion on the part of officers and men, and this work was carried out in very severe weather, with frequent—almost daily—snowstorms.

The combined graph shows for the division during this period an increased incidence as compared with former periods of "rest," but the increase is really greater than the graph makes evident, for each brigade was affected separately and successively; thus the increase due to the

CHART 7.—Weekly numbers of cases of "pyrexia" admitted to the three field ambulances of a division for a period of twelve months.

CHART 8.—Number of cases for each brigade separately during week of training.

one cause acting in each case for a week is shown spread over three weeks. Each brigade having had one ambulance attached to it for the period of rest, it is possible to record the incidence for each brigade separately, as in Fig. 8. Each brigade shows a distinct maximum of incidence whilst it was under the strenuous training.

From former periods of "rest" a normal average incidence may be assumed; a third of this number will represent the average for each brigade. If for the period in question the excess of actual incidence in each brigade over this average be calculated and the three excesses be combined, a figure will be obtained which would represent the excess of incidence over the average for the division had the three brigades been affected simultaneously.

This estimated maximum is shown in broken line on the larger graph (Fig. 7), and shows in true proportion the effect on incidence of the conditions under which the troops were at the time.

The billets had not been occupied by troops recently, so that endemic infection was very improbable.

The increased incidence corresponds exactly to that observed when the division was "in the trenches," and yet the men were completely away from the trench area. The conditions common to the two situations were those of extra exertion and exposure, jointly productive of fatigue, but most of the special conditions of trench life were absent from the training area.

This demonstrates the fallacy of applying to the disease the term "trench fever." The term would imply that the disease depended upon some virus indigenous to the trenches, and that the disease was endemic there, or that it depended upon conditions inherent to the trenches and limited to that area.

The term thus expresses a generalization that is far from absolutely true and suggests a limitation of incidence that is very misleading, as will be further shown in the following notes. In Captain McNee's article, already quoted, it is stated regarding distribution of the disease, that from casualty clearing station experience:

The cases have been met with, curiously enough, only among two classes of men, namely, those direct from the trenches, or at least from near the trench zone (artillerymen, etc.), and men of Royal Army Medical Corps. On looking into our records no real exception can be found to the above generalization. Thus, in our experience, only those who have actually lived in or near the trenches, and those who by reason of their work are constantly in contact with sick and wounded men from the firing line, have suffered from the disease. This seems important in searching for the means of transmission of the malady, and shows, at any rate, that the name "trench fever" is not without some justification. No case has been met in units such as ammunition columns, ordnance, head quarters troops, etc., which, although in the army area, are situated at some distance from the lines.

Unfortunately for the inferences drawn, the experience upon which they are based is an incomplete one, and the above statement of the limitation of the disease is not borne out by the more inclusive experience of cases as seen in a field ambulance.

It must be remembered that practically all cases are first admitted to a field ambulance, but that not all such cases are sent on to a casualty clearing station. From the "Admission-and-Discharge" books of the field ambulances of a division it is found that only 55 per cent. of the cases admitted are so evacuated. The experience in the clearing station is thus confined to a percentage only of the total cases, making it a somewhat risky datum upon which to base a sweeping generalization, and the selection of cases as explained below makes it more than risky.

Attention has already been drawn to the circumstances governing such selection, but repetition may be excused to explain its bearing on the point in question. Whilst a division is in action the field ambulances are situated so as to serve most conveniently all the various troops which may be scattered over a somewhat large area.

One of the three ambulances (possibly two) is placed as far forward as safety and convenience allow, the primary duty of this ambulance being to receive and deal with wounded from the trenches and other advanced positions.

If only one ambulance be "up," a second is placed conveniently to receive and treat sick from the various units of the division. If two ambulances be "up," each will receive its share of sick as well as wounded.

The third ambulance is held "in reserve"—more or less

literally according to circumstances, but normally it will be "open," at least partially, to receive sick transferred from the more advanced ambulances, and direct from units situated further behind the firing line—in the area sometimes spoken of as the "reserve area" of the division.

The advanced ambulances, concerned mainly with wounded, do not retain any cases for longer than a few days at most, and, on account of the uncertain incidence of casualties, accommodation must always be held in reserve, so that as a rule very few, if any, sick cases are retained, but are transferred at the earliest convenient opportunity, usually to a casualty clearing station or possibly to the reserve ambulance. The remaining ambulance, situated further from the firing line, is, on the other hand, mainly designed for and concerned with the reception of sick, and receives its cases from units in the "reserve area" of the division, precisely those units—"ammunition columns, ordnance, head quarters troops, etc."—from which the casualty clearing station is reported to receive no cases of so-called "trench fever."

From such units cases of the disease under consideration are admitted in numbers by no means negligible in comparison with the strength of the units concerned, though the proportional incidence is probably lower than in units situated further forward in what may from this point of view be termed the more strenuous area.

On account of the situation and correspondingly more elastic accommodation of this reserve ambulance, there is not the same necessity for immediate or wholesale evacuation, and consequently a large number of the cases received are retained and treated till fit for discharge to a convalescent rest station or to light duty. The cases received from the nearer units—those of the "reserve area"—are, further, the most likely to be retained, since such cases are, as a rule, proportionately milder on account of earlier admission and the shorter and less fatiguing transport necessary to reach the field ambulance. That a casualty clearing station receives very few cases from those units in the "reserve area" is explained by the above circumstances, although it seems hardly possible that many such units are in a position to state that "no cases have been met with."

The fallacy of the quoted generalization is obvious, and this takes away all strength from the suggested plea of justification for the term "trench fever." The term has inherent drawbacks, and its use seems, on the whole, inadvisable, despite its convenience.

To venture a short way towards hypothesis, it may be said that the disease would seem to be due to some infecting agent ubiquitous in its distribution, and most probably borne on or in the human person (nasopharynx?), the determining factor of incidence being the condition of the individual as affecting his power of resistance.

Hence towards the end of a long spell in the trenches, with its inevitable fatigue and exposure, the men individually and collectively tend towards a condition favourable to the onset of the disease. The factor of defence is the deciding factor, not so much that of attack. Such effect is cumulative, for as earlier cases are evacuated greater strain is thrown on the men remaining, and the incidence rises to a climax, as well shown in the graph in Fig. 7.

This cumulative effect is increased further by the fact that, as in similar cases, the virulence of the virus becomes accentuated by its success, and contagion becomes more probable and widespread so long as the other conditions remain unchanged.

Change of those external conditions by removal of the men to a less exacting and more comfortable environment is at once followed by a marked decrease in the incidence of the disease.

Where cases are aggregated, as in the wards of a medical unit, the contagion is correspondingly concentrated; hence the cases amongst R.A.M.C. personnel, and also accidentally at times amongst patients admitted for other ailments.

At first sight this high incidence in the trenches and decrease on withdrawal of the men from the trenches might seem to justify the name of "trench fever," but as pointed out, the disease undoubtedly occurs amongst men who are practically never in the trenches, and the increased

incidence may appear under suitable conditions far removed from the trench area.

As to conveyance of the disease there is much to suggest, and nothing to contraindicate, direct contagion from man to man, the most probable route being nasopharyngeal, although no direct positive evidence of this has as yet been produced.

Flies or parasites may convey the infection, and lice have been specifically blamed, or rather suspected, by many competent observers. Much experimental work, however, of a far-reaching and exhaustive nature has yet failed to produce positive evidence of conveyance by any of these means.

As regards lice, these pests are unfortunately so ubiquitous among the troops that it is difficult to settle the question by direct observation. In a small percentage of cases the absence of lice was practically certain, so that unless, and until, positive evidence be produced of the conveyance of the disease by this means it is certainly most inadvisable to employ a term, such as "lice fever," which, to say the least, definitely assumes an uncertainty.

If a temporary name were necessary for the disease, the term "fatigue fever" might fit the facts so far as known, but as that term was employed by Sir William Aitken many years ago it might be misleading.

In corroboration of this suggestion it is of great interest to quote a report recently submitted by the medical officer of a battalion in a division separate in its activities from the division in which was gained the experience upon which the foregoing remarks are based. The report was drawn up on a request to explain the excessive incidence of sickness in the battalion towards the end of a long spell in the trenches. Among other points of minor interest the R.M.O. reports:

(a) Chief ailments—Fever N.Y.D. (not yet diagnosed), 75 per cent.

(b) In my opinion excessive incidence is due entirely to overwork, excessive strain and exposure, and lack of rest.

At times such excessive strain, exposure, etc., is doubtless inevitable, and at such times the excessive incidence of this disease may be the necessary price to be paid under present conditions of warfare. It is well, however, that the fact should be recognized even though it may remove possible prophylactic measures from the immediate sphere of the medical services.

CONCLUSIONS.

There is little to summarize in the foregoing remarks, as they are discursive in nature, and distinctly contributory in intention rather than conclusive; but attention may be focussed on the following points:

1. The nature and mode of conveyance of the infective agent producing the numerous cases of "short fever" met with in our troops are still unknown, and merit further observation and research.

2. The term "trench fever" is distinctly misleading, and is not justified by analysis of the total number of cases which occur in the various units of a division and under varying conditions. Cases occur in considerable numbers in units situated outside the "trench area," and markedly increased incidence is met under suitable conditions whilst the troops are far removed from the trenches.

3. Such inclusive experience can only be gained in a field ambulance, as all cases are primarily brought there, and many (about 45 per cent.) are not transferred to any other medical unit.

4. The name "lice fever" is also objectionable, since it assumes as a fact a possible means of conveyance which at present is merely a hypothesis.

5. The infective agent is probably a widespread virus borne on the persons of men concerned (nasopharyngeal?) normally of low virulence.

6. Incidence of the disease depends upon the condition of the men, whose defence against the infection is specially lowered by exposure and fatigue.

Thanks are due for facilities and assistance in compiling the above notes to Colonel Ferguson, D.S.O., A.M.S., and to Lieutenant-Colonel Jerman, Lieutenant-Colonel Dawson, and Major Rutherford, R.A.M.C.T.

This does not imply their acquiescence in the views expressed, which, in any case, are entirely tentative.

The writer is keenly aware of the incompleteness of the observations, but is prevented by an unfortunate accident from pursuing them further. In the hope, however, of stimulating discussion, however adverse, the notes are published.

A CASE OF ACUTE MYELOBLASTIC LEUKAEMIA.

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The following case of acute myeloblastic leukaemia presents some points of interest.

A naval officer aged 40 came under my care on August 9th with the following history. As a child he had been delicate. Some years ago after joining the service he had malaria, and in 1913, whilst living in South Africa, had haematuria. He rejoined the service at the outbreak of war, and had fair but not robust health until the onset of the illness which was the cause of death. Towards the end of July, 1916, he consulted his dentist about a tooth which was troubling him, and on July 28th the tooth was extracted and some pus was evacuated from the socket. There was no excess of haemorrhage from the socket, but the same day diarrhoea commenced with motions every three or four hours, the stools being very offensive, and containing at first bright red blood, and later blood of a dark brown colour. The diarrhoea, though later not so urgent, continued until August 8th. On August 6th vomiting set in, and lasted until August 8th. When first seen by me, on August 9th, the patient was very weak and markedly anaemic. There was nothing of note in the condition of the heart, lungs, or nervous system. The abdomen was much distended, but there was no tenderness. The liver extended 5 in. below the costal margin in the right nipple line, and the spleen could be felt 1 in. below the costal margin at the end of inspiration. The teeth had many gold crowns, the gums were clean but pale. The urine was acid, specific gravity 1014, and contained a trace of albumin, but no sugar, albumoses, casts, cells, or blood. The glands in the right posterior triangle of the neck were about the size of haricot beans. Those in the left posterior triangle, in the groins, and in the axilla were just palpable. There were no swellings about the long bones, nor was there any tenderness on percussion. Examination of the blood gave the following results:

Red cells, per c.mm.	1,670,000
White cells, per c.mm.	431,000
Haemoglobin	40 per cent.
Colour index	1.1
Differential count of 500 leucocytes:	
Polymorphonuclears	2.2 per cent.
Small lymphocytes	1.8 "
Large lymphocytes	0.6 "
Eosinophile myelocytes	0.4 "
Myeloblasts	95 "

The red cells showed little alteration in size or shape. A few nucleated reds, a few Riedel cells, but no mast cells, could be seen. The cells which I have designated myeloblasts were large mononuclear cells with a purple-staining nucleus (Leishman), the structure of which was loose, many containing two or three nucleoli. The cytoplasm stained blue, and was distinctly granular.

No vomiting or diarrhoea occurred after the patient came under my observation, and a normal-looking stool was passed after the administration of an aperient. The temperature varied between 99.2° and 102° F. from August 9th until death. Considerable oozing into the subcutaneous tissues followed a hypodermic injection.

At 9.30 p.m. on August 12th epistaxis commenced, and lasted until 10.15 p.m. About midnight the patient gradually became unconscious, the breathing became stertorous, the epistaxis recurred, and at 2.15 a.m. on August 13th he died.

POST-MORTEM EXAMINATION.

Lungs.—Both were united by thin filmy adhesions over the whole of their external surfaces to the surrounding structures. On section they were pale in colour, but otherwise apparently normal.

The **thymus** was atrophied.

Heart.—Was slightly enlarged. Beneath the serous covering of the heart, especially over the ventricles, were multiple plum-coloured petechial haemorrhages. On opening the cavities much pale-coloured clot was found. Beneath the endocardial covering of the walls of the ventricles were many small haemorrhages, more especially in the right ventricle. The muscle was paler than usual. The valves and aorta were normal.

Liver.—Was united by filmy adhesions to the anterior abdominal wall and diaphragm. Weight 90 oz. On macroscopic section it was somewhat pale and had a slight nutmeg appearance.

Spleen.—Weighed 13½ oz. It was united by filmy adhesions to surrounding structures, and on the convex surface was an area 3 in. in diameter of marked perisplenitis uniting the spleen to the diaphragm. On section the Malpighian bodies seemed unduly prominent.