

A STUDY OF THE HAEMATOLOGY OF TRENCH FEVER

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WHEN the disease now commonly known as trench fever was first recognized in the British Expeditionary Force the regularly relapsing character of the temperature charts suggested that the cause of the condition might be found in an examination of the blood.

McNee and Renshaw (1) in an experimental study of the disease were the first to prove that the infecting agent, whatever its nature, was present in the circulating blood. Their observations, confirmed in all essential particulars by other investigators, stimulated research wherever the disease was met with, and during the past two years the causative organism has been sought in blood films by very many observers.

Opportunities have arisen during the investigation of trench fever carried on during the past few months under the auspices of the Trench Fever Committee in France for a careful examination of the blood at all stages of the disease.

It has been possible to retain cases under observation for a period of several weeks, a condition favouring research, which, for many reasons, has been impossible for other workers.

In this investigation endeavours have been made (1) to identify the causative organism in films; (2) to study the morphology of the blood elements during the disease; (3) to determine by repeated enumeration and differentiation of the cells present in the blood during the various phases of the disease whether or no there exists a blood picture characteristic of the disease or of diagnostic significance.

In the examination of blood films several methods of staining have been employed, but as a routine measure Leishman's stain has been adopted.

Cells have been counted on a Thoma Zeiss stage and haemoglobin estimations made with a Gower's apparatus. The latter, as an instrument of precision, leaves much to be desired, but in the absence of facilities for procuring coal gas, was the most accurate obtainable.

Blood films from several hundred cases have been examined and the blood count has been carefully followed through in over fifty. The counts in the latter cases have always been made at the same hour of the day (11 a.m.–12.30 p.m.), and have been repeated as often as possible—daily in many cases.

The examination of blood films has so far thrown no light on the aetiology of the disease.

From time to time several observers have claimed to have found in them

organisms to which they have attributed an aetiological significance. Reimer (2) is credited with having described a spirochaete in the blood; Jungmann and Kuczynski (3), using Giemsa's stain, have observed dumb-bell shaped organisms; Dimond (4), the flagellates he described as haemogregarines, and Pappenheimer small discoid bodies.

Of the organisms mentioned above, Dimond's flagellates are the only ones that have been recognized during this investigation. In Ross films laked with distilled water they have frequently been met with, but they also are found in similar films of normal blood. They play no part in the causation of the disease and, as was shown by Henry, their occurrence in films can be explained by their presence in the distilled water employed in their preparation.

A study of the morphological changes observed in films has contributed nothing which can be considered of diagnostic importance.

One of the most striking characteristics of the blood in trench fever, especially of films taken during a relapse, is the presence, often in great numbers, of the *corps en demi-lune* described in association with this disease by Renaux (5). They are not peculiar to trench fever but occur in other conditions associated with high fever. They have been found during this investigation in blood taken for control purposes from patients suffering with pneumonia and have also been described in association with malaria.

Punctate basophilia of the red corpuscles has been described by McNee and Renshaw as a constant feature of the blood in this disease. They associate its incidence with the anaemia which accompanies the condition. It has been noted in only a few cases of those dealt with in this communication, and therefore as a diagnostic feature must be considered to be of but little value. In a much larger proportion of cases very large pale red corpuscles are found. In films stained with Leishman's stain these have a yellowish colour.

No attempt has been made to enumerate the blood platelets, but a very definite impression remains that they are increased both in number and size. This increase appears to be most pronounced during the febrile periods. There is nothing which peculiarly characterizes the leucocytes in this disease, but in many cases associated with high fever the nucleus of the polymorphonuclear cell has appeared to be unusually lobose. Attention has been called by others to the anaemia which accompanies trench fever.

In the present investigation, cases in the early weeks of the disease are alone included. At this period anaemia is not clinically a recognizable symptom, but an enumeration of the red cells and an estimation of the haemoglobin confirm the observations of McNee and Renshaw, who found a definite defect in the percentage of haemoglobin, but no loss in the number of red corpuscles. In this series the red count has averaged five and a half million corpuscles; a percentage of haemoglobin below eighty has never been recorded—a common average is ninety.

It is difficult without burdening this communication with much detail to place on record all the results of the blood counts made during this investigation.

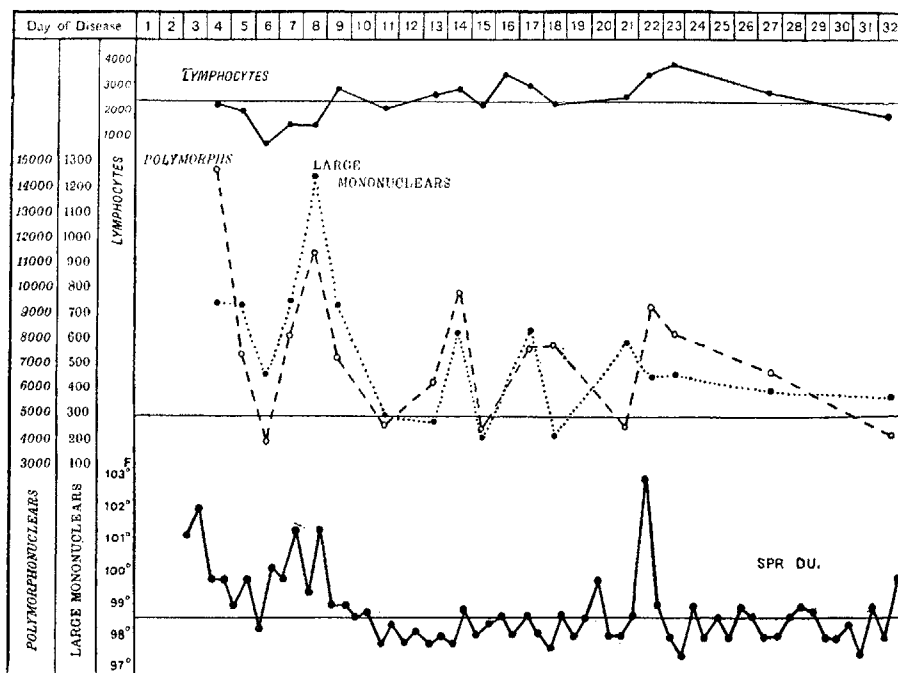


CHART 1. Spr. Du. Age 29. 2-8. Severe pains, with pink eyes. 9-11. Felt better. 12-20. Considerable pain. Bad in shins on 14th day. 21-26. Pains occasional. 27-29. Headache. Nystagmus and pink eyes. 30-32. Rather better. Pulse followed temperature and kept low. Spleen felt from admission to evacuation 48th day.

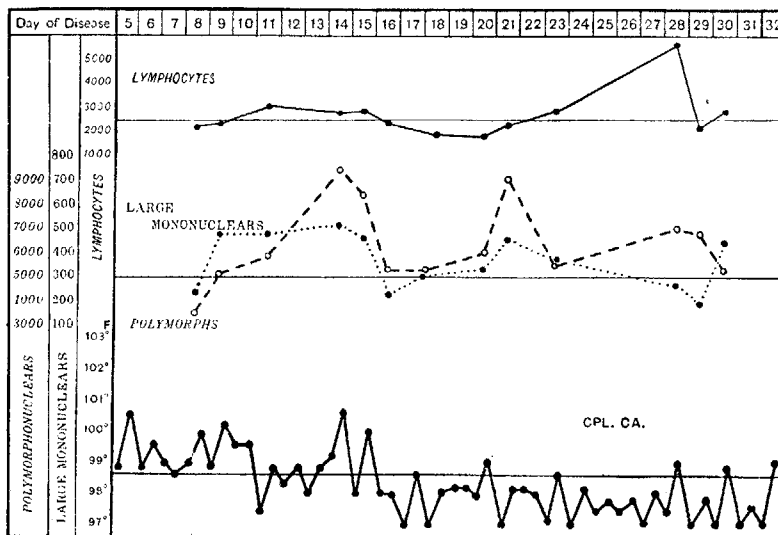


CHART 2. Cpl. Ca. Age 25. 5-8. Pains in shins. 9-10. Felt well. A few spots each day. 11-13. Felt well. 14-15. Return of headache and pain in shins. 19-27. Feeling very well. 28. No pains.

The pulse was irregular. It varied closely with the temperature till 16th day, when it rose to 90 in the evening. Thence onward it varied from 72 to 100.

He got up for a few hours first on 24th day. The spleen was palpable from admission to 33rd day. Discharged 42nd day.

Twelve illustrative cases have therefore been selected and the results have been presented in chart form.

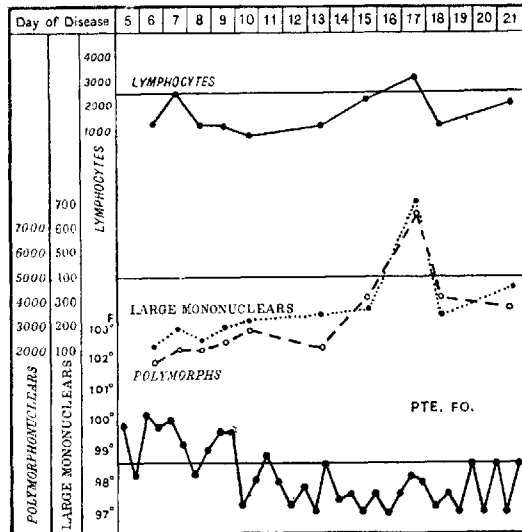


CHART 3. Pte. Fo. Age 25. 5-6. Shin pains and backache. 7-8. Felt better. 9. Headache, pain in back and legs. 13. Pain in back and thighs. 17. Pain in back and hips. 18-21. Pains better. Feels and looks better. The pulse followed the temperature until 16th day, when it rose over 80 and lay between 80 and 90 until 22nd day. Spleen palpable from admission to 27th day. Discharged 50th day.

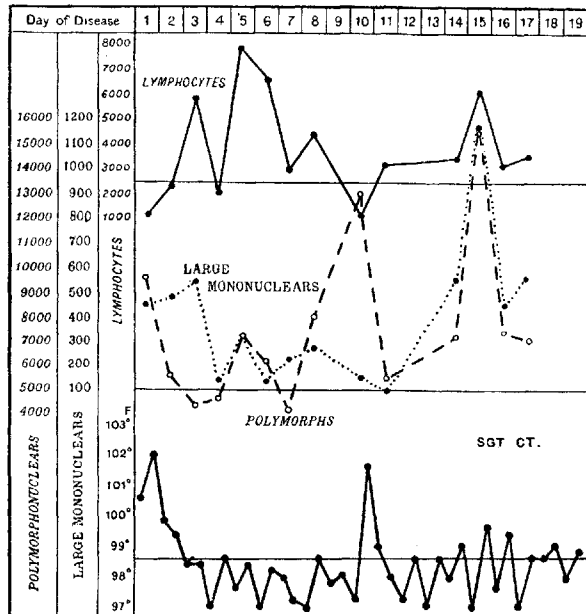


CHART 4. Sgt. Ct. Age 28. Spots seen on admission 7 hours after onset. 4-9. Felt perfectly well.

These charts depict fluctuations as they occur in three types of leucocytes only, viz. in the polymorphonuclears, the lymphocytes (including both large and small varieties), and in the large mononuclear cells.

Except in a few cases, to which reference will be made later, the other cells of the blood—the transitionals, the eosinophils, and the basophils—showed but such slight variations that all record of these has been omitted.

The numbers of cells of two out of the three types represented are charted, about a separate normal line for each kind of cell.

This line for the polymorphonuclear cells represents a count of 5,000 cells per cmm.; for the lymphocytes 2,500 per cmm.

At the foot of each chart is a record of the temperature during the disease.

In the note the date-numbers refer to the day of the disease.

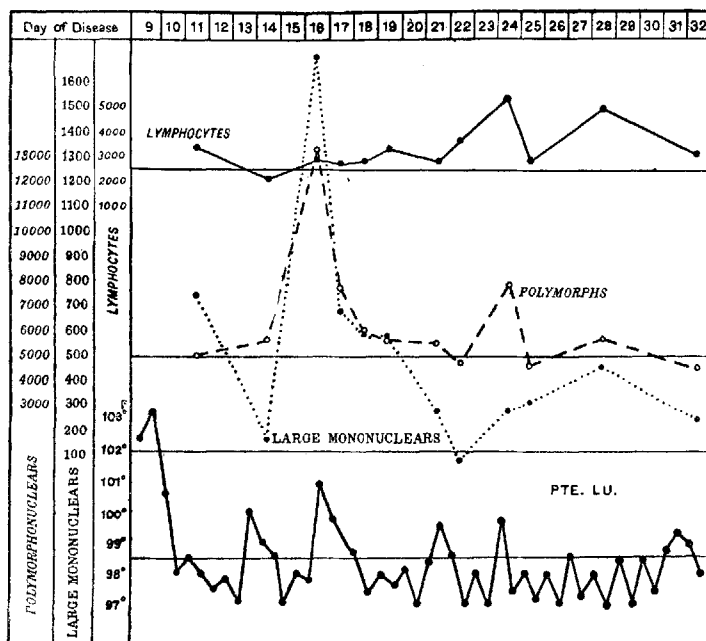


CHART 5. Pte. Lu. Age 28. Admission 9th day, probably in relapse. Pains till 13th. 15. Feeling well. 16-18. Bad pains. 22. Head pains. Vomited. 23. No pain. 24-26. Slight pain. 29. Pains. Spots, which returned afresh 30th, 32nd, and 33rd days. 30-32. Headache but no other pain. Headache and pains finally ceased on 43rd day. There was some tachycardia from 23rd day (while still in bed) till 47th day. The spleen was felt from admission to 13th, and from 17th to 20th days. Discharged 52nd day.

A study of the blood counts recorded during this investigation apparently justifies the following conclusions:

1. Generally speaking the disease is associated with a leucocytosis.

The polymorphonuclear cells and the lymphocytes are nearly always present in more than normal numbers; very occasionally, during an afebrile period, their number may be diminished.

2. There is, as a rule, a marked rise in the number of leucocytes present in the blood at the time of a febrile relapse. This rise sometimes precedes the fever, sometimes accompanies it, sometimes follows it.

3. Occasionally there is a similar rise in the number of leucocytes without

any corresponding rise in temperature. This rise suggests a relapse and is frequently associated with an exacerbation of the patient's symptoms.

4. Subject to exceptions which occur in but very few instances, there is during a febrile period a simultaneous increase in number of both the polymorphonuclear and lymphocyte cells. Relatively this increase is greater in the case of the polymorphonuclear cells than in that of the lymphocytes.

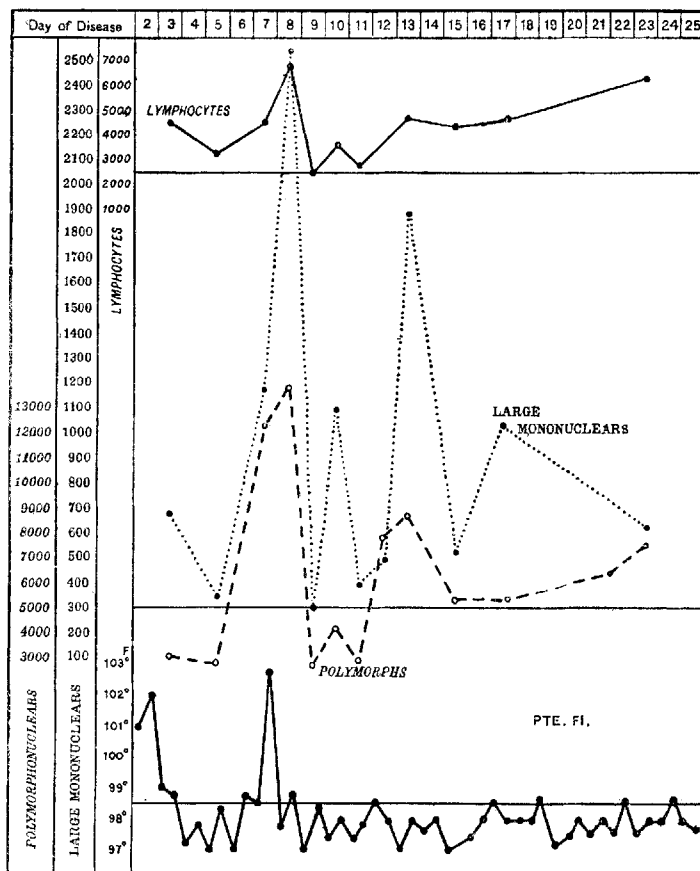


CHART 6. Pte. Fi. Age 19. 4-6. No pain. Felt well. 7. Chills. Headache. After this he felt quite well. Spots seen on 14th day (leucocytosis). Pulse-rate below 80 9th-13th days, rose to 80 14th-16th, over 80 19th-21st days. Spleen felt from admission to 19th day. Discharged 31st day. A slight case.

5. During convalescence the number of lymphocytes present in the blood relatively increases.

6. Variations occurring in the number of the large mononuclear cells closely correspond with those affecting the polymorphonuclear and lymphocyte counts.

With reference to the cells of the blood not included in the charts, the transitionals and the basophils present no marked variation from a normal standard.

In a few cases a pronounced eosinophilia has been met with, the number of eosinophils present varying greatly from day to day. No cause could be assigned for this condition nor for the marked fluctuation in numbers which accompanied it.

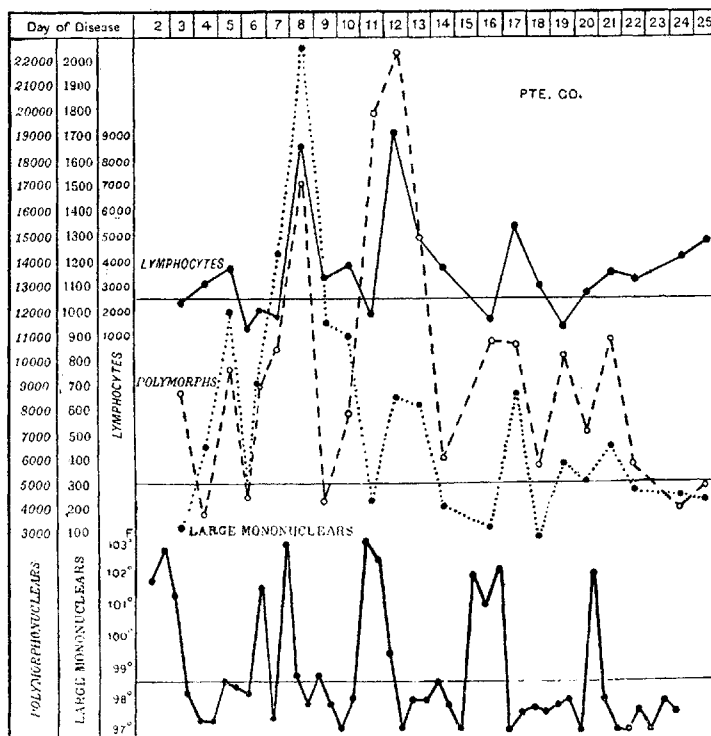


CHART 7. Pte. Go. Age 19. 2-6. Pains. 7. Felt well. 8-9. Headache. 10. Felt well. 11. Headache. Spots. 12-14. No symptoms. 15-16. Headache. Spots on 15th day. 17-18. Felt well. 19-20. Headache. Spots on 19th day. Hyperalgesia 10th D. root-zones on 20th day. 21-23. Felt well. 24. Headache. 26. Felt well. 29. Discharged.

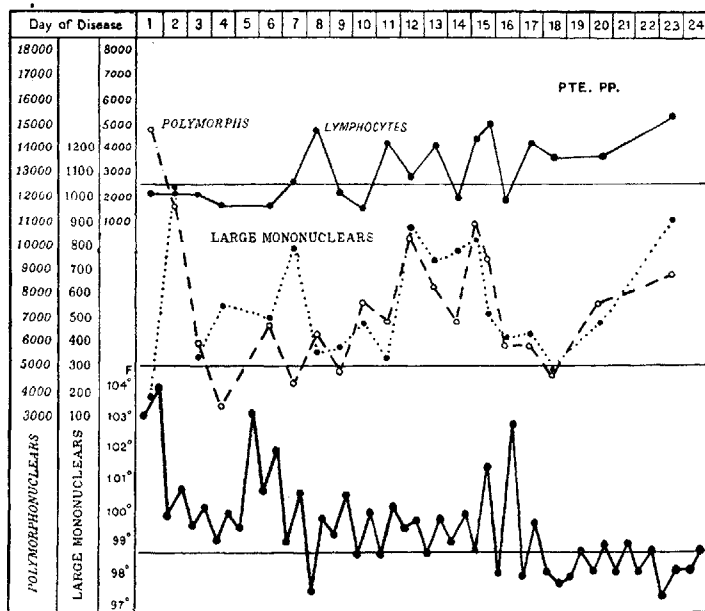


CHART 8. Pte. Pp. Age 23. Fever with irregular relapses lasted 17 days. Spots were seen on the 2nd and 14th days. Nystagmus on the 11th and 15th-18th days. After this, though there was no fever, he complained repeatedly of pain, and nystagmus lasted with occasional intermissions to the 29th day. The pulse followed the temperature. The spleen was felt on 3rd-7th days. Discharged 39th day. A severe case.

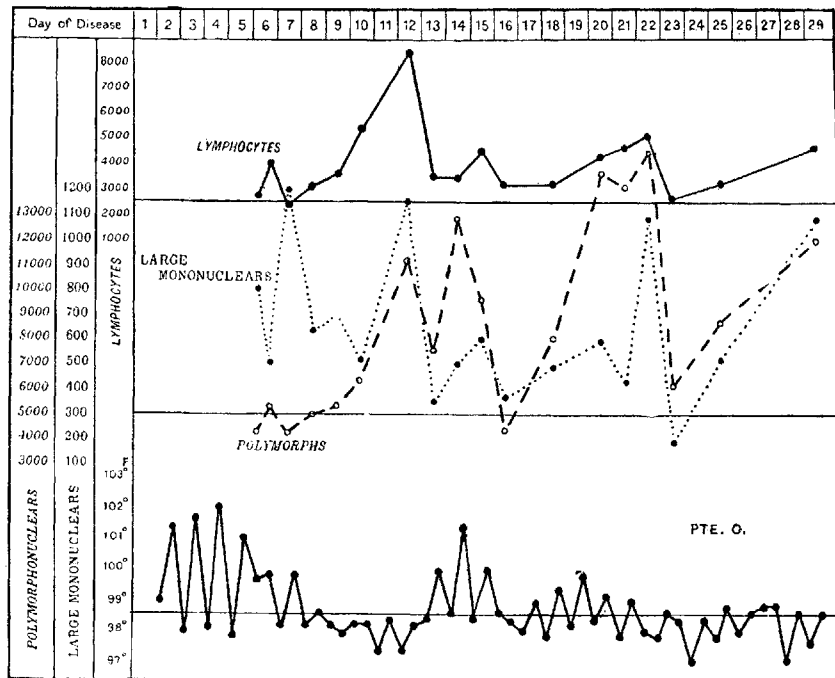


CHART 9. Pte. O. Age 30. 1-6. Nystagmus and shin pains 7-13. Felt well with occasional slight pains, until afternoon of 13th day, when symptoms occurred. 13-21. Pains almost every day. 22. No pains. The pulse followed the temperature. Spleen felt from admission to discharge 51st day.

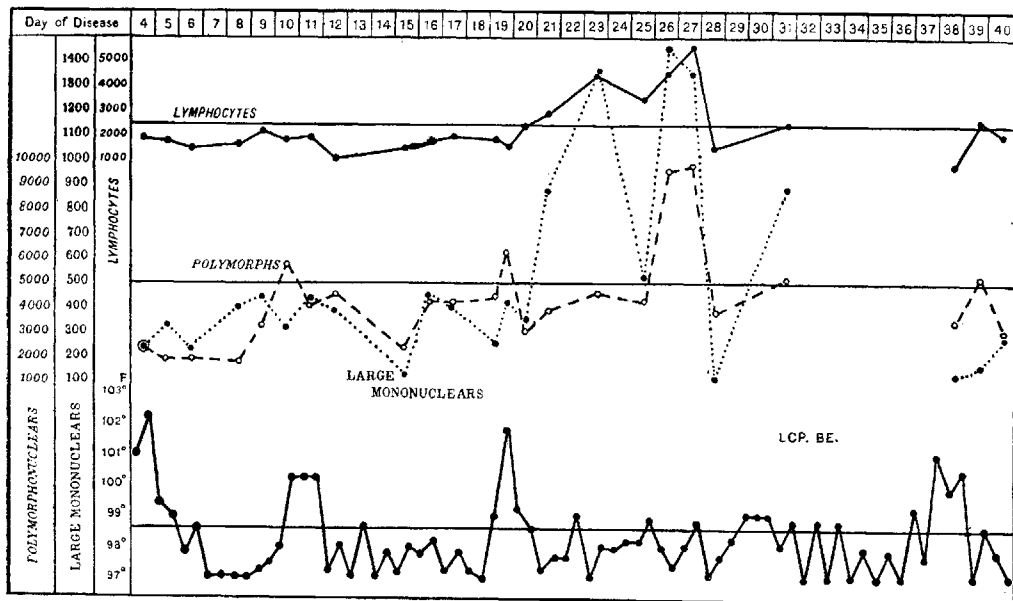


CHART 10. Lcp. Be. Age 22. 4. Pains. 5-9. No symptoms. 10-12. Headache. Nystagmus on 10th, spots on 11th day. 13-15. No symptoms. 16. Hyperalgesia 10th D. root-zones. 19. Headache and pains. Spots. Nystagmus, which lasted till 23rd day and returned on 25th and 28th days. 20-27. No symptoms, but nystagmus. 28-31. Pains. 36-38. Headache and pains. The pulse followed the temperature. The spleen was felt from admission to 33rd day, and again 38th-44th days. Discharged 68th day. A severe case.

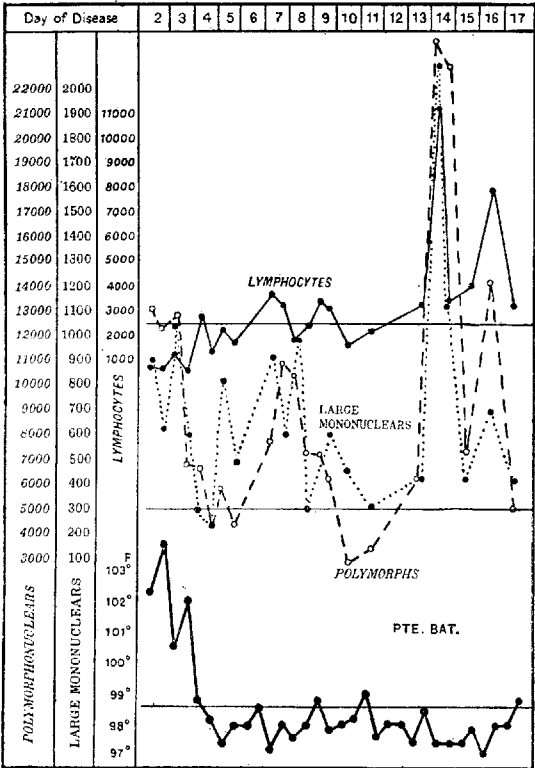


CHART 11. Pte. Bat. Age 23. 2-3. Pains. 4-5. Better. 6-9. Slight pains and headache. 10. No pain. 11-13. Headache and pains. 14-20. Still slight pains. No cause obvious for great leucocytosis. 21. Felt well. The pulse was low throughout. The spleen was felt from admission to 15th day. Discharged 39th day.

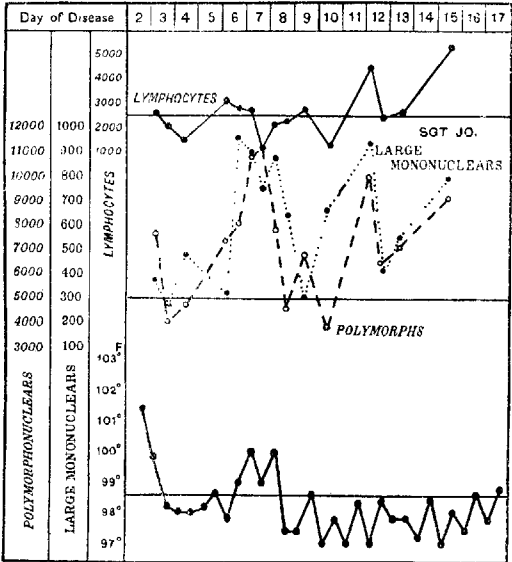


CHART 12. Sgt. Jo. Age 24. First bout ended 3rd day. 5. Pains returned and lasted till 10th day. Nystagmus on 7th and 8th days. 12. Feeling well. 14. Headache and slight nystagmus, which lasted over 15th day. The pulse-rate was low, 70-80 after the 5th day. The spleen was felt from admission to 20th day. Discharged 41st day.

Conclusions.

1. There is no appearance in blood-films which is characteristic of the disease.
2. A single enumeration and differentiation of the leucocytes is often of value as a means of diagnosis from enteric, but cannot afford any reliable evidence that the disease present is trench fever.
3. Repeated counts carried on through the various phases of the disease produce a composite picture which, though not without exceptions, is so constant that it may be considered characteristic. It consists in the combination of the following features :
 - (a) A marked rise of leucocytes of all three kinds (polymorphs, lymphocytes, and large mononuclears) at the time of a febrile relapse.
 - (b) A gradual relative rise in the lymphocytes during the period of convalescence.

REFERENCES.

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3. Jungmann, P., and Kuczynski, M. H., *Zeitschr. f. klin. Med.*, Berl., 1917, lxxv. 251-272.
4. Dimond, *Lancet*, Sept. 8, 1917.
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