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President — Sir HUMPHRY ROLLESTON, K.C.B., M.D.

OCCASIONAL LECTURE.

Medical Experiences in Macedonia and the Caucasus.¹

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IN no other war area can there have been greater wealth of clinical material from the physician's point of view than in Macedonia and the Caucasus, and in this lecture I shall endeavour so far as time permits to give an account of some aspects of the medical work, which was throughout of absorbing interest. The only drawback was the difficulty, owing to stress of work, of making continued observations on a systematic basis, and I must ask the indulgence of the Society for the fragmentary nature of the records in many of the cases I shall have occasion to quote.

The accommodation in the base area for British sick during the summer of 1918 comprised fifteen general hospitals, most of them containing 1560 beds, a few with 2000 beds. In the preceding summer the number of hospitals was nearly as large, additional hospitals having been provided when it became necessary, owing to the difficulties of sea-communication, to modify the policy of evacuation on a large scale to Malta. The large number of beds thus provided was none too great, and often patients had to be discharged to convalescent depots earlier than one would have wished in order to maintain the necessary reserve of empty beds for fresh convoys. The hospitals and convalescent depots were situated away from the town, by the sea or among the hills, in comparatively healthy surroundings. A group of four hospitals, three

¹ At a meeting of the Society, held March 26, 1920.

of which were huddled, were placed at Kalamaria, on a low promontory, about 8 km. from "Piccadilly Circus," the centre in Salonika to which all roads converged. One of these hospitals occupied an ideal position overlooking the sea, with an uninterrupted view across the bay to Mount Olympus in the distance, and even on the hottest day relief was afforded by a fresh breeze from the sea, which made its appearance in the early afternoon with unfailing regularity. Here was the section for cases of tuberculosis, which as a rule did very well, and one often regretted the necessity of evacuating these cases, in order to provide much-needed beds, to less favourable surroundings in Malta or at home. Adjoining this, and on an equally good site, was one of the two hospitals for sick sisters. Another group of hospitals and convalescent depots was situated high up among the hills, about 16 km. from the town, on the plateau immediately below Mount Kotos, a well-wooded mountain of some 4000 ft. which dominated the Salonika district. A couple of hospitals were placed farther away across the bay to the south of Salonika, on the promontory of Karabaroun, with communication by water. This was, perhaps, the healthiest of all the sites, as the promontory was swept by sea breezes, the only drawbacks being the complete absence of natural shade, and a certain brackishness of the water, which had the effect on newcomers of a mild saline aperient. There was excellent sea-bathing for convalescents, and in addition to the hospitals the colony included two convalescent depots and a rest camp. It was necessary to close these hospitals during the winter owing to their exposed position and difficulties of communication in stormy weather. Supplementary to the British hospitals there were four general hospitals for Serbs, staffed entirely by British personnel, two of which were near Salonika and two at Vertekop, about two and a half hours' run on the Monastir road not far from the Serbian front. The fortnightly visits to Vertekop were always interesting, as, owing to temperament or circumstances, or both, the resisting powers of the Serb to disease were on a different level from those of the British, and common diseases frequently presented unusual features; also one saw examples of conditions, such as scurvy, that were practically unknown among our own troops. The most attractive medical unit in the command was at Stavros, a four hours' journey to the east, on the shores of a sheltered bay with high wooded mountains rising steeply from the sea. The tents were pitched by the seashore, and between them were well-grown plane trees which gave good shade; the water supply was abundant, and on the fertile soil all kinds of produce were grown for

hospital consumption. It was curious that a well-wooded site like this should be practically free from anopheline mosquitoes. Though nominally a field ambulance, the unit was practically on the scale of a stationary hospital. Closely rivalling Stavros in natural beauties was a unit in the opposite direction at Naoussa, beyond Vertekop, where a convalescent depot was established in connexion with the Serbian hospitals, high up among beech forests on the slope of a mountain which arose behind the depot to a height of over 6000 ft. Unfortunately this was too far away to be used to any large extent by the British, though accommodation was unofficially available for a limited number of officers, and was much appreciated by those who were run down and in need of a holiday.

Much has been said in disparagement of the climate at Salonika, but with all its drawbacks we might in many respects have been worse off. The heat in the summer was sometimes very trying, specially for those who had to reside in Salonika itself; the hills, which during spring and early summer were covered with a profusion of flowers, towards the end of June became parched and arid and of a monotonous faded yellow aspect, all vegetation being dried up with the exception of patches of the dwarf prickly oak. But outside the town the days were few when the heat did not become mitigated in the afternoon by the breeze from the sea, and the nights were usually tolerable. The winter climate was of two kinds—periods of three to five days during which the bitter “Vardar” wind blew from the snow-covered mountains to the north, bringing with it cold rain and a state of indescribable mud, or blizzards of fine-driven snow with twenty or more degrees of frost. During these spells transport was a matter of the greatest difficulty, and there was nothing in the climatic conditions to make life attractive except the certain knowledge that in the course of a few days matters would improve, and two or three weeks would follow of perfect weather, practically windless, with cold nights and warm sunny days, when convalescent patients could sit out and enjoy the sunshine.

MALARIA.

It is no disparagement of the fighting qualities of the Bulgar to say that by far the most formidable foe we had to contend with throughout the Macedonian campaign was the mosquito. Compared with the havoc wrought among our troops by malaria, the casualties from wounds, even including the periods of greatest military activity, sank into relative insignificance. There may be some consolation in the reflection that

the mosquito is no respecter of persons, and levelled its attacks with impartial pertinacity against Bulgar and British alike.

The extent to which our troops suffered may be partly realized from the fact that the total admissions to hospitals for malaria during the years 1916, 1917, and 1918 amounted to 161560. Expressed as a ratio per 1000 of strength (fig. 1) this number is equivalent to 1053 per 1000, the ratios for the respective years being: for 1916, 331 per 1000; 1917, 353 per 1000; 1918, 369 per 1000. These figures, large as they are, give a very incomplete picture of the incidence of malaria, since they include only admissions to general hospitals, stationary hospitals, and casualty clearing stations. They do not include cases treated at field ambulances and discharged as fit from there, nor cases returning to

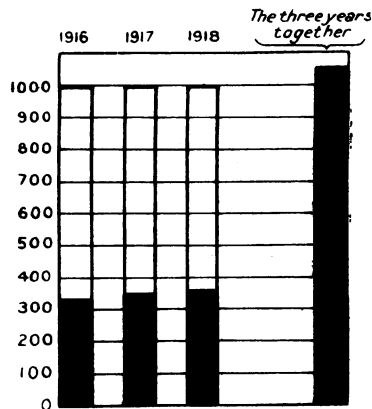


FIG. 1.

Malaria. Admissions to General Hospitals, Stationary Hospitals, and Casualty Clearing Stations. Shown as a ratio per 1000 troops.

duty after treatment by regimental medical officers, nor do they take into account the numerous instances in which officers and men with slight attacks carried on without reporting sick. The mortality was at the rate of 2.02 per 1000 troops during 1916, 1.17 per 1000 during 1917, and 1.69 per 1000 during 1918. The last figure is probably too high, as there was an enormous increase in the number of reported deaths from malaria in the earlier part of the influenza epidemic, and the figures undoubtedly include many cases in which death was due, not to malaria, but to influenza or its complications.

The seasonal incidence of the disease is well shown by the accompanying curve (fig. 2), which is based on the return of weekly

admissions during 1917 shown as a ratio per 1000 of strength. It is seen that the first material increase in the number under treatment, representing the earliest fresh infections of the year, was at the end of June, from which date there was a steady rise to a maximum in the beginning of October, followed by an abrupt fall during the latter part of that month and continued through November. The cases responsible for the early part of the flow of the malarial tide are exclusively benign tertian. This is probably due to the fact that subtertian infections die out in the course of the winter, and that from February onwards relapses are generally attributable to the more resistant benign tertian parasite. The benign tertian relapsing cases

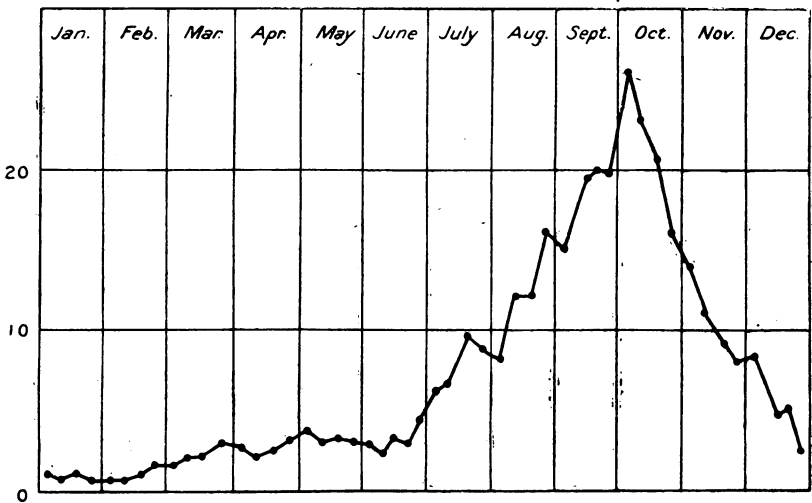


FIG. 2.

Malaria. Weekly admissions shown as a ratio per 1000 of strength, 1917.

act as carriers from which the mosquitoes become infected as their activity increases in early summer. About the latter part of August the number begins to be appreciably swelled by the inclusion of malignant tertian cases. Coincident with this is a distinct change in clinical type; the severity both of benign tertian and malignant tertian cases is greater, cerebral cases become more frequent, and the death-rate rises. It has been impossible to determine the exact ratio of benign tertian to malignant tertian cases, as such a comparison could only be effected by a complete series of blood examinations; the amount of pathological work entailed by this procedure would have been over-

whelming, and in 1917 an order was made that in cases where the diagnosis was clear on clinical grounds blood films were not to be sent to the laboratories. The curve shown in fig. 3 was constructed by Colonel Wenyon, C.M.G., C.B.E., A.M.S., from various data, with the object of giving a relative view of the seasonal incidence of benign tertian and malignant tertian infections during 1917; it must not be taken as possessing exact numerical accuracy. During the early part of the malarial season the prevailing species of mosquito is *Anopheles maculipennis*. With the appearance of malignant tertian malaria in August the mosquito ranks are swelled by the addition in

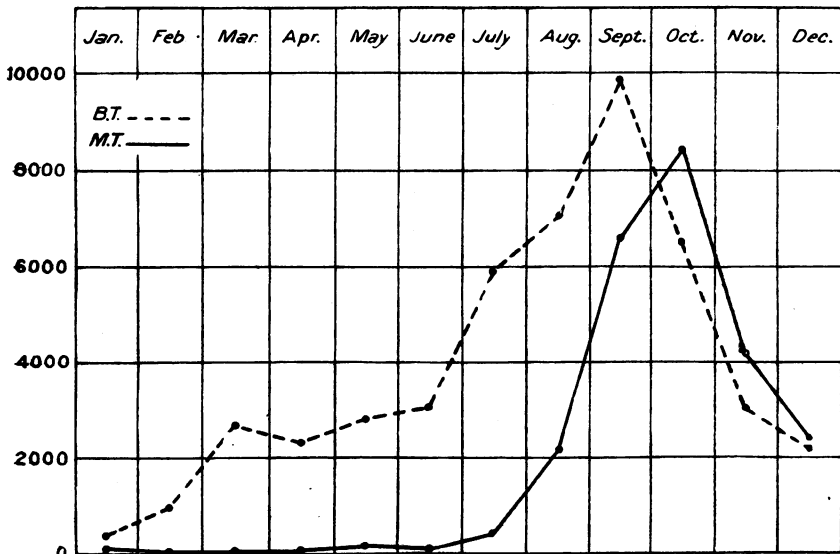


FIG. 3.

Calculated number of cases of benign tertian and malignant tertian malaria in hospitals during 1917.

large numbers of *Anopheles superpictus*. It might be supposed that there is some causal connexion between the two events, but I am told by Colonel Wenyon that there is no direct evidence that *Anopheles superpictus* possesses any superiority over *Anopheles maculipennis* as a carrier of malignant tertian infection; both species appear to infect themselves equally readily with malignant tertian parasites.

Clinical Features.—In attacks of primary benign tertian malaria the clinical phenomena usually formed so definite and characteristic a picture as to be recognizable even by those who had had no previous

practical knowledge of the disease. But the same cannot be said of the manifestations of many cases of subtertian and recurrent malaria, and a very short experience in Macedonia sufficed to bring home the difficulties with which diagnosis might be beset. In malaria the parasitic invasion, which is a general one, often falls with disproportionate emphasis on some special tissue or organ, thereby producing a symptom-complex which may lead to a remarkable simulation of other forms of disease. Thus cases were admitted with symptoms of an acute enteritis, with frequent watery stools, sometimes fæulent, sometimes containing blood and mucus. The clinical resemblance to dysentery might be very close, but no dysenteric organisms were present, and in many cases an examination of the blood disclosed evidence of malaria. The condition yielded rapidly to prompt treatment with quinine, and there is every reason for regarding these as cases of malarial enteritis. In other cases the intestinal symptoms were more severe, the stools being profuse and watery and associated with vomiting, collapse, and cramps, simulating cholera. Other cases were seen of prolonged pyrexia of indeterminate type in which one or another member of the enteric group was suspected, and it was only after weeks of illness and repeated blood examinations that the nature of the case could be proved by the demonstration of parasites in the peripheral circulation. A mistake made by almost everyone at some stage of his experience was the diagnosis of appendicitis in cases of malaria where initial symptoms of marked pain and tenderness with muscle rigidity in the right iliac region were prominent, and in some of these instances an opportunity was provided by the surgeon of proving by direct observation the healthy character of the appendix. The absence of anything like a definite tumour, and the results of blood examination, including differential count of leucocytes, were the distinguishing criteria in these cases, though it must be allowed that exceptionally the simulation of appendicitis was so close that the matter could only be decided by an exploratory laparotomy. Further pitfalls for the unwary were provided by cases of malaria with lumbar pain and a transient hæmaturia, rapidly subsiding under quinine; cases with symptoms of acute nephritis also rapidly controlled by quinine; cases with acute gastric symptoms and hæmatemesis; cases of acute pleurisy with effusion, the fluid sometimes containing blood; cases with acute pulmonary symptoms, cough and copious purulent sputum often streaked with bright red blood, and signs of a patchy consolidation of the lung; cases with acute mental symptoms; cases with coma of abrupt onset resembling apoplexy; cases with epileptiform fits, or

symptoms suggesting a cerebellar or a bulbar lesion; cases simulating meningitis with prostrating headache, head retraction, and rigidity of neck muscles; in an example of this, occurring on an hospital ship and diagnosed as a fulminant form of cerebro-spinal fever, the blood examination showed a heavy infection with benign tertian parasites.

It is not intended to discuss the exact pathology of these conditions, nor to make any attempt to define the extent to which the symptoms in some instances may be due to a complication of the initial malarial invasion by an added bacterial infection. What I wish to emphasize is the importance, in the first place, of not overlooking the malarial factor, and secondly, of giving due weight to this factor in determining the treatment to be adopted.¹

With a widening realization of the manifold and far-reaching activities of the malaria parasite, there arose an almost inevitable tendency on the part of the clinician to fall into a different error, and, attaching undue weight to probabilities, to arrive too readily at a diagnosis of malaria in doubtful cases. Such diverse post-mortem conditions as cerebral abscess, meningitis, hepatic abscess, gastric ulcer with perforation, appendicitis, were found in cases diagnosed as malaria. These mistakes were sometimes due to lack of thorough examination, and therefore unjustifiable; but, on the whole, it is remarkable that the standard of diagnosis was so high, and serious mistakes were so infrequent, considering the strenuous conditions of work in the hot season when hospitals were crowded and heavy convoys were coming at short intervals, and bearing in mind that of medical officers arriving in the country there were very few indeed who had any previous experience of tropical diseases.

The difficulties of diagnosis were enhanced in the influenza epidemic when the two infections frequently ran concurrently in the same individual; and the clinical threads became still more tangled when, as happened at one time, a considerable outbreak of sandfly fever was added to the prevailing epidemics of malaria and influenza. There

¹ Lieutenant-Colonel Falconer, D.S.O., C.B.E., R.A.M.C., in an article on "The Pulmonary Manifestations in Malaria" in the *Journal of the Royal Army Medical Corps*, February, 1920, describes a group of cases presenting the physical signs of more or less extensive consolidation of one or more lobes. He considers that in most of these cases the physical signs depend on massive collapse and not on true consolidation, and regards the condition as representing a pure malarial phenomenon. I was unfortunate in seeing very few cases in which the physical signs could be interpreted as due to pulmonary collapse, and formed the opinion that the most common pulmonary complication of malaria was a fine-tube bronchitis, with patchy consolidation of one or both lungs, probably due in all cases to a superadded infection.

were many difficult cases in which the only proof of malaria lay in the demonstration of the parasite in the blood. An ideal course would have been the examination of a blood film in every case; but with such large numbers this procedure was impossible; and in order to relieve laboratories of unnecessary strain it was ruled that blood films were not to be taken in straightforward cases progressing favourably under quinine treatment. The information afforded by examination of the blood was especially useful in the more chronic forms of malaria with irregular pyrexia, in which there might be long periods without demonstrable parasites in the peripheral blood. The diagnosis in these cases was often proved by repeated blood examinations, resulting sooner or later in a positive finding. In the apyrexial stage the information afforded by a white blood corpuscle count was always valuable, as the combined relative preponderance of large mononuclear cells, with reduction in the total number of white cells, gave a picture which was the reverse of that obtaining in many of the acute inflammatory conditions from which malaria had to be distinguished. Enlargement of the spleen taken by itself was of little help; but a palpable and tender spleen, or tenderness over the splenic area combined with increase upwards of the splenic dullness was valuable evidence of acute malaria.

The *after-effects* of malaria were numerous, and examples were commonly to be seen not only in the wards of general hospitals but also in the various special departments of the medical service. In the cardiological department a large proportion of the cases of D.A.H. with unduly sensitive exercise-response were traceable to malaria. In the neurological department, in addition to cases of peripheral or central lesions of the nervous system directly due to malaria, the influence of the disease as a contributory factor in various functional conditions was clearly manifested. In the mental department a majority of the cases under treatment was attributable to the same cause. In an analysis published in the *Lancet*, of January 3, 1920, by Major Forrester, R.A.M.C., who was latterly in charge of the department, it appears that the commonest type of psychosis following malaria was either some form of mental confusion, or depression. The outlook in these as in other post-malarial psychoses is favourable, and after a course of treatment it was generally found possible to transfer cases to the general wards whence they could be sent home by hospital ship as ordinary patients.

No one passing through the malaria wards of any general hospital could fail to be impressed by the large proportion of cachectic cases, with profound anæmia, enlarged spleen, marked wasting, more or less

pyrexia, and persistent tachycardia increased on any slight exertion. Very low blood counts were recorded, e.g., 900000, 880000, 810000, and in one case 690000. Accurate hæmoglobin estimations were unfortunately seldom available as many of the instruments had deteriorated through climatic influences and the colour readings were not reliable. In some instances the blood picture was of the "pernicious" type, with poikilocytosis, megaloblasts, and a high colour index. In others the clinical picture was that of pernicious anæmia, plus a large spleen, plus myelocytes in the blood. In other cases there was an aplastic anæmia with little or no attempt at repair. In two cases at least blood was transfused. One of these, a patient with malignant tertian malaria and profound anæmia, under the care of Major A. C. Sturrock, R.A.M.C., was transfused twice, 18 oz. of blood being introduced on the first occasion, 24 oz. on the second. Previous to transfusion the patient was going rapidly downhill and it seemed that a fatal issue could not long be delayed. The immediate effect of the first transfusion was very striking, but it led to no permanent response on the part of the blood-forming tissues, and again the patient lost ground and a fortnight later was rapidly approaching his former condition. The second transfusion was followed after a short interval by a gradual and lasting improvement in the blood state, the first evidence of returning functional activity being a remarkable increase in the white corpuscle count from 3200 to 12300, this leucocytic phase definitely preceding the period of red cell reconstruction. The patient was evacuated by hospital ship three months after his first transfusion. A full account of this interesting case will be duly published by Major Sturrock, who has kindly supplied me with the above details.

Treatment.—I do not propose to spend time in describing the routine measures of treatment which came to be adopted as the result of our experience of malaria in Macedonia. I have dealt with these in some detail in a recent article in the *Lancet* (January 24, 1920), and will here limit my remarks to the discussion of certain points of general interest.

In endeavouring to estimate the value of quinine in the treatment of malaria one is at once impressed by the remarkable contrast between its controlling influence over the acuter manifestations and its comparative failure to prevent relapses in the more chronic forms. In acute malaria the results obtained by quinine properly administered and in sufficient quantities are little short of marvellous. As our experience grew the tendency was to give increasingly large doses in primary

attacks, as it was found that this was the only stage of the disease at which permanent results in the sense of preventing relapses could be hoped for. In cerebral malaria the prompt use of intravenous quinine undoubtedly saved many lives. But as a means of controlling the incidence of relapses in recurrent malaria the efficiency of quinine was found to be on a very different plane. Numerous observations were made, some on a considerable scale, having for their object the comparison of large bodies of men, others in special malaria wards, where with comparatively small numbers to deal with it was possible to carry out a systematic comparison of various methods on a scientific basis. The practical outcome of an immense amount of work was the realization of the impossibility of eradicating the malarial parasite from the system in cases of relapsing malaria by any known method of treatment. While quinine was being taken in effective doses the disease was kept more or less under control, but on the cessation of treatment relapses again made their appearance, and after a few weeks became as frequent as in the period before the treatment was begun. The best results in relapse-control were obtained in the special observation wards under the direction of Major A. G. Anderson, R.A.M.C., by the "week-end" system of 30 gr. of quinine on each of two successive days in each week; an important advantage of the method is that treatment can be continued for an indefinite period. Under this system the percentage of non-relapsing cases was raised to 78 as compared with 32 per cent. in cases in which no quinine was given except for the treatment of relapses as they occurred. But for all its limitations no drug was found to exceed or even to approach quinine in efficiency. At one time, with the introduction of galyl it was hoped that a parasite destroyer of considerable power had been discovered, but the promise of early trials was not fulfilled, and although the preparation undoubtedly possesses some parasite-destroying properties, specially in subtertian cases in which quinine has been pushed to the limits of tolerance, its chief value was found to lie in stimulating the blood-forming organs in cases of profound cachexia and in the anæmia of blackwater fever.

On the much debated subject of the channel by which quinine may with the greatest advantage be introduced, a very decided impression was formed that a given quantity of quinine is more effective if injected intramuscularly than if taken by the mouth. It is difficult to say how far this impression was correct; observations made in the Special Malaria Laboratory on the rapidity with which parasites disappear from the blood and the rate of quinine excretion suggests that the advantage

lies with oral quinine. Personally, I hold the view that if the desired effect can be obtained by oral quinine there is no justification in submitting the patient to the inconvenience of intramuscular injections. But instances in which quinine requirements could not be met by the oral method were very numerous, and the value of the alternative channel was amply proved in such conditions as vomiting or intestinal disturbance, when absorption from the alimentary tract is impaired, and in cases of pernicious type, where it is imperative to produce a greater effect than can be obtained by mouth administration only, and in cases of cerebral malaria as a supplementary measure to intravenous injections. The risk of local complications is practically negligible if ordinary precautions are taken to prevent such mishaps as sepsis and injury to nerve trunks. In a recent number of the *Journal of Hygiene* (October, 1919), Colonel Dudgeon, C.M.G., C.B.E., A.M.S., has drawn attention to the serious degree of necrosis which follows intramuscular injections of quinine in mules and rabbits, and has suggested that medical officers and officers in charge of divisions in the Salonika hospitals were not fully alive to the injuries they might inflict on their patients. It may be said that, apart from cases of faulty technique, and a few instances of extensive necrosis that followed intramuscular injections in patients who were debilitated from the effects of dysentery, such untoward results were practically unknown in our clinical experience. The number of injections given was enormous and there is no means of accurately estimating them; but assuming that each of twelve medical officers in each general hospital had occasion to give one intramuscular injection on each day during the malarial season of, say, one hundred days—an assumption which is undoubtedly considerably below the mark—the total number of injections for the season would amount to 18000. And yet with the exceptions mentioned above, it was the rarest event for any ill-effect to follow, beyond a localized induration which rapidly subsided, leaving no permanent disability.

The treatment of malaria in patients who at the same time were suffering from dysentery presented special difficulties, as on the one hand oral quinine was badly absorbed and often of little use, and on the other hand there was the risk of intramuscular injections, if repeated, leading to serious damage to the muscle. With this combination of diseases it was often impossible to push quinine to the same extent as in a case of uncomplicated malaria. Many of the acute Shiga cases showed a marked febrile reaction, and in order to assess the pyrexia at its true value the examination of blood films was found to be quite as important, if not more so, in the dysentery hospitals as in any other.

Of unfavourable symptoms as the result of the large doses of quinine which it was often necessary to give we had fortunately small experience. A few cases of idiosyncrasy were seen in which a moderate or even a small dose of quinine consistently gave rise to hæmoglobinuria. An instance of this was met with in a Greek boy, who had had malaria and was given a dose of quinine with resulting hæmoglobinuria and the rapid development of a very marked anæmia. It was thought the matter might be a coincidence, and as there were special reasons for quinine treatment a further dose of 10 gr. was given after a short interval with the same dramatic result of an intense hæmolytic and severe anæmia. This condition should be sharply differentiated from blackwater fever which I believe comes and goes quite independently of quinine. A variety of skin lesions, such as erythema, scarlatiniform rashes, urticaria, and less commonly purpura occurred in definite association with quinine treatment. More serious than these was a condition of exfoliative dermatitis, of which I saw two examples. In each there was a protracted illness, in the course of which the exfoliative condition became generalized, and ultimately septic infection occurred notwithstanding the most careful nursing, and the patient succumbed. The total duration of illness in one of these cases was six months.

In the course of 1917 twelve cases of quinine amblyopia were reported. Further cases occurred in 1918 but I do not know the exact numbers; they were fewer than in the previous year. Of the 1917 cases two followed the taking by mistake of a large but unknown quantity of quinine; in one two "mouthfuls," in the other four to six tablespoonfuls of quinine in solution were taken. The remainder were cases of severe malaria in which the need for pushing quinine in large doses was imperative. Most of these were cases of subtertian infection; in three the clinical condition was complicated by blackwater fever. One patient, an officer, while on 30 gr. daily, developed cerebral symptoms and was given while unconscious 70 gr. of quinine intravenously and 90 gr. intramuscularly, 160 gr. in all. On regaining consciousness he was amblyopic. There was a gradual but slow return of vision, and when evacuated by hospital ship several weeks later there was still a considerable degree of amblyopia. Another case, of malignant tertian malaria with multiple rings, was given on October 14, 30 gr. of quinine intramuscularly, on October 15, 60 gr., half intramuscularly, half by mouth, and on October 16, 60 gr. intramuscularly. After the evening dose he could hardly see, but the pupils reacted well to light. At 8 a.m. on October 17 he was totally blind with widely

dilated pupils which did not react to light. In the evening he could see a little. On October 18 he was delirious, but apparently could see. On the next day his malarial symptoms were so urgent that it was decided after careful consideration to give more quinine, and 15 gr. were administered intramuscularly. After the injection there was rapid dilatation of the pupils and he became totally blind with pallor of the discs and contraction of the retinal arteries to a mere thread. On the following day he was given galyl but in the evening the general condition was so grave that it was decided that further quinine treatment was imperative, since it afforded the only hope of saving his life, and that it must be undertaken even at the risk of permanent damage to the sight. Further doses of intravenous quinine were given, but the treatment was unavailing and the patient died. In a third case of cerebral malaria 55 gr. of quinine were given on November 21, 60 gr. on the 22nd, and 20 gr. on the 23rd. He then became completely blind, and when I saw him a few hours later the pupils were widely dilated, failed to react and the fundus was pale with very small threadlike arteries. No further quinine was given after the onset of blindness, but notwithstanding this there was not the slightest recovery of vision and the patient was evacuated by hospital ship several weeks later, still blind. In this case continuous sluggish movements of the iris were observed independently of light stimulus. These cases fall into three groups: (1) Those in which there is fleeting amblyopia followed by full recovery of vision; (2) cases of incomplete recovery in which useful vision is restored but with a varying degree of lasting contraction of the fields; (3) a comparatively small group in which blindness is permanent.

Y Scheme.—Owing to increased submarine activity in the first half of 1917, facilities for invaliding by sea became greatly restricted, and there ensued a gradual accumulation in the Salonika command of men whose usefulness for military purposes was practically *nil*, since by reason of repeated attacks of malaria they spent the greater part of their time at hospitals and convalescent depots, in many cases being readmitted from convalescent depots to hospital for a malaria relapse before their period of convalescence was completed. These men were not only unfitted for active service and were an unnecessary burden on the military machine, but as possible carriers they constituted an actual danger to the community. On the other hand there was a fair prospect that under less trying climatic conditions a proportion of them would recover to a sufficient extent to be of use in the home command or in France. These circumstances led to the inception and organization of

the Y scheme, and by the latter part of December, 1917, the necessary arrangements had been completed and the first drafts were evacuated from Salonika under the scheme. The men were chosen with the greatest care, every case being inspected either by the D.M.S. or the consulting physician before being passed as suitable for evacuation. The scheme worked well, and by October 31, 1918 a total number of 26001 officers and other ranks had been evacuated, to the great advantage both of the command as a whole and of the men themselves. I am told that these officers and men, not only useless but a danger to their companions in the East, have in a large proportion of cases regained their health and strength, and have been responsible for much good work both at home and on the western front.

Malaria in the Caucasus.—The shifting of the troops, after the armistice, from Salonika to the neighbourhood of Constantinople and to the Caucasus was followed by a marked improvement in the health of the Army and at the same time there was a considerable change in the character of the sickness. The dominance of malaria over all other conditions dwindled, and diseases such as typhus, small-pox and relapsing fever, of which only occasional isolated cases cropped up in Salonika, made their appearance in increasing numbers during the early spring of 1919. Thanks to protective measures and early isolation of cases these diseases were always under control, and did not assume anything approaching the dimensions of the epidemics by which large sections of the Turkish and Russian armies were devastated. The approach of the malaria season was awaited with some curiosity, as we were anxious to see how far the prediction of a heavy malarial incidence in this new country would be fulfilled. In June, when I had an opportunity of visiting the medical units in the Caucasus, except for recurrent cases carried over from previous seasons, there was no malaria. My first note of primary malaria was on July 14 when a man from Batoum, who came out from home in December, 1918, was admitted to a general hospital in Constantinople with a benign tertian infection. There may have been a few isolated cases before this, but, in contrast to our experience in Salonika, primary malaria in the early summer in the Caucasus was a negligible quantity. On a subsequent visit in the latter part of August the state of things was very different, and there were serious outbreaks of malaria in many parts of the country. At an aviation post at Petrovsk, on the shores of the Caspian, fifty out of 150 men had gone down in the course of a fortnight. A battalion on its way to Shusha, a post among the hills, had its orders changed while *en route*, and encamped at Barda

on the plain, on a site chosen among other reasons for its propinquity to a stream. I was told by the C.O. that no mosquitoes were noticed until about ten days later, when men began to go down with malaria. I visited the battalion a few weeks later after they had moved to a healthy camp on high ground above Tiflis, and by that time out of a total of 305 N.C.O.'s and men 303 had fallen victims to malaria. A large proportion had been sent into hospital, but fresh relapses were occurring every day, and it was with great difficulty that fatigue parties could be mustered for the performance of the ordinary camp duties. At this period there was a general movement of troops in progress from Baku and Tiflis to the Black Sea coast at Batoum, where malaria was also prevalent, most of the available camping ground being heavily infested by anopheline mosquitoes.

BLACKWATER FEVER.

During the year ending October 31, 1918, 136 cases of blackwater fever were reported in the Salonika command; of these thirty-six died, giving a case mortality of 26.5 per cent. In the previous year only eighteen cases were reported. The circumstances of the two years are not strictly comparable, as in the course of 1916 malaria cases in large numbers were being invalided to Malta, and during the following winter blackwater fever was common in Malta. Owing to submarine risks and consequent restrictions in sea communication between Salonika and Malta the evacuation of malaria cases on a large scale became for the time impossible, and the accumulation of these cases in Salonika was doubtless largely responsible for the rise in the blackwater figures. The chart in fig. 4 shows the seasonal incidence of the disease; it is seen that the great majority of cases occurred between December and April with a maximum in February, and that during the summer there were no cases except for a short outbreak during September. This happened to correspond with the military advance, and may be related to the strenuous conditions and special hardships of that time.

During the winter there were three short spells of exceptionally severe weather. The first of these was in early December and coincided with the beginning of the blackwater season; the second was in early January; and the third, at the end of March, may have been responsible for checking the fall in the number of blackwater cases that had already taken place. There was no specially severe weather in the last three weeks of January, or during February, when blackwater fever attained its maximum incidence.

The outstanding feature in the ætiology of blackwater fever is its relation to malaria. Of a series of seventy-eight cases which I had special opportunities of investigating, in all except one a definite history of malaria was obtained, and seeing how prevalent malaria was, it is more than probable that this single case was really no exception to the rule that malaria is an invariable antecedent of the condition. But notwithstanding this general relationship, it was rare to find evidence of more than slight malarial activity during the actual blackwater attack. In only 27 per cent. of a series of fifty-eight cases in which special care was given to the examination of the blood were there positive findings, and in nearly all of these the number of parasites

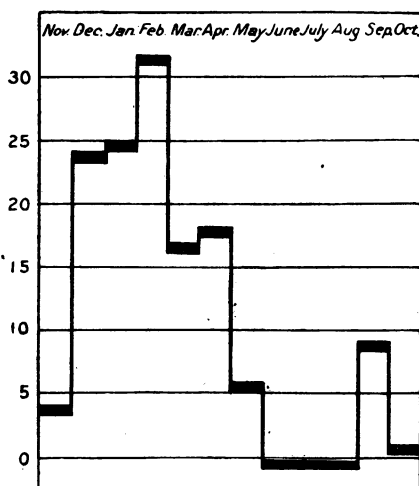


FIG. 4.

Blackwater fever. Number of cases reported monthly during the year ending October 31, 1918.

present was very small. The type of parasite was benign tertian in seven cases, malignant tertian in four, and indeterminate forms, probably malignant tertian, in five cases. That some agent other than the malarial parasite is the determining factor in the acute hæmolysis of blackwater fever is further suggested by its seasonal incidence, which in Macedonia is at its height, not during the malaria season, but at a time of year when malarial activity is at its lowest level. What the determining factor is, remains at present obscure. No support was found for the hypothesis that quinine is the activating agent. On the one hand blackwater occurred in cases in which no quinine had been

taken for a considerable period; on the other hand in several cases quinine was given in large doses without prolonging the period of blackwater; it was the practice of some medical officers, in the belief that blackwater fever was the expression of a specially malignant type of malaria, to treat the condition energetically with quinine, and I have many charts which illustrate the rapid and complete clearing of the urine under these conditions. Clinically the cases presented no special features. The abrupt destruction of enormous numbers of red corpuscles, leading to a drop to 30 per cent. or even 20 per cent. of the normal number; the state of collapse with extreme pallor and small compressible pulse; the rapid darkening of the urine with characteristic absorption

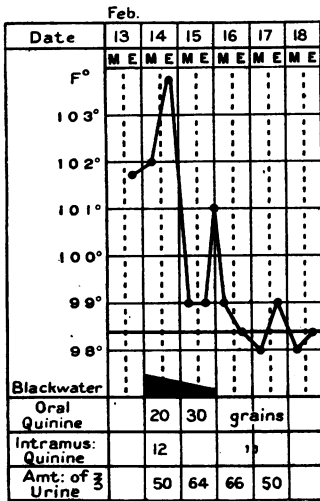


FIG. 5.

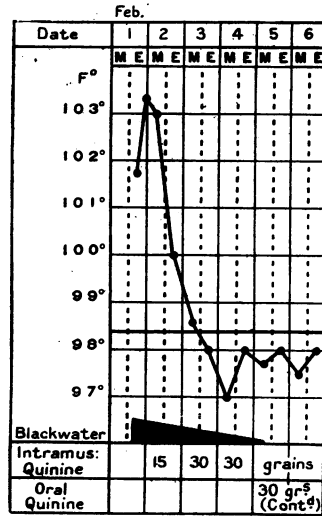


FIG. 6.

Fig. 5.—Blackwater fever. No quinine had been taken for seven weeks previous to onset of blackwater. The urine rapidly cleared while quinine was being given.

Fig. 6.—Blackwater fever. Rapid clearing of urine during administration of quinine.

bands; the pyrexia with shivering, vomiting, headache, and lumbar pains all went to form a picture which differed in no essential from that described in connexion with outbreaks elsewhere. The average duration of hæmoglobinuria was three days; the longest period was five days; in one case characteristic dark red urine was passed on a single occasion only; all subsequent specimens were clear. Two symptoms we learned to regard as of specially grave significance, jaundice and suppression of urine. Enlargement and tenderness of the liver with slight icteric

was undoubtedly saved this way. The general rule in regard to quinine was to withhold it unless there was evidence of concurrent active malaria. If parasites were present, or the spleen was enlarged and at the same time tender, quinine was given in full doses and with beneficial results.

The charts (figs. 5 to 9, pp. 74-76) selected from a series published in the *Journal of the Royal Army Medical Corps*, January, 1920, illustrate some of the above remarks.

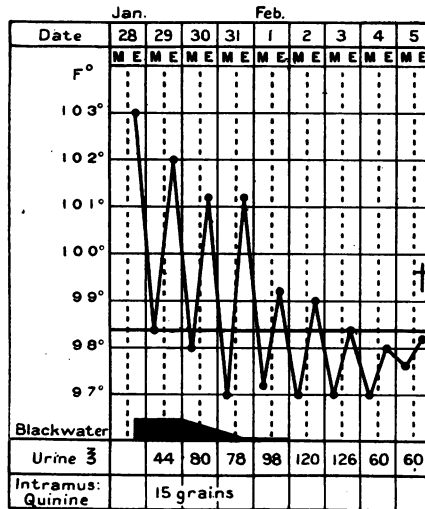


FIG. 9.

Blackwater fever. Abundant urine up to date of death. Death from cardiac failure.

DYSENTERY.

Next in numerical frequency to malaria, and hardly less important in its consequences, was dysentery. The total number of admissions for the three years was 21147, representing a ratio per 1000 troops of 64 in 1916, 29 in 1917, and 58 in 1918. The total number of deaths was 414, equivalent to 1.9 per cent. of admissions; or calculated as a ratio per 1000 troops, 1.4 in 1916, 0.6 in 1917, and 0.98 in 1918 (fig. 10). The above figures are probably in excess of the actual numbers, specially for the year 1918, as, owing to the importance of early treatment and the impossibility of bacteriological examination in all cases, it was agreed to accept as the basis of diagnosis clinical criteria irrespective of bacteriological proof. This policy was deliberately adopted as affording the maximum of protection to the community,

though it doubtless involved a diagnosis of dysentery in a certain number of cases of acute enteritis which were really due to some other cause.

There are unfortunately no figures available to show the relative frequency of the amœbic and bacillary forms of the disease. The latter was the dominant form, and though amœbic cases were present throughout, it was only late in the season of 1917 that the extent to which this form prevailed in the command came to be recognized, partly owing to the indefatigable work of a protozoologist who spent his whole time in visiting laboratories, giving his opinion on doubtful specimens, and advising as to methods. Evidence gradually accumulated of the existence of a widespread amœbic infection in its most insidious form, being carried by apparently healthy individuals, with or without a history of previous dysentery, and often suffering from no

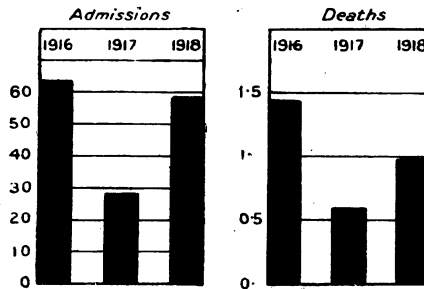


FIG. 10.

Dysentery. Admissions and deaths shown as a ratio per 1000 troops.

disability beyond occasional attacks of diarrhœa. The policy with regard to evacuation of dysentery cases became more and more stringent; first, all proved cyst carriers were sent home; then all cases which came under observation with a history of repeated attacks of diarrhœa; then all dysentery cases with a history of a previous attack; and finally (in 1919) all cases of dysentery, amœbic or bacillary, first attacks or otherwise, clinical or bacteriologically proved, were evacuated by hospital ship. These successive measures indicate the importance which came to be attached to the rôle played by carriers in spreading the disease in both amœbic and bacillary forms. It is impossible to say how far these measures might have succeeded in reducing the disease had troops remained in Salonika during 1919 in the same numbers and under similar conditions; with the rapid evacuation of

troops after the armistice and the shifting of headquarters to Constantinople the conditions were radically changed; but it is worth noting that the type of dysentery seen in the hospitals in the Caucasus during 1919 was very different from that which we had been familiar with in Salonika; the bulk of the cases were mild and of short duration; serious cases were uncommon, and the death-rate for the year was only 0.43 per 1000 troops.

Of equal importance to human carriers, and commonly forming an intermediate link in the chain of infection, came flies. The plague of flies was at its worst at two periods of the year, in the early summer, and in the autumn; at both these seasons the heat was accompanied by a relatively high humidity; during the intervening months of great

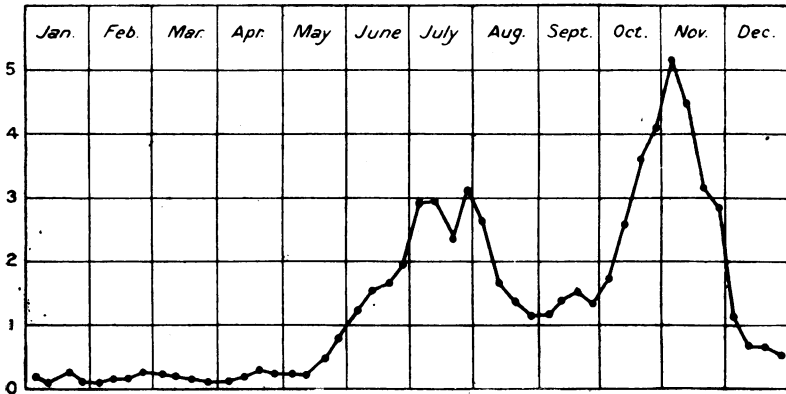


FIG. 11.

Dysentery. Weekly admissions during 1918 shown as a ratio per 1000 of strength.

heat with dryness the fly nuisance was largely mitigated. Turning to the dysentery curve, it is seen to present a precisely similar seasonal variation, with an initial outbreak in the spring, reaching its maximum in late June and July, followed by a substantial reduction in the number of cases during August and September, and a recrudescence of disease in the autumn, at its height at the end of October or early November (fig. 11). This coincidence, obviously on the larger scale, was worked out on a more exact basis for a group of hospitals near Salonika by Captain J. F. Taylor, R.A.M.C., whose observations go far to incriminate the fly as a carrier of dysentery organisms. Not only did he prove an exact parallelism between the incidence of dysentery in these hospitals and the prevalence of flies as measured by the numbers caught

in traps which were exposed from 11 a.m. to 2 p.m. on each day, but he also showed experimentally that the fly is capable of carrying both Flexner and Shiga bacilli; in one instance he recovered from a fly captured in a hospital kitchen Shiga bacilli with typical cultural and agglutination characters.

Clinical Features.—As with malaria, so in dysentery a few cases were seen in which the initial symptoms appeared with such dramatic suddenness, and the intestinal disturbance was of so severe a character, that the possibility of the case being one of cholera could not be dismissed without serious consideration. The possibility of an outbreak of this disease had always to be reckoned with, though fortunately the organization which had been prepared to meet such a contingency never had to be put to the test. In the cases referred to all the initial symptoms of cholera were present, copious rice-water stools, profuse vomiting of watery fluid, cramps, low blood-pressure, and rapid collapse; but an immediate examination of the stools showed an absence of vibrios, and the cases, which ultimately were proved to be dysentery, responded rapidly to intravenous injections of antidysenteric serum combined with hypertonic saline.

Another interesting group of cases was characterized by *œdema*. This sometimes developed during the acute phase of cases of a severe Shiga infection, in which there appeared to be a rapid flooding of the system with dysentery toxins. In other cases the symptom appeared at a later stage, and in the absence of any of the usual antecedents of œdema; the cardiac condition, though feeble, was not in itself sufficient to cause œdema; the urine was not reduced in quantity, and though containing albumin in varying amounts it had none of the characters which are distinctive of nephritis; the possibility of the condition being due to a food deficiency, and connected with the drastic restrictions in diet which were found essential in the routine treatment of acute dysentery, deserves consideration. A noteworthy feature is that ascites was often a prominent symptom, and out of proportion to the œdema elsewhere; thus in one case 10 pints of fluid were removed from the abdomen, and on the following day, when I saw the patient, there was still a large amount of fluid present.

Other cases of special interest were those in which, after the cessation of all intestinal symptoms, pyrexia continued and the patient rapidly lost ground and became emaciated. The tongue was usually dry, smooth and shiny. A liberal diet made little or no difference to these patients. They were able to take and digest a considerable

amount of semi-solid food without diarrhoea or any symptoms of gastric or intestinal disturbance, but their assimilative powers seemed at fault and they steadily lost weight.

Hæmorrhage and *perforation* were both very rare complications. The first event was more common in connexion with the ulceration of long-standing amœbic dysentery than in cases of bacillary origin. In cases of perforation the actual rupture of intestine was almost always preceded by an adhesive peritonitis, which sufficed to prevent a general infection of the peritoneum. The resulting abscess formed slowly and was strictly localized. The whole process was very insidious, and, being marked by no special symptoms either at the time of perforation or during the subsequent stage of pus formation, might easily be overlooked. In one instance of acute Shiga dysentery a generalized acute peritonitis occurred without perforation; except for rather marked meteorism the features of the case were in no way distinctive; but at the post-mortem examination general peritonitis was found, with 2 pints of thin purulent fluid in the abdomen. The intestines were examined with the greatest care, but no perforation was discovered.

Although *arthritis* cannot be called a common complication of dysentery, there were during the season always a few cases under treatment, arising more often in complication with Shiga than with Flexner infection. The condition usually appeared in the course of the third week, and involved one or more of the larger joints, especially the knee. In the acute stage there was considerable enlargement and tenderness of the joints, with effusion of fluid, and pyrexia of irregular type. The acute stage was followed by a protracted period during which the fluid was absorbed and some thickening of the periarticular structures took place, giving rise to a condition not unlike that of rheumatoid arthritis, with considerable stiffness and pain on movement (fig. 12). In some cases the course was so prolonged that a permanent disability seemed inevitable, but I remember no case, however protracted, which had not made some progress towards recovery before leaving hospital. In the acute stage rest is necessary, and when the joint was tense with fluid much relief was afforded by tapping and the removal of the fluid. Some cases were treated with anti-dysenteric serum, with apparently good results, as shown in fig. 13 (p. 82); it is undesirable to use this method of treatment in cases that have previously been given serum during the stage of acute dysentery, on account of the risk of anaphylaxis. After the acute symptoms have subsided it is a mistake to keep the joint

was laboured, and the voice was hoarse. Two days later (July 17) there was complete loss of power in the legs, which were flaccid. Sensation was unimpaired. On July 18 there was anæsthesia on the inner aspect of both legs and knees, there was very little power in the recti muscles, respiration was chiefly intercostal, and the patient was unable to puff out his cheeks. The cerebro-spinal fluid was under slight pressure; its characters were normal. On July 21 there was incontinence of urine and fæces. In the course of the following days breathing became very difficult, the patient was irritable and restless, and on July 25 he died, twelve days after the onset of nervous symptoms.

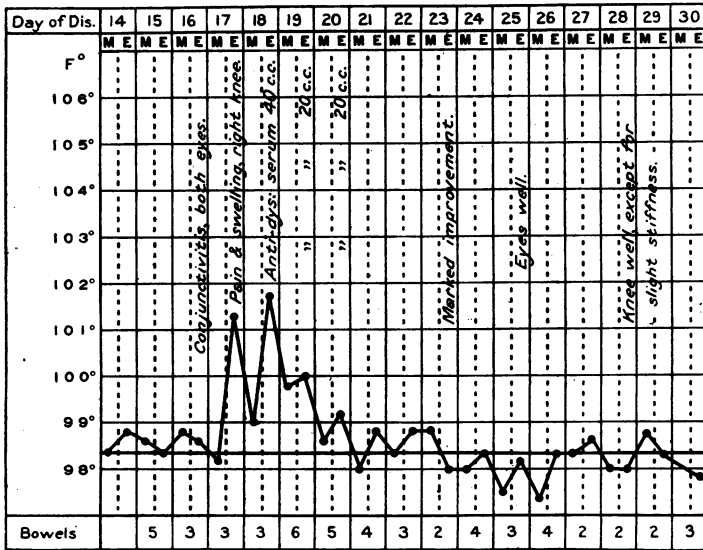


FIG. 13.

Dysentery with arthritis. Given anti-dysenteric serum; rapid subsidence of joint symptoms.

Post mortem the meninges of the brain were congested and the cerebro-spinal fluid was in excess, otherwise there were no macroscopical lesions of the nervous system. The intestines showed evidence of long standing dysenteric ulceration. Unfortunately no data as to the microscopical lesions were forthcoming. In another case of clinical dysentery, not bacteriologically proved, paresis of both legs and both arms with loss of deep reflexes supervened a fortnight after the cessation of intestinal symptoms. The cardiac dullness was increased both to the left and to

the right, the breathing became embarrassed, and the patient died of heart failure nineteen days after the onset of paresis. Post mortem all the chambers of the heart were dilated, the brain and meninges were congested and œdematous, and marked degenerative changes were found in sections of the popliteal and vagus nerves that had been removed for examination.

The subject of *amœbic hepatitis* is one that would be more fittingly dealt with by one of my surgical colleagues. Some scope, however, was provided for the exercise of the physician's art, both in diagnosis and treatment, as the diagnosis largely depended on the correct reading of the physical signs produced by an upward displacement of the

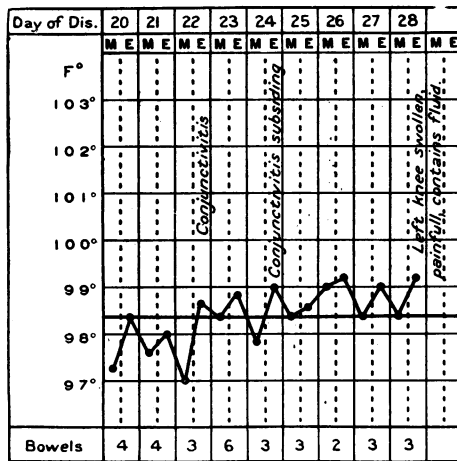


FIG. 14.

Dysentery with arthritis. Conjunctivitis six days previous to onset of joint symptoms.

diaphragm, usually on the right side, with shifting of the heart to the left, and collapse of the lower portion of the right lung; also by prompt emetine treatment the process was often arrested in the pre-suppurative stage. The chart in fig. 15 (p. 84) illustrates a case of this kind, which for some time was regarded as one of malaria. The prompt effect on the temperature curve of substituting emetine for quinine is very striking. Brief particulars may be given of two cases with unusual features. The first case was complicated by general peritonitis, which supervened without obvious cause four weeks before pus was located in the liver, and was dealt with successfully by operation; subsequently

pleurisy occurred with clear effusion, which became converted into an empyema owing to sloughing of the diaphragm, and escape of the contents of the liver abscess into the pleural cavity, as was shown later at the operation. This patient made a good recovery. The second case, a fatal one, was remarkable for the presence of two large abscesses in the right lobe, and numerous small abscesses about the size of a pea in both right and left lobes of the liver; one of the two larger abscesses was incised and drained, but was found at the autopsy to have leaked downwards below the colon and cæcum. In view of the multiple foci of suppuration it is clear that no further operative measures could have saved the life of this patient. For the records of these three cases I am indebted to the kindness of Major St.

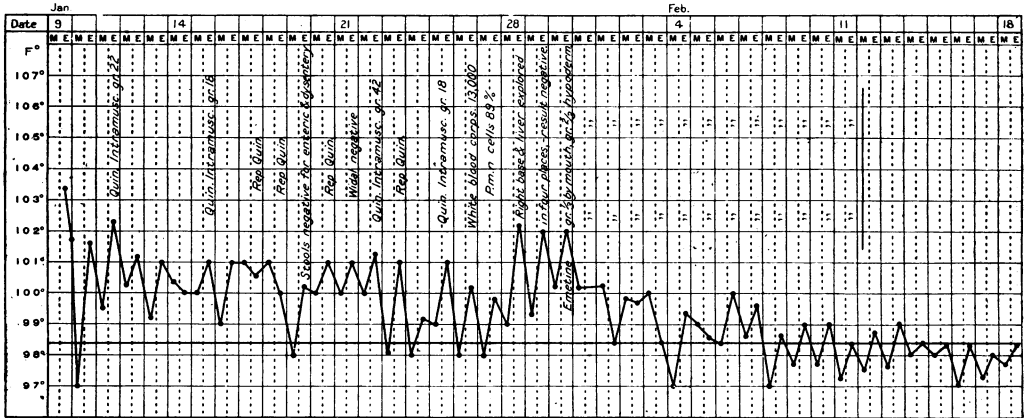


FIG. 15.

Case of acute hepatitis, probably amebic, with pyrexia subsiding under treatment with emetine. History: no dysentery, frequent malaria. Taken ill first week in January—feverishness, shivers, flatulence. On admission: slight jaundice. Triangular patch of dullness at right base with distant breath sounds and increased vocal resonance. Abdomen distended; liver, almost to umbilicus, not tender. Spleen not palpable. Blood film negative.

John D. Buxton, R.A.M.C. The association of a clear pleural effusion with pus in the liver was observed in another case (fig. 16), the nature of which was obscure until in the course of the fifth week a large aspirating needle was introduced into the right pulmonary base and 6 oz. of very thick pus were withdrawn. In the course of operation on the following day clear fluid, through which the aspirating needle must have passed, was found in the pleural cavity; below this was a liver

abscess, which was incised and drained. In this case no direct evidence of an amœbic infection was discovered, either in the pus or the stools, and on the strength of the agglutination results the condition was regarded by Colonel Dudgeon as one of paratyphoid A, though there was nothing in the clinical course of the case that could not be accounted for by the hepatic abscess ultimately discovered.

In the dysenteric wards there were always to be seen the best instances of *combined infections*, with a complex clinical picture in which it was often difficult to assess the relative importance of the various infective agents. As an example, the case may be quoted of a patient, admitted to hospital as a proved Flexner case. As the result

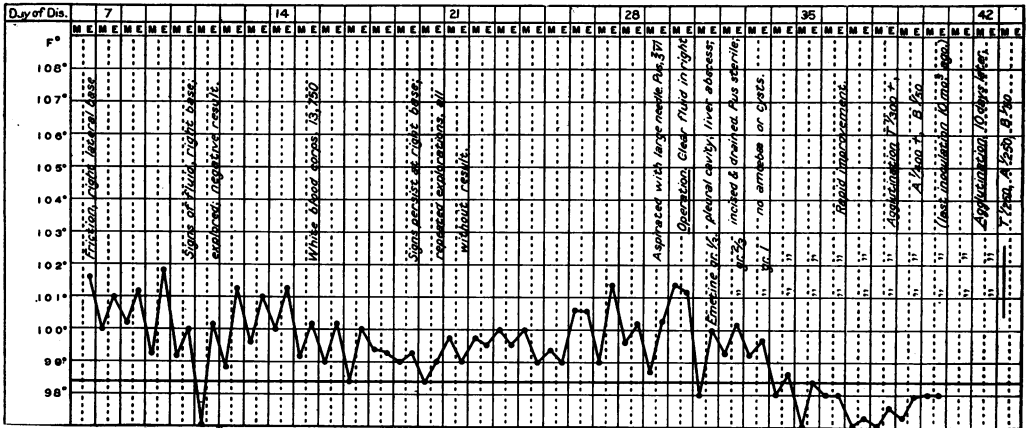


FIG. 16.

Case of hepatic abscess, complicated by pleurisy, with effusion of clear fluid.

of pathological observations initiated on the following day, subtertian parasites were found in the blood, and *Entamoeba histolytica* in the stool, from which Shiga bacilli were also isolated. Three days later he fell a victim to influenza; bronchiolitis supervened and he succumbed. Total, five distinct infections.

Treatment.—Among the many points of interest which might be discussed in connexion with the treatment of dysentery I will make no reference to the important subjects of dieting and the use of salines and will confine my remarks to two points only: (1) the use of serum in bacillary dysentery, and (2) the value of emetine in amœbic cases. As regards serum treatment we were at a disadvantage in being

supplied with a polyvalent serum of the specific properties of which we knew very little beyond the fact that in different samples agglutinins against the various types of dysenteric organisms were represented in very varying degrees. The situation was to some extent cleared by Colonel Dudgeon in 1918, who by his observations on seventeen samples of sera showed that many of them were very deficient in agglutinins, especially for Shiga's bacillus, which were precisely those of which we had the greatest need, as the Shiga bacillus was undoubtedly the organism responsible for the bulk of the more serious cases of acute dysentery. If it had been practicable to supply us with pure anti-Shiga and anti-Flexner sera more striking results would doubtless have been obtained. Even as it was, working with sera of undefined therapeutic properties, a favourable impression on the whole was formed of the value of serum treatment, given two conditions—(1) that the serum was administered at the earliest possible moment, and (2) that sufficiently large doses were used. The tendency with serum in dysentery, as with quinine in malaria, was to give increasingly large doses as our experience grew, and latterly amounts of 80 to 100 c.c. were given subcutaneously in all cases with the clinical features of a severe bacillary infection immediately on admission, without waiting for a bacteriological report. The dose was usually repeated on the following day, and again on each of the succeeding two or three days, in the same or reduced amount, according to the course taken by the disease. In cases of special severity serum was given intravenously, in combination if necessary with normal saline or isotonic glucose solution. The value of intravenous saline was very great in dehydration cases with copious watery stools, a condition in which the maintenance of the body fluids is of the utmost importance. The prospective benefit of serum treatment in any given case rapidly lessens with the lapse of time from the onset of symptoms, and the opinion was formed that nothing is to be gained by the inauguration of serum treatment later than the sixth or seventh day of the disease. Serum rashes and transient joint symptoms were not uncommon; these were accompanied by severe febrile reaction in many cases (*see fig. 17*): true anaphylaxis was fortunately very rare. A valuable article on the diagnosis and treatment of dysentery in the British Salonika Force was read by Lieutenant-Colonel Graham, C.A.M.C., at a meeting of the Salonika Medical Society in May, 1917, and published later in the *Lancet*. In the light of subsequent experience it is interesting to note his opinion, expressed at the time, that less than 3 per cent. of the dysentery in the Salonika area was of the amoebic type.

In the treatment of amœbic cases emetine was of the greatest value in controlling acute symptoms and causing the disappearance, at least for a time, of cysts and amœbæ from the stools. But in a large proportion of cases the benefit was temporary, and periodical examination of the stools sooner or later disclosed the reappearance of organisms, though the accompanying intestinal disturbance might be of very slight severity, amounting only to looseness of the bowels, with or without the presence of mucus in the stools. The tendency to relapse is well shown by figures supplied to me by Captain Budden, R.A.M.C., who was in charge of the special section at the convalescent depot to which

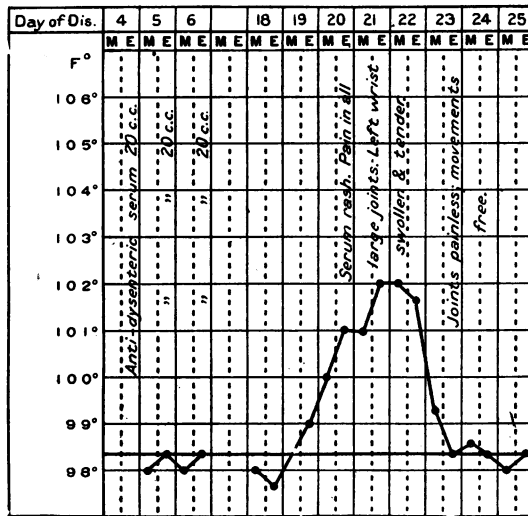


FIG. 17.

Dysentery. Severe type of serum reaction, with joint symptoms.

dysentery cases were discharged. His figures proved that of all dysentery relapses 65 per cent. were in amœbic cases, and that of all amœbic cases which came under his care 75 per cent. never became sufficiently fit to return to duty. It cannot be said that these patients had not received adequate emetine treatment; in every refractory case at least two and sometimes more than two full courses of emetine were given, though it was eventually realized that if a patient was not cured by a second course, it was waste of time to give further treatment in Salonika, and that the only prudent course was to evacuate him from the command as soon as possible. The value of emetine in acute dysentery was very

similar to that of quinine in malaria, that is to say, of the greatest use in controlling the acute manifestations of the infection, but disappointing when used for the purpose of eradicating the parasites from the system. A course of emetine lasted for twelve days, during which the patient either received $\frac{2}{3}$ gr. hypodermically twice daily, or 1 gr. hypodermically plus $\frac{1}{2}$ gr. by the mouth daily, or 3 gr. of bismuth-emetine-iodide by mouth, either alone or in combination with hypodermic treatment. From statistics in No. 15 of the Special Report Series of the Medical Research Committee it appears that emetine treatment meets with a greater measure of success here in England than was the case with us. This is no more than one would expect, and justifies the policy of the early evacuation of cases which did not rapidly clear up.

The criteria adopted for the discharge of bacillary cases from both hospitals and convalescent depots was a purely clinical one; after a week on full diet and in the absence of intestinal symptoms the patient was regarded as fit to leave hospital, and similarly if there was no recurrence of symptoms during his stay at the convalescent depot, and his general health was good, at the end of three weeks he was passed as fit for duty without bacteriological examination. Special importance was attached to the presence of mucus in the stools as evidence that the dysenteric process had not completely subsided.

ENTERIC GROUP.

Of the enteric group I have very little to say. The troops were well protected and the incidence was small. Fig. 18 shows the incidence of all forms grouped together for the three years 1916-18. It is seen that there is a marked drop from 11.77 per 1000 troops in 1916 to 0.84 per 1000 in 1918. In fig. 19 is shown an analysis into the various members of the group for each of the three years. I cannot explain the large number diagnosed as "enterica, clinical," during 1916; it is out of proportion, not only to the pathologically proved cases in the same year, but also to the number of "clinical cases" in the following years. Of cases pathologically proved it is seen that most were paratyphoid, para-A being in excess of para-B, specially in the two later years. The disease with few exceptions was of a mild type, and only sixty-five deaths occurred during the whole period. The case-mortality in 1916 was 3.62 per cent., in 1917 3.78 per cent., and in

1918 4.44 per cent. The majority of severe cases were due to *Bacillus typhosus*, a large proportion of these being admitted to hospital from vessels arriving at the port.

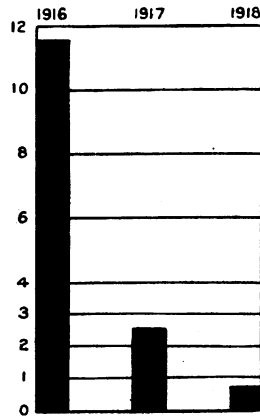


FIG. 18.

Enteric group, showing incidence of all forms as a ratio per 1000 of strength.

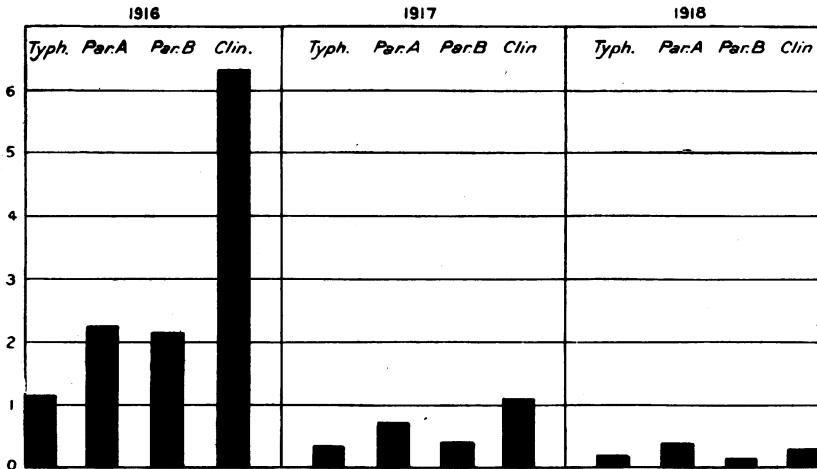


FIG. 19.

Enteric group, showing relative incidence of different varieties as a ratio per 1000 of strength.

INFLUENZA.

The outbreak of influenza with its attendant complications took a heavy toll of the forces, and was the cause of special anxiety owing to the fact that the height of the epidemic corresponded to the military operations in September, 1918, which led to the defeat of the Bulgars and the signing of the armistice with Bulgaria. The total admissions for influenza and pneumonia during 1918 were 17813, being at the rate of 111.33 per 1000 troops, and the total number of deaths was 1387, or 8.67 per 1000; that is to say, almost one man out of every hundred troops fell a victim to the disease. In fig. 20 is shown a comparison between admissions and deaths from malaria and influenza (including complications) during the year expressed as a ratio per 1000. It

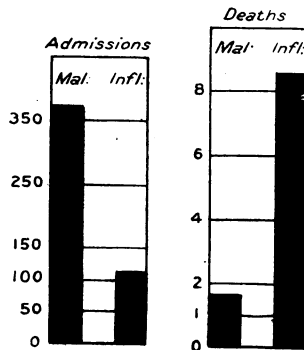


FIG. 20.

Admissions and deaths due to malaria and influenza (with complications) during 1918, shown as a ratio per 1000 troops.

illustrates graphically the enormous mortality from influenza. During the five and a half weeks from September 22 to October 30 deaths were occurring at the rate of 112 per week.

The epidemic first made its appearance in June in an outlying prisoners-of-war camp near Ekaterini, where there was an extensive outbreak of more than 800 cases, nearly all of mild type. By the end of June cases of what had come to be described as the "prevailing epidemic," many of them with serious pulmonary symptoms, were common in the Janes district, and as at the same time and in the same area there was an outbreak of sandfly fever, and every day showed a rising rate of admissions for malaria, the differentiation of these

diseases was often difficult and a certain degree of confusion in diagnosis was inevitable. At the end of August there was a serious outbreak of disease among Indian troops and Turkish prisoners of war at two adjacent camps at Arakli Farm near Llangaza Lake; some of these were cases of malaria, but in the majority the illness differed from malaria in the sudden onset without rigor or shivering, the absence of enlarged spleen or splenic tenderness, and the presence of a respiratory tract catarrh. Of the malaria cases in this outbreak there was a great preponderance of malignant tertian infection, as proved by examination of blood films. Another serious outbreak occurred a week or two later in a battalion 590 strong on the Doiran front; of these 130 fell ill, chiefly from two companies, in the course of three days; the infection spread rapidly, and in a couple of weeks the whole battalion was, in the words of the medical officer, "almost burnt out." In the earlier stage of the influenza epidemic, attempts were made by segregation of the sick to prevent its spread; but these proved unavailing, and the disease rapidly became practically general throughout the command.

The clinical features of the epidemic in Macedonia do not appear to be essentially different from those of the epidemics at home and on the western front, and I have little to add to the full and vivid account given by Major Burnford, R.A.M.C., in a communication to the Section of Medicine of this Society on April 29, 1919.¹ The disease usually began as an intense tracheitis spreading to the bronchial tubes and in the more severe cases rapidly involving the finest elements of the bronchial tree, with a patchy consolidation of lobular type. A true lobar pneumonia was comparatively uncommon, but frequently so many lobules were involved that the condition became confluent and the physical signs were indistinguishable from those of a lobar consolidation. Pleurisy and empyema were common complications. Other grave complications were necrosis of the lung leading to multiple abscesses, pericarditis, and meningitis. In one case next to no normal lung tissue was left; the lower lobes, middle lobe, and central part of the upper lobes were in a state of necrotic disintegration, crumbling under the finger, and readily separated from the pleura and the connective framework of the lung. The remainder of the upper lobes was emphysematous, some of the bullæ being of the size of a Tangerine orange.

The course of the disease was sometimes very rapid. In the case of a V.A.D. a state of generalized bronchiolitis was developed within a few

¹ *Proceedings*, 1919, xii (Sect. Med.), p. 49.

lost ground and ultimately succumbed. The chart of a case of this kind is shown in fig. 21. In other cases sudden death occurred from cardiac failure after the fall of temperature, and when the patient was apparently progressing towards a satisfactory convalescence (see fig. 22). Cases were unfortunately common in which influenzal pneumonia was complicated by an acute attack of malaria, a combination which usually proved fatal.

I cannot leave this part of my subject without paying a tribute to the devotion and utter disregard of personal risk displayed by the

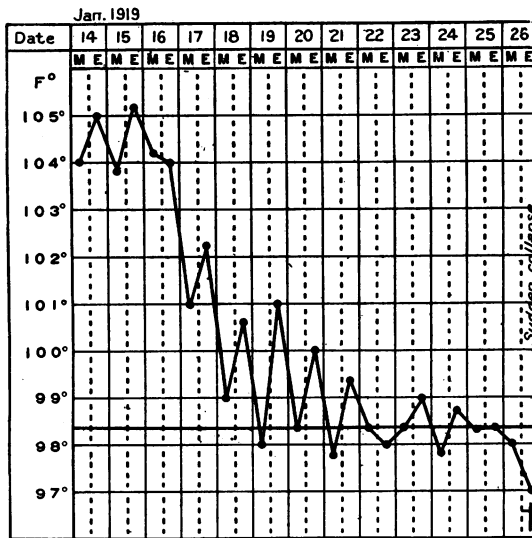


FIG. 22.

Influenza with bronchopneumonia. Sudden death during early convalescence, due to myocardial degeneration. Post mortem, heart dilated and flabby, subendocardial fat in excess, myocardium pale and friable.

nursing staff on duty in the wards reserved for serious cases during this epidemic. The work in these wards was extremely heavy and the risk of catching a disease which might prove fatal was a very real one; but they did not spare themselves, and the nursing of the sick throughout the emergency was worthy of the best traditions of the profession.

SANDFLY FEVER, &c.

Outbreaks of *sandfly fever* occurred at various places during the hot seasons, specially at Janes and at Chanak, and on more than one occasion the routine work of a medical unit was carried out only with great difficulty owing to the rapidity with which one member after another of the community fell a victim to the disease. Distinguishing points from malaria, apart from the blood examination, were the conjunctival injection with pain behind the eyes, the severe character of the pains in back and limbs, and the fact that with an equal degree of pyrexia the patient was not so much under the weight of his illness as during the actual attack of malaria. Convalescence, on the other hand, was more protracted. Initial rigors were rare, and the temperature curve, with its maximum on the first day, and its gradual fall during the two following days, was unlike that of any type of malaria. The subjective feelings of the patient were different in the two diseases; a patient with sandfly fever who had had previous experience of malaria was always emphatic that his present illness was something different from malaria. The presence or absence of sandfly bites gave no help, as it was common in sandfly districts for patients with malaria to bear the marks of previous bites; on the other hand, sandfly fever might occur without any marks on the skin, or any knowledge on the part of the patient that he had been bitten.

Sporadic cases of *acute meningitis* were seen from time to time, the majority being due to the meningococcus, while others were in connexion with the influenza epidemic. In one case of meningitis involving both brain and spinal cord, films and cultures from the meninges showed a Gram-positive coccus; cultures from the heart's blood obtained post mortem also showed a Gram-positive coccus which was morphologically identical with *Staphylococcus aureus*.

In 1917 a *Neurological Section* was started at one of the general hospitals in which invaluable work was done by Captain T. Graham Brown and Captain R. M. Stewart, R.A.M.C., who were in charge of the department. As I understand it is their intention to publish a full account of the work of the department I will make no further reference to it here.

Shortly after the armistice I made two expeditions to Bulgaria, as far as Sofia, and from there to Pirot, just beyond the Serbian frontier. In the Bulgarian hospitals at Sofia there were a few of our men who had been taken prisoners of war, and were being treated for wounds

or sickness. None of them were seriously ill, and in conversation they all expressed themselves as satisfied with the way in which they were being looked after; they were evidently receiving the same attention as the Bulgarian patients, and so far as could be seen the Bulgarian doctors were well trained and skilful, though much handicapped through shortness of medical supplies and appliances. There was also great scarcity of provisions, and our men found it necessary to supplement their scanty rations by buying bread, as far as their resources permitted, at the exorbitant prices which were ruling in the town. One of the hospitals was equipped with a complete set of Zander apparatus, a gift from the German Red Cross at the beginning of the war; when the Bulgarian collapse was imminent and the Germans left Sofia they wanted to take this costly apparatus away with them, and had to be reminded by the Bulgars that it was a gift, not a loan. Very different was the treatment of Serbian prisoners of war patients by the Bulgars. At Radomir, an hour's run from Sofia to the west, there was a concentration camp for prisoners of war, and a so-called hospital was attached to this. The dysentery ward was crowded with patients lying on filthy mattresses on the floor, two or three to each mattress; these patients were mostly suffering from acute dysentery, and were supplied with no conveniences and no attention beyond what they could give one another. A Bulgar doctor was supposed to see them daily, but I was told that before the arrival of the British he seldom visited this ward, and the only regular attention they received was a morning visit from orderlies to look round and remove the bodies of those who had died during the previous twenty-four hours. As I was leaving the ward one of the inmates in a far corner called out to me in English; he was one of our men who by some mischance had got mixed up with the Serbian patients; it was not many hours before he was being cared for in a section of a field ambulance that had recently arrived at Radomir, to his unspeakable relief. He was suffering from a severe attack of dysentery, but when I last heard from him he was doing well. Thanks largely to the energy of Colonel J. Ward, D.S.O., backed by the Bulgarian D.M.S., who gave what help he could, hospitals for sick and wounded Serbs were rapidly organized and staffed by our R.A.M.C. at Sofia, Radomir, and later at Pirot, where Serbs once more after long disuse were able to enjoy the advantages of good treatment and careful nursing.

A few cases of *typhus* and *relapsing fever* occurred in the Macedonian area; both these diseases became relatively more common after the

movement of troops to Constantinople and the Caucasus, though there was never anything approaching an outbreak on a large scale. The Weil-Felix reaction was of value, specially in mild cases, though its usefulness was restricted, owing to the fact that a positive result could not be expected earlier than the fifth day, by which time the diagnosis had in most cases become clear on other grounds. From investigations made by Captain Warnock, R.A.M.C., it appeared that the rise in the agglutinating power of the serum was very rapid, and in the course of twenty-four hours there might be an increase from 1 in 25 or 1 in 50 to 1 in 100, which was taken as the standard for a positive result. This standard was reached on the fifth day, sometimes earlier, and was followed by a rapid rise in agglutinating power until at the end of the pyrexial period (tenth to fourteenth day) a reaction was obtained with a very high dilution, e.g., 1 in 3000, 1 in 8000, and in one case 1 in 32000. The subsidence of fever was followed by a rapid fall of the reaction. Control observations were made in cases of relapsing fever, cerebro-spinal fever, small-pox, typhoid fever, malaria, influenza, pneumonia, syphilis, and in normal individuals, with negative results.

As an example of the utility of the reaction a case may be quoted in which marked meningeal symptoms were present at the onset; as a result of lumbar puncture a few drops of semi-gelatinous mucoid material were obtained containing scanty lymphocytes and no micro-organisms; the Weil-Felix reaction was positive on the seventh day with a dilution of 1 in 100; on the tenth day it was marked at 1 in 1600 and slight at 1 in 3200.

In the state of profound toxæmia which characterized the severer forms of typhus, benefit was derived from repeated intravenous salines; in the case of a patient at Tiflis who was desperately ill, in a semi-delirious state with low temperature and irregular pulse almost imperceptible at the wrist, and dry thickly coated tongue which could hardly be protruded, this procedure seemed to be the turning point of the illness, and when seen a week later he was convalescent. Among the complications and sequelæ of typhus observed in our own units and in Russian hospitals, I may mention suppurative parotitis, otitis media with mastoid disease, bronchitis and bronchopneumonia, femoral thrombosis and hemiplegia. In one case a complete unilateral paralysis of head, arm and leg developed gradually in the course of three days during convalescence.

While travelling in the Caucasus and Southern Russia with Colonel

Wenyon in the summer of 1919 we had opportunities of visiting hospitals, both civilian and military, other than our British ones. At Batoum we visited the general hospital for the province and the infectious hospital for the town, both civilian hospitals but under different management. The first was fairly well run on very limited resources; they were short of drugs and all kinds of medical appliances; but the hospital was clean, and they were making the best of a difficult situation. The cases were chiefly relapsing fever and convalescent typhus. The town hospital was a contrast in every way; the wards were crowded and filthy, the bed-clothes were grimy; flies were everywhere, and the atmosphere on a hot afternoon with closed windows can be better imagined than described; outside one of the wards was a cesspool overflowing into the hospital grounds. At Tiflis Colonel Wenyon and I were taken over the Georgian Municipal Hospital, a fine building in extensive grounds, with clean and well arranged wards, and adequate laboratories. The methods here were up-to-date and the standard of clinical work was high. The clinical material was excellent, and we spent a long morning in the wards, seeing many interesting cases. From Tiflis we went up to Erivan to investigate the circumstances of a case of suspected cholera among our troops, and were shown round one of the military hospitals by an Armenian doctor. The chief clinical interest was in the wards where cases of "typhus recurrens" or relapsing fever were under treatment. Of the numerous charts shown to us there were only one or two with more than a single relapse, notwithstanding the fact that no arsenical preparation was used in treatment. When asked why he did not give salvarsan, the doctor replied that it was unnecessary, as the cases were mild, and invariably recovered without special treatment; he said he had never had a death from the disease; but I think the real reason for withholding salvarsan was the fact that he had none to give. At many of the other hospitals I made the same inquiry and received a similar answer; it was clearly the local view that relapsing fever was a comparatively mild disease and that deaths were very rare.

From Batoum we went north to Novarossisk and Ekaterinodar, which at that time was General Denikin's headquarters. At both these places in early June the prevailing disease was relapsing fever; there were also many cases of typhus in the hospitals, but the majority were in the convalescent stage. At Ekaterinodar some of the hospitals were well arranged, others were the reverse; a reproach common to all was the failure to keep the patients free from lice. The part played by lice

in the spread of disease was well known, but when it came to practical measures there was a lamentable failure in the application of their knowledge. Real difficulties were present in the shortage of change of clothing and bedding, shortage of nurses, and sometimes shortage of water. The first of these was being remedied as far as possible by grants of linen from the British Military Mission, but little or no attempt was made to grapple with the louse problem, with the result that large numbers of the medical and nursing personnel fell victims to typhus. An incidence of 30 to 50 per cent. was regarded as a normal state of things; at one hospital in a vodka factory, with beds almost touching in unventilated and stuffy wards, *all* the personnel had had typhus, a record of which they were proud, instead of regarding it as a mark of the inadequacy of their hygienic service. It is a curious illustration of the mentality of the Russian authorities, that while neglecting such obvious precautions, they were ready to experiment with unproved and speculative methods of prevention and treatment. At Ekaterinodar some of the personnel in typhus wards were being inoculated with what was described as a "vaccine," consisting of sterilized blood drawn from typhus patients at the date of the appearance of the rash; good results were claimed for this procedure. Also, cases of typhus were being treated with serum removed from convalescent patients three to five days after the temperature had become normal; a daily dose of 10 c.c. was given subcutaneously for three to four days; the account of the benefits derived from this method of treatment was not convincing, and hardly justified the removal of large quantities of blood from those who were recovering from a grave and debilitating illness. At Novarossisk intravenous injections of cyanide of mercury in doses varying from 0.001 to 0.01 grm. were given in 2 c.c. of water every second day; 300 to 400 cases of typhus had been treated in this way with alleged good results.

The hospitals at Constantinople were on the whole clean and well ordered in most respects, except in their nursing arrangements, which were far below the standard which we regard as essential. Everywhere there was a shortage of drugs and of medical and surgical necessaries and all schemes for improvements and developments were held up for want of funds. The children's hospital on the outskirts of the town was a model of its kind, consisting of a number of separate pavilions standing well apart from one another in wooded park-like grounds overlooking the Bosphorus.

I cannot conclude my remarks without paying a special tribute to

the D.M.S., Major-General Sir M. P. Holt, K.C.B., K.C.M.G., who was always ready with his advice and whole-hearted support in carrying into effect any recommendations made with the object of improving the details of the medical service, and whose unfailing interest in the clinical aspects of the work was of immense encouragement to all concerned in maintaining a high standard of clinical efficiency. I also wish to express my thanks to Colonel C. B. Martin, C.M.G., Brevet Lieutenant-Colonel J. A. Anderson, and Major W. R. Galway, O.B.E., M.C., for supplying me with the figures and curves on which the foregoing statistical diagrams are constructed; to my predecessor Sir J. Purves Stewart, K.C.M.G., C.B., for many kindnesses; to Major H. W. Wiltshire, O.B.E., D.S.O., and Major H. R. Evans for valuable criticisms and suggestions, and to officers-in-charge of medical divisions and medical officers of the various hospitals, on whose willing co-operation in showing and discussing cases of interest so much depended in collecting the data on which this communication is based.

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