LABORATORY WORK IN TURKEY, 1920-1923.

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When the post of D.A.D.P. was instituted in the spring of 1920, the Force in Turkey, although considerable, was very scattered and at the same time in the process of demobilization. There were still troops in Salonica as well as far inland from the Black Sea. Apart from the medical units with the South Russian Military Mission, there were four general hospitals, two stationary hospitals, one casualty clearing station, and three field ambulances—all treating sick. Each of these units had a small clinical laboratory where at least full microscopic examinations could be made, and every unit could diagnose its own cases of malaria, so that treatment could be commenced without any delay. There were four larger laboratories in the general hospitals where all the ordinary routine work was carried out. There was also a central laboratory where the more advanced serological work was performed, animal inoculations were done, and vaccines prepared in bulk for the Force. Here also chemical work and the training of officers for the smaller laboratories was carried out. The establishment was two officers, five N.C.Os. and five other ranks, plus local labour.

Towards the end of 1920 the Force had diminished and it was found possible to begin to close down some of the medical units. The central laboratory then moved into a section of No. 82 General Hospital—which was the central hospital—and, apart from the routine work of the Indian General Hospital, it was now found possible to carry out all the laboratory work with the reduced establishment of two officers (shortly after reduced to one) and two other ranks.

When, in the autumn of 1922, the Chanak crisis arose and the concentration of troops began in the Dardanelles, new medical units were organized for that area. A central hospital was established at Kilia, on the opposite side of the water to Chanak. An A.D.P. was appointed and a district laboratory was at once put up in the hospital grounds. Although this was only a field laboratory, all the routine work from the hospital was done in it, in spite of the frequently trying and difficult conditions.

Both laboratories closed down with the final evacuation of the troops from Turkey in September, 1923.

The three main causes of disability throughout the period were acute diarrhoea, malaria and venereal disease, and work in connexion with these three groups of diseases constituted the main work of the laboratory.

DYSENTERY AND DIARRHOEA.

It was not possible to concentrate all these cases in one hospital owing to the distribution of the troops, and special runners had to be employed to bring specimens to the laboratory as quickly as possible in order to ensure their freshness. Even then the results obtained were poor as compared
with the results obtained with specimens from the hospital in which the laboratory was situated. The routine method adopted was as follows: A suitable portion of the feces was taken and emulsified in saline and part of it was inoculated directly on to MacConkey or litmus lactose media; the other part was examined microscopically. Extremely few cases of amebic infection were seen and certainly no epidemic during the period occurred. The small number of cases diagnosed all gave histories of previous attacks in other places. Bacillary dysentery was the type and the Flexner group was responsible for the majority of the cases. In the period immediately preceding the Chanak crisis, the troops had been occupying permanent quarters; a high standard of hygiene was possible. The incidence of dysentery had gradually declined to a very small figure indeed. But as soon as the movement of troops began in the Dardanelles, bacillary dysentery commenced to occur in considerable numbers—over thirty cases in the first week. As soon as it was possible to commence laboratory work at Kilia a high percentage of positive findings was obtained in the dysentery cases. Nearly fifty-five per cent of the cases of acute diarrhoea in Kilia proved to be Flexner Y infections; in the Constantinople area, however, only forty per cent gave this result during the same period. The method of diagnosis was to pick off suggestive colonies from the plates after fifteen to twenty hours' incubation and to test them against a high titre serum by the rapid method on a slide. In this way a diagnosis could be obtained immediately. The organism was tested against the sugars also to confirm the finding. In the period preceding the Chanak crisis, the proportion of the original Flexner V to Flexner Y was about three to two, but afterwards Flexner Y constituted about seventy per cent of all the Flexner infections. Shiga infections were not frequent, but they were always extremely severe cases. Bacillus morgan and B. schmitz were recovered from a fair number of cases of a milder dysentery; they were not so regular in their serological reactions as were the Flexner and Shiga types. Flexner Y was found in two healthy carriers eleven and nine months respectively after they had experienced any diarrhoea. In 237 successive cases of acute diarrhoea with blood and mucus: Flexner group was found 156 times; Morgan group 39 times; Schmitz group 30 times; and Shiga group 12 times.

MALARIA.

The examination of blood films for malaria parasites produced the greatest amount of routine work in the laboratory. In 1920, when the troops were scattered over a large area outside Constantinople, malaria was a very serious source of disability, but with the withdrawal of the troops into proper barracks in the town area the number of fresh infections in 1921 and the first half of 1922 was very small. When the troops were moved a rapid increase in the number was inevitable.

The average number of blood-films examined per annum in the central laboratory was about 1,000.
Laboratory Work in Turkey, 1920-1923

In 1920 1 in every 4-0 films was positive.

1920 1 8·0 (1·5 per cent M.T., rest B.T.)
1921 1 4·6
1922 1 4·0 (9·0)
1923 1 8·0 (8·0)

The parasite of quartan fever was seen very occasionally (four times in Kilia and three times in Constantinople). Had the occupation not ended in September the figures for 1923 would have been much higher. The average number of films examined at Kilia was about the same as in the central laboratory. Owing to the large amount of dust and fine sand blown about it was found very necessary to use fresh double distilled water for diluting the Leishman's stain in order to get satisfactory preparations.

VENEREAL DISEASE WORK.

Wassermann examinations constituted the bulk of the work in this group as the routine examination of gonococcal smears was made at the venereal disease hospital. The Wassermann reaction was carried out weekly after the manner of McIntosh and Fildes, measuring each quantity with a pipette or burette—and an average of 2,750 were examined each year. Considerable numbers of these tests were carried out for the Royal Navy in conjunction with the Fleet Medical Officer. The results were worked out quantitatively and standardized in conjunction with the Naval laboratory in Malta in order that the effects of various arsenobenzol compounds upon the Wassermann reaction might be judged. The drug being given by the subcutaneous, intramuscular and intravenous routes.

Flocculation tests were carried out as the opportunity arose, but were only done as controls of the Wassermann test and not as a routine.

Originally the dark-ground examinations for the spiroerna were carried out in the venereal hospital, but owing to the lighting difficulty it was decided to do all that work at the central laboratory where a small arc lamp was installed. Serum was collected from the sore in capillary tubes and forwarded to the laboratory for examination. If the first examination was negative another specimen was taken after an interval of twenty-four hours. If necessary further examinations were made. During 1922 it was decided to examine every penile sore in this way and it would appear that the results obtained justified this:—

In 1920 40 sera were examined and Spirocheta pallidum found in 10 cases.

1921 156
1922 250
1923 501

(January to September.)

SANDFLY FEVER.

Each late spring and summer large numbers of cases of this infection occurred, and as would be expected most of the cases were found in the towns. As a matter of fact the disease was practically confined to two barracks, which for military reasons could not be entirely evacuated, the
only satisfactory method of prophylaxis. The enormous cost which would have been involved in repointing buildings, levelling broken ground, etc., for the destruction of breeding grounds of the phlebotomus fly was not found justifiable.

Blood films from every case were examined for the possible presence of parasites and for blood changes. The case which was clinically typical of pappataci fever invariably showed a leucopenia with a relative increase in the mononuclear cells, but many other not quite so typical cases occurred in the sandfly season which were frequently labelled sandfly fever and showed an early leucocytosis. In these one could not find absolute evidence of association with the phlebotomus; and it is doubtful if they were true cases of sandfly fever.

Considerable numbers of early blood cultures of cases were examined by citrated methods, animal inoculation, etc., but with negative results.

Enteric Group.

The inoculation state of the Army was always very high and infections of this group were few; paratyphoid infections were far more common than typhoid. Blood culture was attempted in every case, but owing possibly to the high inoculation state of the troops was not successful in seventy-five per cent. of the cases. In the case of the mercantile marine, etc., who were poorly protected, blood culture was successful in almost every case. The routine method finally adopted was cultivation in pure ox bile. At the slaughter-house a ligature was placed round the duct and the gall bladder dissected completely away and brought directly to the laboratory. The surface was seared and the bile removed aseptically into small sterile flasks. These were incubated and subsequently tested for sterility before being filled into ten-cubic-centimetre serum flasks. It was found that after sterilization the bile was not such an efficient medium. In our hands this method gave better results than taurocholate, trypsin or oxalate methods. A supply of these flasks was sent to each hospital. After five cubic centimetres of blood had been introduced at the bed-side through the broken tip of the neck, the flask was resealed with sealing wax and forwarded to the laboratory. Delay was not so very serious as the organisms multiplied very rapidly in this medium. Paratyphoid A appeared the most difficult to cultivate from the blood and frequently diagnosis had to be made upon a series of agglutination tests and on the recovery of the organism from the faeces, etc. Paratyphoid A occurred in two strains, one very inactive hardly ever producing gas and taking ten days or more to ferment dulcite and the other from kelia which produced gas very readily. Serologically they were both agglutinated to titre.

Paratyphoid B grew readily in blood culture and was regular in its reactions.

Paratyphoid C was isolated with some frequency in 1920, whilst the original Salonica force was in occupation. Later when this force was replaced by fresh troops Paratyphoid C was no longer found.
Bacillus *faecalis* alkaligenes was isolated from blood cultures in two cases whose clinical picture suggested an enteric group. It was generally found that in unprotected persons the organism could be recovered from the blood very late in the disease if the temperature had not remitted.

**CHOLERA AND PLAGUE.**

Although the Army did not contract either of these two diseases, the infection occurred amongst the civilian population and a prophylactic vaccine against both cholera and plague was prepared in large quantities in the central laboratory and the troops were inoculated.

With regard to plague, which occurs sporadically in Constantinople, every effort was made in conjunction with the Sanitary Commissioner to find infected rats, but with negative results. Owing to the enormous prevalence of bed bugs large numbers of experiments were carried out to discover if the bugs transmitted the disease. The experiments produced no evidence of transmission.

**SMALLPOX.**

A serious epidemic of smallpox in 1922-3 amongst the civilian population produced a certain number of cases in the Army. The disease was of a very virulent type, but vaccination was very complete and there was only one death amongst the Army cases. One point in the treatment was the daily painting of the whole body with 1/200 solution of potassium permanganate. The results on the whole were very satisfactory.

**RESPIRATORY DISEASES.**

This group of diseases was uncommon in Turkey throughout the period under review. It is true that one hill regiment of Indian troops suffered extensively from tuberculous disease, but the infection was generalized and not confined to the lungs. There was a large amount of pulmonary tuberculosis amongst the natives employed, but there was no evidence that any one of the few cases of tubercle in the British Army was recently infected. In 1921 a troopship arrived with practically all the troops infected with influenza. It was a very mild infection and mass isolation entirely prevented any spread. Sample post-nasal swabbings in fifty early cases showed *B. pfeiffer* to be the predominating organism in about fifty per cent.

Pneumonia and pleurisy were so infrequent that they call for no note.

Diphtheria occurred in sporadic form in the Army and was of a very mild type. In the routine sample swabbing of contacts, one was struck by the number of avirulent forms of Klebs-Loeffler bacillus isolated from healthy people. Between January, 1921, to September, 1923, Klebs-Loeffler bacillus was isolated from seventy-three throats or noses, twenty-eight of these cultures appeared to be absolutely non-virulent. There was a small outbreak in one of H.M. battleships in which a mess servant (a virulent carrier) infected about half the gun-room. The very prompt measures of
putting the "gun-room" ashore in a camp completely prevented the spread of the infection.

**Relapsing Fever.**

Two or three cases occurred each year, but apart from the cases from Russian camps, no epidemic was seen. The spirochète was always found with comparative ease during the pyrexial period.

**Vincent's Disease.**

The fusiform bacillus and spirochète of Vincent were found together in a variety of conditions, chiefly in ulcerative tonsillitis, ulcerative stomatitis and gingivitis, and ulcerative balanitis. All these conditions were fairly common. On the whole the "infection" responded very well to arsene-benzol compounds, the lesion being free from these organisms after two doses 0.45 gramme of sulfarsenol had been given. The lesions invariably contained other organisms besides those of Vincent, and it was frequently found, especially in the gingivitis cases, that a streptococcus would persist after the other organisms had disappeared and that after a lapse of time the Vincent organisms would again be found in the gums in as large numbers as before. This sequence of events was met by vigorous local treatment and the employment of autogenous vaccines. These results would suggest that Vincent's organisms frequently are not primary infecting agents.

**Anthrax.**

During the year 1923, four cases of malignant pustule occurred amongst the troops. Anthrax was prevalent to a certain extent in the horses and mules and the fact that the organism was not found in any of the shaving brushes examined and also the fact that all the cases were possible contacts of cases in animals, point to the horse or mule as the infecting agent.

In each case cultures were taken from the blebs and grown on artificial media and also inoculated into a guinea-pig. The organism was highly virulent. 0.1 cubic centimetre of either the serum or of a twenty-four hours broth culture killed a 250-gramme guinea-pig in less than twenty-four hours.

Blood cultures were taken in each case, but anthracæmia was not found. The treatment was entirely non-surgical. Three of the cases were treated with a single dose of fifty cubic centimetres of anti-anthrax serum subcutaneously and a local carbolic compress and the fourth with the local compress only. Every case made a complete and uninterrupted recovery.

**Jaundice.**

Apart from ordinary catarrhal jaundice there was a type that occurred in the summer months which had a curious onset, etc. The disease was not associated with any intestinal disturbance, but was always preceded by a short pyrexial period which had subsided three to seven days before the jaundice appeared. A few of the patients were rather miserable during
the first day of the jaundice, but both the symptoms and the colour itself cleared up very quickly.

There was a slight early leucocytosis (10,000 per cubic centimetre) with a relative increase of six to nine per cent in the large mononuclears. Urine, faeces, and blood examinations were carried out in most of the cases, but there were no abnormal findings. Triple centrifugalization of the blood and examination by dark-ground methods failed to show any spirochaetal infection.

The disease was far more common in officers and officer's wives than amongst the troops.

Agglutination Tests.

The routine method was that of Dreyer, but the Oxford standard emulsions were not used—the bacterial emulsions were prepared in the laboratory, and each batch standardized against the previous batch. The large majority of these tests were against the typhoid group, in which case it was the rule to make at least three tests with weekly intervals. Malta fever and dysentery group agglutinations were also carried out in the same manner, but with different incubation times.

The Weil-Felix reaction was carried out in every case of suspected typhus fever, of which there were considerable numbers in 1920. The original technique was followed with a culture of \textit{B. proteus} X 19 obtained from the Austrian Hospital in Constantinople in 1919. It was rare to obtain a positive reaction before the 6th day of the disease, and then only in a low dilution, but by the 8th to 9th day the titre was usually 1-500. Every case of typhus that gave a positive clinical picture gave a positive Weil-Felix reaction. Very large numbers of agglutination tests were also performed for the identification of organisms, etc.

Vaccine Therapy.

With the exception of the mixed gonococcus vaccine almost all the attempts at active immunization were carried out with autogenous vaccines. In 170 successive cases of furunculosis so treated 140 were reported as cured or markedly improved, the remaining thirty showed no change.

Twenty-five cases of common cold were treated and fourteen of the cases considered themselves to be greatly improved in general health with almost complete relief from colds.

Just over a thousand cases of gonorrhoea treated with a mixed gonococcus vaccine and compared with about 200 other cases with identical treatment, except that the vaccine was not given, failed to show any benefit from the vaccine, either in shortening the time in hospital or in effecting a more thorough cure. On the other hand the small number of cases (primary) treated from the very first moment with vaccine, and with an autogenous vaccine on the third day, were distinctly promising in their results.
POST-MORTEMS AND HISTOLOGY.

All post-mortem examinations in the Constantinople area were carried out by the central laboratory and those in the Kilia area by the district laboratory. They averaged about thirty per annum. The histology in connexion with these and any growth, etc., removed at surgical operations was carried out at the central laboratory.

CHEMICAL WORK.

For the most part this was just the routine work such as is carried out in a hygiene laboratory, i.e., analysis of foods, drugs, etc., together with a small amount of chemical pathology.

Travel.

DAGSHAI, SIMLA HILLS.

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Dagshai is one of the smaller hill-stations near Simla, and is situated in the Sub-Himalayan Range, on the top of a ridge running east and west. It is ten miles from Kasauli, and eighteen miles from Kalka by road. Latitude, 30° 58' 4" N.; longtitude, 77° 2' 3" E. approximately; altitude, 6,087 feet above sea level.

The climate is temperate throughout the year; in the hottest months, May and June, the temperature rarely rises above 80 degrees, and in the winter the minimum is about 35 degrees in the early morning and 50 degrees at mid-day.

The most unpleasant period is during the monsoon, which commences early in July and ends in the middle of September; this year there was an extra downpour, commencing on September 27, during which 17½ inches of rain fell in sixty-three hours. This downpour did very great damage throughout the district, railways, roads and houses being very much damaged, and for some days transhipments of passengers and baggage were necessary.

The average rainfall is about 67½ inches, of which the greater part falls during the monsoon. This year there were 12·23 inches in August and 24·64 inches in September.

Snow falls during the winter months, but does not remain long on the ground, most of it melting in two or three days; during these months the air is dry and bracing.

The cantonment is built on two hills running east and west, and surrounding these two hills is a flat road, somewhat in the shape of a figure