ON LABORATORY DIAGNOSIS IN THE TROPICS AND SUB-TROPICS IN WAR TIME.

By PHILIP MANSON-BAHR.

(Continued from p. 333.)

DIPHTHERIA.

The provision of adequate means of laboratory diagnosis of diphtheria is very important also from a military standpoint. But it is doubtful whether this can be fully undertaken by a forward diagnosis unit. It entails the provision of sterilized throat swabs in sterile tubes, the direct inoculation of the swabs on to suitably prepared Loeffler's medium, and its subsequent incubation. It was found to be a matter of considerable difficulty to prepare satisfactory Loeffler's medium in the field. Sheep's serum does not congeal sufficiently solidly for the purpose, but (when obtainable) camel's serum was found to be satisfactory. It should be the duty of a base laboratory to prepare and supply the field laboratories with an adequate amount of Loeffler's medium for diphtheria diagnosis, and it must always remain the duty of the latter to perform this diagnosis, if necessary, on a more extended scale.

THE INSTITUTION AND ORGANIZATION OF THE DIAGNOSIS UNIT.

Consideration of the facts detailed above, and the necessity of conserving the numbers of European troops, in view of the menacing military situation in France, led at the beginning of 1918 in Palestine to the establishment of this new unit—the diagnosis station.

The conception of these diagnosis units was that they should be—

(a) Extremely mobile.

(b) Self-contained and possess their own transport.

(c) Able to perform a large amount of work at a very rapid rate.

The personnel consisted of one Royal Army Medical Corps Officer and two orderlies, especially trained in rapid methods of diagnosis as detailed above. The unit and its equipment was so designed as to be transported in a G.S. wagon drawn by four horses or mules. They were, therefore, extremely mobile, their equipment was so simple that they were able to commence work at short notice, and were able to accompany the cavalry divisions on any rapid advance into enemy territory. These units, which were trained and equipped for work in May, 1918, continued to do good service throughout that summer. They fulfilled their most important function in the momentous advance in the autumn of that year, and each unit eventually became a laboratory centre on a line extending over more than 300 miles.
Six of the units were equipped and two were assigned to each of the three Army Corps which went to make up the Egyptian Expeditionary Force. The location of these units in the field was a matter of considerable deliberation. As previously stated, under ideal conditions, their location should be somewhat in advance of the field ambulance so as to be in touch with regimental medical officers. Wherever possible this was accomplished, but as a general rule it was found most suitable to attach such a diagnosis unit to one centrally placed field ambulance mainly for the purposes of rations, in a location easily accessible to other field ambulances, or in some sheltered position where one or more ambulances had been located, thus forming a collecting station. The diagnosis stations in this latter situation obtained the greatest opportunities for work, and from the returns available, herewith reproduced, they seem to have been well patronized throughout.

**Details of Personnel and Equipment.**

**Personnel.**—One officer; two specially trained Royal Army Medical Corps orderlies (training to be detailed later); one British and one native driver.

**Equipment.**—Tents, C.D.L. (bell tents), two (one for medical officer and one for orderlies); tents, I.P.G.S., 160 lb., one.

This light tent (see illustrations) was found to be most satisfactory. It was easily portable and erected, and if the ground space was well excavated, a very handy and comfortable laboratory could be made.

Tables, G.S., six feet, three (these made good and stout laboratory tables); forms, dining, three; lamps, F.S., paraffin, four. The ordinary hurricane lamp, if arranged so that the edge of the flame impinges on the mirror of the microscope, makes a suitable luminant for night work. Microscopes (fitted with oil immersion lenses), two.

It was found that two microscopes were ample for each unit. They had to be provided with a mechanical stage, and whenever possible with spare lenses. The work could then be performed by the officer in charge and one orderly, while the other was employed in cleaning up and other necessary duties.

Wagon, G.S., one; mules or horses, four. If need be, the outfit could be transported by pack mules or camels.

Each unit was provided with six or more gross of microscope slides, a stock of fully prepared Leishman's stain, a gallon cask of neutral distilled water, pipettes, grease pencils, two spirit lamps, cedarwood oil, methyl alcohol in ampoules of 100 cubic centimetres, methylated spirit, two quarts; glass rod, four feet; two porcelain staining troughs, twelve by ten inches. The total laboratory equipment, with the exception of the microscopes, could be packed away into two empty kerosene tins. It was estimated that such a unit was capable of examining and reporting upon 100 blood slides a day, and in many instances this number was achieved. The units actually
Laboratory Diagnosis in the Tropics and Sub-Tropics

Diagnosis Station Operating in Jordan Valley.
(Photo by Col. Andrew Balfour: reproduced by kind permission of the Lancet.)

Diagnosis Station Operating at Tripoli in Syria, November, 1918.
also reported upon a large number of faecal specimens, mainly for dysentery, about which, unfortunately, no adequate records now exist.

Rendering of Reports.—As regards the rendering of reports a period of five minutes was allocated for the microscopic examination of each slide. In order to avoid any unnecessary delay, and in order to ensure prompt delivery, the orderly who brought the specimens either from the regimental medical officer or from the field ambulance, was detained till the required number of examinations had been concluded, so that he could return with the reports. In most instances the orderlies themselves had been instructed in the methods of making blood films, and under the direction of medical officers were able to take them in a routine manner. On the whole this system was found to act admirably.

Training of Medical Officers and Men.—The successful performance of rapid and accurate microscopic diagnosis on a large scale, such as outlined above, entails a considerable knowledge of protozoology and cellular pathology. A course of instruction dealing especially with the diagnosis of malaria and dysentery was commenced in March, 1918, at a convenient centre some distance behind the line. Seven officers and sixteen Royal Army Medical Corps orderlies were detailed to attend this course, which lasted six weeks. Naturally, within this period, it was not possible to enter fully into a complete study of the blood nor to become familiar with all possible pathological appearances. It was shown, however, that within the time allocated it was possible to render the officers, and in most cases the men as well, familiar with the structure and appearances of the normal blood cells and the various stages of the malaria parasites, both in stained and unstained preparations. Separate classes were held for the officers and men.

The course was divided as follows :

First week.—Study of normal blood of man, domestic animals, reptiles and birds.

Second week.—Study of pathological changes in the blood. Pernicious anaemia, changes in the blood cells produced by malaria, helminthic disease, etc.

Third and fourth weeks.—The recognition and detection of various forms of malarial parasites at different periods of development. Staining and recognition of spirochaeta of relapsing fever. The differentiation of these parasites from artefacts: Leishman’s stain being utilized as a routine throughout.

Fifth week.—The recognition of Anopheline mosquitoes, their eggs and larvae. A large amount of pathological material being available at that time, the last week of the course was devoted to a series of practical examinations in order to test their capacity to recognize blood parasites under the most severe conditions. When found proficient the class was moved to a field laboratory in connexion with a casualty clearing station, and their reliability was tested on the pathological material sent for examination.
MAP SHOWING DISPOSITION OF THE EGYPTIAN EXPEDITIONARY FORCE IN 1918.

Diagnosis Stations (M.D.S.) are shown by solid dots. Their relation to Field Laboratories before final advance is made clear. It is impossible to show in graphic form the route they took during the rapid advance into Syria. Field laboratories are indicated by a shaded dot. Motor laboratories are indicated by a shaded square.
At the end of two months the units were considered to be sufficiently efficient to be posted to their positions in the field.

In addition to blood work, in so far as opportunity offered, the officers were instructed in the practical diagnosis of dysentery. The main point to be arrived at is the recognition of the active stages of *E. histolytica*, and the features by which it may be differentiated from non-pathogenic species should be considered, rather than the different forms it may assume during various stages of its existence. It is the recognition of the active vegetative stage that is really essential. Little difficulty was experienced in teaching the cytological diagnosis of bacillary dysentery and especially the recognition of the large phagocytic cells which are apt to be mistaken for entamebae.

Should these diagnosis units be at any time employed in the future, great stress should be laid upon their aid in the rapid diagnosis of dysentery this being of equal importance as that of malaria.

It was laid down as a maxim that, though the orderlies were instructed in the use of the microscope, and in the appearance of parasites, yet the actual diagnosis had to be made by the officer in charge.

The position the diagnosis units occupied in the line during the summer of 1918 is shown in the accompanying map (see map, p. 320).

In the advance into Syria in September, 1918, the mobility of these units was amply demonstrated. The two diagnosis units attached to the Desert Mounted Corps were able to move forward with the cavalry. One was at work in Damascus by October 12, and soon became the laboratory centre for that city. The necessity of this diagnosis unit at that time, when malaria and influenza were both epidemic, may be gathered from the statement of the officer in charge. He stated that he found 11 out of 15 patients isolated as dysenterics to be suffering from subtertian malaria, and in the general ward of an improvised hospital he found 30 out of 45 patients, diagnosed on clinical grounds as influenza, to be examples of the same disease.

I may quote also from a report of the A.D.M.S of the Desert Mounted Corps: "In the recent operations microscopic examination of the blood proved to be of inestimable value. In every case of pyrexia the question immediately arose—is it malaria or influenza? If the former it was essential to give quinine at once, but, if this were done before a blood-slide could be taken, the probabilities were that the case would never be subsequently diagnosed and might be discharged without a proper course of treatment, as influenza. If influenza, it might go through a course of treatment for malaria on the presumption that quinine had obscured the parasite."

The actual amount of work performed by six diagnosis stations is given in the accompanying table.

As previously stated, it is not possible to give accurate statistics of the amount of dysentery diagnosis done during the same period, although this was by no means negligible.
Laboratory Diagnosis in the Tropics and Sub-Tropics

THE ACTUAL AMOUNT OF WORK PERFORMED BY THE DIAGNOSIS STATIONS IN PALESTINE FROM APRIL TO OCTOBER, 1918 (SIX MONTHS).

<table>
<thead>
<tr>
<th>No. of unit</th>
<th>Total slides examined</th>
<th>Benign tertian</th>
<th>Subtertian</th>
<th>Quartan</th>
<th>Mixed infection</th>
<th>Relapsing fever</th>
<th>Percentage of the main forms of malaria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>16,002</td>
<td>2,550</td>
<td>823</td>
<td>3</td>
<td>123</td>
<td>194</td>
<td>15.9 per cent B.T.</td>
</tr>
<tr>
<td>2</td>
<td>8,432</td>
<td>3,292</td>
<td>366</td>
<td>---</td>
<td>---</td>
<td>72</td>
<td>5.9 B.T.</td>
</tr>
<tr>
<td>3</td>
<td>3,414</td>
<td>856</td>
<td>69</td>
<td>---</td>
<td>---</td>
<td>60</td>
<td>4.8 M.T.</td>
</tr>
<tr>
<td>4</td>
<td>5,595</td>
<td>745</td>
<td>507</td>
<td>2</td>
<td>---</td>
<td>35</td>
<td>2.5 B.T.</td>
</tr>
<tr>
<td>5</td>
<td>4,121</td>
<td>546</td>
<td>675</td>
<td>4</td>
<td>3</td>
<td>---</td>
<td>2.0 M.T.</td>
</tr>
<tr>
<td>6</td>
<td>2,604</td>
<td>494</td>
<td>174</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>1.8 M.T.</td>
</tr>
<tr>
<td>Total</td>
<td>40,168</td>
<td>8,483</td>
<td>2,614</td>
<td>9</td>
<td>126</td>
<td>361</td>
<td>21.1 per cent B.T.</td>
</tr>
</tbody>
</table>

Together with the blood examinations done by the field laboratories attached to the force, the total number of slides examined amounted to 111,261 from which the accompanying graphs (Graphs I and II) were made. These demonstrate the prevalence of malaria during the various months, the earlier prevalence of the benign form and the dramatic and sudden autumnal rise of the subtertian infection.
The value of accurate statistical information of this kind, especially to the Sanitary Service, is obvious. The information with reference to the outbreaks of malaria and dysentery are so readily and promptly obtained, so as to enable active preventive measures to be as promptly taken whenever they occur.

The nature of the information obtainable by these means is well illustrated by Graph III, which demonstrates, day by day, the incidence of malaria in the Cavalry Divisions operating in the direction of Damascus, and how the sudden rise of subtertian malaria took place after an incubation period of twelve days, subsequent to bivouacking one night in a malarial centre.

It appeared to be the fate of the cavalry to strike almost every possible
malarious locality. Night riding was almost the rule and infection was contracted at that time in the Plain of Esdraelon. It is estimated that at this time some 7,000 new infections occurred.

Graph II.

Composite weekly malaria graph from aggregate returns of the Diagnosis Stations, showing the infections of the Jordan Valley. The preliminary rise of benign tertian malaria and the rapidly developed autumnal epidemic of subtertian malaria are represented.

Although the main topic in this paper is malaria, the same information is readily obtainable, when desired, with reference to outbreaks of bacillary dysentery and enteric fever; it is especially valuable in localities infected with schistosomiasis.
Graph of tertian malaria cases diagnosed by blood examination in September and October, 1918. Though representing but a fraction of the whole epidemic, it clearly shows the sudden onset after an incubation period of 12 days.

The Unsuitability of Motor Laboratories for Work of this Description.

The advantages which mobile, horse-drawn, diagnosis units of this description possess over the cumbersome, more elaborate motor laboratories in a semi-civilized country with bad and in many cases non-existent roads, soon became apparent. As has already been stated these horse-drawn vehicles could proceed over the roughest ground, the equipment being light, the glassware being minimal, and the whole outfit of the simplest character. The motor laboratories, on the other hand, though capable of doing very excellent work where the roads were reasonably passable, proved to be too heavy and cumbersome to move over rough country, and in doing so the vibration caused great disorganization of the delicate apparatus, and damage to the glassware. And after the rains or in sandy desert they were unable to move at all. The somewhat elaborate equipment proved for rough work of this description to be disadvantageous, for, indeed, the simpler the apparatus the more rapidly is the work performed.

For work of this description the diagnosis station is more economic, more practical, and is therefore preferable to the motor laboratory.

Administration of Diagnosis Units.

The map (p. 420) shows the disposition of these units in Palestine during the summer of 1918, immediately before the September advance. They were
allocated two to each Corps; but since they had proved their usefulness and practicability, and since it was realized that they did not hinder, but rather accelerated the evacuation of the sick, I consider that this number could be advantageously increased to three in each Corps, so as to be accessible to every field ambulance.

As regards their position in the field, I am of the opinion that they should be attached for rations to the most forwardly situated field ambulance, but this naturally is a matter for discretion as circumstances arise.

In the matter of command, it was found advantageous for purposes of co-ordination to keep these units under the administration of one officer who was responsible for their work and the provision of the necessary reagents and supplies. It is suggested that this officer, who may be termed "officer in charge of diagnosis units," should himself be responsible to the director of pathology attached to the Force. Probably, unity of purpose is better obtained if the work and allocation of these units is made from general headquarters.

**SUPPLY.**

The officer in charge of these units should be responsible for the regular supply of necessities. Such necessities include microscope slides, cover slips, fully prepared and active Leishman's stain, freshly prepared neutral distilled water; this latter is most important. These supplies were obtained from the nearest field laboratories, special attention being given to the question of the stain and the distilled water; the condensation water from the steam sterilizers provided in these laboratories being found suitable for the latter purpose. The water was despatched to the diagnosis units in gallon rum jars whenever transport was available.

**THE RELATION OF THE DIAGNOSIS UNIT TO THE EVACUATION OF THE SICK.**

So far from impeding the evacuation of the sick from the forward area, it is evident from the foregoing, that, by establishing a rapid diagnosis, the mechanism of evacuation is accelerated. The work of the field laboratories is also greatly alleviated and the routine of the casualty clearing station considerably lightened. In times of emergency it is necessary, as in 1918, to conserve the man-power; here the work of the diagnosis unit becomes invaluable. By differentiating the more serious from the less severe forms of disease, it is possible to reduce the sick rate, by returning those only temporarily indisposed directly to their units, so as to avoid their evacuation altogether. For this purpose accurate diagnosis is essential, especially the differentiation of subtertian from tertian malaria.

**THE FIELD LABORATORIES.**

These are larger and more complicated units, and are necessarily more heavily equipped and less easily mobile, and therefore can usually be estab-
ished only where rail and road transport is available. They should be capable of performing more elaborate bacteriological work and the routine analysis of the water supplies. Their work is of a more general character, and their situation in the field should be in relation to a casualty clearing station or a group of these units. In many ways they should supplement and elaborate the work already performed by the diagnosis stations. I therefore give an outline of the establishment and equipment we found to be necessary, as the result of experience in such a field laboratory four of which were attached to the Egyptian Expeditionary Force.

**Equipment of a Field Laboratory.**

The equipment of a typical field laboratory such as that referred to may be stated as follows:

Two Indian Pattern Marquees, one for the accommodation of the officer in charge, the other for use as a laboratory; one portable canvas hut, in sections, easily dismantled and erected, windows of mica, wooden floor. Dimensions: 16 feet by 8 feet by 8 feet.

In the hut, media making and preparation generally is carried out: it also serves as a store-room for reagents and glassware.

One bell tent for accommodation of the Royal Army Medical Corps orderlies.

**Apparatus.**

*One Autoclave.*—This is the only piece of apparatus really necessary in the field for making culture media, sterilizing glassware, etc. It can also be employed as a steamer, and, with care, it is possible to inspissate blood serum in it.

A hot-air oven and steamer are quite unnecessary.

*One Incubator.*—Hearson's A.I model working at 37°C, and heated by a paraffin lamp is the best type. It is difficult to know where to place the incubator for safety. The most convenient position is undoubtedly in the laboratory marquee as this obviates running to and fro, with cultures. One field laboratory was burned down through something going wrong with the incubator lamp, which set fire to the marquee. We never had any difficulty in this direction except in the rough weather when the lamp used to blow out. Perhaps the canvas hut is the safest, if the least convenient, place in which to keep the incubator; it is much less draughty than the marquee.

*Four six-feet Folding Tables.*—Two of these are required for the laboratory marquee, one for the canvas hut and one for the officer's tent.

*Six Folding Canvas Stools.*—These are much more convenient than wooden forms.

*Four Primus Stoves burning Paraffin Oil.*—Two stoves, each having four burners, are required for purposes such as heating the autoclave. Two one-burner stoves are required for operations such as boiling water for
washing glassware, etc. The nipple burners on these stoves frequently become choked with a deposit of carbon, when they are useless for heating purposes. Special needles are made for removing this carbon and a good supply of these should be obtained. A good stock of new nipple burners, together with a special key for unscrewing old and fitting new ones, should be carried in the equipment.

Two Bunsen burners for burning methylated spirit; the burner is attached by means of rubber-tubing to a reservoir containing spirit. These burners are useful in the laboratory marquee; they can be employed for heating the water in sterilizing, baths, etc. If the field laboratory is stationed on the sand, it is important to have the floor of the marquee in which cultural operations are carried out covered with a tarpaulin sheet; this prevents fine sand from blowing about and the floor is easily swept. The door flaps of the marquee ought to be closed each night in case of storm, otherwise sand is blown into everything in the laboratory.

One sweeping brush.

In the following list of glassware and reagents, quantities are not stated as these will mainly be determined by distance of the laboratory from the base medical stores.

Glassware.

Bottles with ground glass stoppers.
Spirit lamps.
Specimen tubes for faces, etc.
Hypodermic syringes of various capacities.

Apparatus and Reagents.

Microscopes fitted with $\frac{3}{4}$-, $\frac{1}{2}$-, $\frac{2}{4}$-inch objectives.
Balance and weights.
Red and white blood cell counting apparatus.
Hämolöbinometer.
Lamps—hurricane pattern—excellent for microscope illumination.
Hand centrifuge.
Files, triangular in section.
Filter papers.
Indiarubber tubing.
Tripods.
Wire gauze for tripods.
Test tube stands.
Wire baskets for incubator.
Test tube brushes.
Pestle and mortar.
Rubber gloves.
P.M. instruments.
Hammer and pincers.
Scalpels.
Forceps.
Scissors.
Grease pencils.
Platinum wire.
Iron wire for making throat swabs.
Urine testing set.
Thresh water testing set.
Ice chest for storage of sera, etc.
Sterilizing baths.
Hydrochloric acid.
Nitric acid.
Sulphuric acid.
Acetic acid.
Formalin.
Absolute alcohol.
Methyl alcohol.
Methylated spirit.
Xylol.
Ether.
Agar agar.
Peptone (sugar free).
Sodium chloride.
Lemco.
Cresol.
Soap.
Plasticine.
High titre sera.
Indol reagent.
Diluting fluids for blood counts.
Aniline oil.
Glucose.
Lactose.
Saccharose.
Dulcite.
Mannite.
Mercuric chloride.
Iron alum.
Iodine.
Potassium iodide.
Sodium citrate.
Copper sulphate.
Caustic soda.
Rochelle salt.
Cedar wood oil.
Vaseline.
Mead’s strapping.
Corks.
Rubber stoppers.
Litmus papers, red and blue.
Lint, non-medicated.
Cotton wool.
Gauze.
Rubber teats.
Fehling’s solution, Nos. 1 and 2.

Stains.

Leishman.
Neutral red.
Methylene blue.
Bismarck brown.
Eosine.
Haematoxylin.
Methyl violet.
Carbol fuchsine.

The above list does not pretend to be exhaustive; for, as already indicated, the stock of materials carried will depend upon the distance from the base.

In place of special wire baskets for holding culture tubes, old cigarette tins (the round variety) with a layer of cotton wool at the bottom can be substituted.

Good staining troughs can be made by laying two pieces of solid glass rod across the length of a flat tin and holding them in position by means of plasticine. Tins of this description can usually be obtained from the canteen.

Distilled Water.—This can be made in a field laboratory in the follow-
Laboratory Diagnosis in the Tropics and Sub-Tropics

A good supply of water is placed into the autoclave, the inside of which is kept clean. The lid of the autoclave is placed in position and the valve is opened. The water is brought to the boil and when steam issues from the valve the latter is connected to a worm condenser. The water used for condensing the steam is syphoned from a kerosene tin to the worm from which it runs into another tin. This water can be used time after time—a great consideration under desert conditions. The distilled water issuing from the worm is collected in a clean vessel.

All packing cases and lids should be carefully preserved ready for the next move. The cases can be arranged around the marquee and hut where they serve as cupboards. Straw from the packing cases should also be kept; it can be buried in the sand until required.

A field laboratory as described above will fit, when packed, in a ten-ton railway wagon. Laboratories of this type are also very mobile; they can be packed, moved and set up in a fresh place in a short time and can if necessary be transported in G.S. wagons. They are better in a country like Palestine than the laboratories fitted on motor lorries.

It is an advantage to pitch the laboratory fairly close to the casualty clearing station or field hospital to which it is attached. This prevents delay in getting specimens to the laboratory, e.g., dysentery stools, blood films, etc. Also, it enables the officer in charge of the laboratory to see the patients in the wards himself.

Personnel of Field Laboratory.—One officer, who is generally a bacteriological pathological specialist.

Three Royal Army Medical Corps Orderlies.—One orderly assists the officer in charge in the laboratory, another prepares the culture media, etc., while the third acts as clerk. The last named keeps a careful record of the results of tests made in the laboratory. One batman.

The large amount of work such a field laboratory, equipped and staffed as above, may be called upon to do in war time, even when a large amount of primary diagnosis work has already been performed by the diagnosis stations, may be gathered from the subjoined returns of such a field laboratory in 1918.

The object of this somewhat lengthy paper I submit will have been attained if it is possible to establish the value of rapid scientific diagnosis as a branch of Army medical organization in war-time.

That the work can be adequately and satisfactorily performed, without clogging the essential existing machinery of evacuation has, I hope, been amply demonstrated. From these recorded facts the principle emerges that for the satisfactory administration of the medical services in a tropical or sub-tropical country, the microscope is as essential for diagnosis and treatment as is the provision of surgical apparatus.

In conclusion I have to thank those who have assisted me in preparation of this paper, as well as in the working of the scheme I have elaborated.
Philip Manson-Bahr

These are too numerous to mention, nevertheless my gratitude is none the less sincere. My thanks are specially due to Drs. C. M. Craig, John Anderson, E. C. Myott, and my former assistant, Mr. T. R. Goddard.

TABLE SHOWING THE NUMBER OF EXAMINATIONS MADE IN A FIELD LABORATORY BETWEEN JANUARY 1, 1918, TO DECEMBER 31, 1918. (CAPT. COLIN M. CRAIG, O.B.E.)

<table>
<thead>
<tr>
<th>Description</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total of diarrhoea cases examined</td>
<td>6,418</td>
</tr>
<tr>
<td>Bacillary dysentery actually diagnosed</td>
<td>75</td>
</tr>
<tr>
<td>B. shiga isolated</td>
<td>58</td>
</tr>
<tr>
<td>B. flexner isolated</td>
<td>17</td>
</tr>
<tr>
<td>Bacillary dysentery, &quot;provisional diagnosis&quot;</td>
<td>1,990</td>
</tr>
<tr>
<td>Amoebic dysentery</td>
<td>150</td>
</tr>
<tr>
<td>Flagellate diarrhoea</td>
<td>171</td>
</tr>
<tr>
<td>Malarial &quot;dysentery&quot;</td>
<td>3</td>
</tr>
<tr>
<td>Enterica stools plated</td>
<td>98</td>
</tr>
<tr>
<td>Enterica stools positive</td>
<td>1</td>
</tr>
<tr>
<td>Total of other examinations</td>
<td>53,245</td>
</tr>
<tr>
<td>Throat swabs for diphtheria bacillus</td>
<td>2,776</td>
</tr>
<tr>
<td>K.L.B. isolated</td>
<td>294</td>
</tr>
<tr>
<td>Septic sores for diphtheria bacillus</td>
<td>50</td>
</tr>
<tr>
<td>K.L.B. isolated</td>
<td>13</td>
</tr>
<tr>
<td>Blood films examined</td>
<td>48,124</td>
</tr>
<tr>
<td>Malignant tertian parasites found</td>
<td>2,442</td>
</tr>
<tr>
<td>Benign tertian parasites found</td>
<td>3,792</td>
</tr>
<tr>
<td>Quartan parasites found</td>
<td>3</td>
</tr>
<tr>
<td>Relapsing fever</td>
<td>2,035</td>
</tr>
<tr>
<td>Urine—general examination</td>
<td>268</td>
</tr>
<tr>
<td>Urine for typhoid</td>
<td>3</td>
</tr>
<tr>
<td>Sputa for T.B.</td>
<td>242</td>
</tr>
<tr>
<td>T.B. found</td>
<td>15</td>
</tr>
<tr>
<td>Sputa for organisms</td>
<td>262</td>
</tr>
<tr>
<td>Blood for culture</td>
<td>14</td>
</tr>
<tr>
<td>Blood for typhus (Weil-Felix reaction)</td>
<td>375</td>
</tr>
<tr>
<td>Positive Weil-Felix</td>
<td>64</td>
</tr>
<tr>
<td>Blood for Widal's reaction</td>
<td>958</td>
</tr>
<tr>
<td>Typhoid</td>
<td>19</td>
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<tr>
<td>Para A</td>
<td>13</td>
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<tr>
<td>Para B</td>
<td>6</td>
</tr>
<tr>
<td>Conjunctivitis</td>
<td>7</td>
</tr>
<tr>
<td>Cerebrospinal meningitis</td>
<td>7</td>
</tr>
<tr>
<td>Meningococcus isolated</td>
<td>2</td>
</tr>
<tr>
<td>Pus for anthrax</td>
<td>10</td>
</tr>
<tr>
<td>Anthrax bacillus found</td>
<td>4</td>
</tr>
<tr>
<td>Pus films for organisms</td>
<td>117</td>
</tr>
<tr>
<td>Fluid from joints</td>
<td>10</td>
</tr>
<tr>
<td>Fluid from gun-shot wounds</td>
<td>3</td>
</tr>
<tr>
<td>Pleural effusion</td>
<td>15</td>
</tr>
<tr>
<td>Blood (hemoptysis)</td>
<td>1</td>
</tr>
<tr>
<td>Blood for M. melitensis</td>
<td>1</td>
</tr>
<tr>
<td>Fluid from oriental sore for Leishman-Donovan bodies</td>
<td>1</td>
</tr>
</tbody>
</table>

Microscopical examinations = 59,663
Post mortems = 147
Veterinary work = 90
Shaving brushes for anthrax = 8

Total = 59,848