NOTES FROM A D.A.D.P. AT A HOME STATION.

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Since the Directorate of Pathology has been established I do not remember having seen any article in the Journal describing in general the work of a D.A.D.P. at home. Consequently it has suggested itself to me that my experiences and impressions during the past sixteen months at Cork might prove interesting.

Following on the comprehensive Senior Officers’ Course at the Royal Army Medical College orders were received to proceed to the Irish Command. A posting to Cork followed with instructions to take over the District Laboratory at Cork, and, after an interval of instruction from Captain J. S. K. Boyd, R.A.M.C., to relieve him of the charge of the venereal laboratory at Spike Island.

The district laboratory proved to be a small brick building of two rooms built in the days when hygiene dominated laboratory work. The larger working room held a central table with numerous drawers, two sides were bordered by inconveniently high working benches with windows above and more drawers below, the third held cupboards and bookshelves and the fourth a stove and door. Four tall office stools were provided perched on which high above the floor one was confronted with the problem of whether to work at the part of the bench above the drawers, which eliminated all room for one’s legs, or to demand comfort for one’s lower extremities and sit at work faced by a round basin inserted into the bench and taking up most of the table space. However difficulties were solved by a compromise and moving from stool to stool as occasion demanded—a sort of Cox and Box entertainment in which my assistant also joined.

I was extraordinarily lucky in what is probably the most important respect; my assistant Mr. Southall (ex R.A.M.C.) was a most keen and reliable worker, with an excellent knowledge of everything that was required and willing to learn new methods, and quite unselfish of time given to his duties. By contrasting him with my previous experiences of Indian laboratory “boys” I can honestly say that the assistant makes the most important factor in the work that can be attempted in a laboratory.

The equipment was patchy, bearing traces of half completed indents in war time—for instance, every article needed for the Leffman Bean estimation of fat in milk was present except the special centrifuge, and the microtome was alone missing amongst the apparatus required for cutting sections.

The first measure consisted in making out indents to supply deficiencies.
in equipment and to arm one's self with all the apparatus and stains necessary for the work learned at Millbank.

Simultaneously correspondence was started to obtain a licence to conduct animal experiments.

In the same month (September, 1920) an outbreak of typhoid fever occurred in Cork, and with indent not yet supplied and one Dreyer's outfit only for agglutination tests it became necessary to improvise; a tin box with holes bored in the lid, part of the bottom cut away, and some perforated zinc inside, the whole tied with string, made a somewhat unsightly but useful "toy," and as an electrically-heated water bath was ready a good many agglutination tests were performed.

Cultures of blood, urine, faces, and rose spots produced Bacillus typhosus, and out of eleven clinically positive cases ten were diagnosed by culture and one by agglutination of the serum.

A visit to Spike was made once a week which provided a pleasant change and the opportunity of seeing Captain Boyd at work on the Rochester Row and ice-chest methods1 of the Wassermann test.

At this time all the venereal patients in hospital from the Irish Command were at Spike, but parcels of sera arrived weekly from all parts of the country.

The laboratory at Spike was in a three-roomed sixty-foot hut with plenty of space and comfort and up-to-date equipment. Clinicians and bacteriologists could work in close proximity and understanding. Captain Boyd was then engaged in his comparison between the two methods of the Wassermann test, his conclusions being published in the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS for May, 1921.

At this time also occurred in Cork the case of gunshot wound complicated with B. enteritidis infection reported in the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS in July, 1921.

At Cork it was necessary to have housing accommodation for animals in view of the licence applied for; the Officer Commanding Military Hospital offered me an old cookhouse and the engineers were approached to make it suitable. Plans were drawn up and submitted but the estimates proved too expensive, and a retrenchment having to be made, at length, in August, 1921, the hut was ready and guinea-pigs were acquired. The licence had not taken the expected time to materialize, and in December, 1921, I was armed with full powers to vivisect but the animal accommodation was lacking.

Seeing painters in the hospital one day an effort was made to have the laboratory re-distempered. The workmen were trapped and the walls cleaned; tearing down a chart of the physiology of the lungs one found underneath an old diagram illustrating "Eight Years' Sanitary Effort at

1 Method proposed in Report No. 1 on Public Health and Medical Subjects issued by Ministry of Health, 1920.
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Home.” The superposed dust of the succeeding years caused one to moralize how seldom sanitary effort begins at home.

At this time the number of specimens examined in Cork was from 200 to 250 per month, the typhoid epidemic and the Gartner case providing the chief interest outside routine work.

Also might be mentioned a patient who had suffered from bilharzia and whose urine was examined daily for months for ova without success, though the relative while cell count showed throughout between nineteen and twenty-three per cent of eosinophiles.

Apart from the medium used for recovery of the Klebs Loeffler bacillus all throat swabs were plated out on to boiled blood medium and various organisms recovered, but no correlation with clinical symptoms of value was noted.

About November, 1920, old stocks of inspissated serum having been exhausted we decided to use Dorset’s egg medium for the recovery of B. diphtheriae. It was with fear and trepidation that I instructed Mr. Southall to make the attempt: nothing abashed he set to and produced twenty-four tubes, 100 per cent sterile. As the ingredients in the preparation of this medium are never raised above 70°C, and as accidental contamination might be expected I regarded this as an extremely lucky event. However, succeeding batches proved as good and a contaminated tube remained a rarity. This proved up to the hilt the reliability of my assistant. One objection I found to Dorset’s egg medium was the facility with which other organisms also grew upon it, so that the isolation of the Klebs Loeffler bacillus in pure culture was made more difficult.

The engineers were persuaded to make a cupboard with numerous sloping compartments for the sugars and other media in test tubes, and also a rack with 220 holes to hold stock cultures; with the subcultures brought over from Millbank and those recovered in Cork it was possible to keep three generations of each.

About Christmas, 1920, the equipment indented for began to arrive. There was some misgiving as to whether it could all be accommodated in the small space available. However, the cupboards and drawers proved capable of holding a tremendous amount, and as there was little superfluous equipment it all fitted in.

On October 18, 1920, I had taken over the Spike laboratory from Captain Boyd and travelled there via Queenstown and War Department launch on Tuesdays and Wednesdays each week. By a carefully regulated time-table it was just possible to complete the Rochester Row method on the Tuesday and also to add the I.C. extract to the serum-complement mixture and put into the ice chest, to be finished on the next day. It required fast working and concentration all the time to catch the afternoon launch, and if visitors found one’s answers somewhat brusque they must forgive the necessity for asking for no interruptions. One was safeguarded from other work intruding and a telephone message to Cork before leaving the island assured one that things were all right there.
On the Wednesday the ice chest method was completed, correspondence attended to, and results were checked and despatched.

Between November, 1920, and July, 1921, 1,700 Wassermanns were performed, all by the Rochester Row method, and the majority by the ice chest method.

One point that helped to establish a measure of confidence in one's reports was the close agreement between both methods. Another clearly brought out by Captain Boyd in his report was the sensitiveness of the ice chest method to the Wassermann substance, especially in cases under treatment. Where the results differed, it was generally in cases of diagnosed syphilis under treatment, which were found negative by the Rochester Row method, and positive by the ice chest method. Whether this degree of "positiveness" calls for further treatment or not appears to be unsettled. According to Mr. J. E. R. MacDonagh, in a paper reported in the Lancet for December 24, 1921, "Those with a large clinical experience are coming to the conclusion that a negative reaction signifies nothing, and that a positive reaction means nothing more than that the patient has had syphilis. It is now being recognized that the reaction can be used, neither as a regulator of treatment nor as a test of cure, and that a positive reaction does not necessarily signify that the disease is active, and that the patient requires treatment." Another advantage in performing the tests by two methods lay in the fact that sharper readings were sometimes given by one method and sometimes by the other, as judged by several control sera, and help was thus afforded in the border line cases. There was a close agreement in primary (A) cases for diagnosis: when in any doubt as to sufficient "positiveness" a provocative injection of "914" and the sending of a second specimen were suggested.

The formalin method was also tried with all the samples of formalin procurable, and with various sized drops with most discouraging results. Even partial coagulation of the serum did not often occur, and sometimes took four to five days to appear, and when it did seemed as likely to take place in a serum negative by other methods as in a positive. Of nineteen sera positive by the ordinary methods, seven were positive and twelve negative by the formalin test; of fifty-two sera negative by the ordinary methods, six were positive and forty-six negative by the formalin test.

At the end of December, 1920, the venereal patients were moved to other hospitals, but the laboratory remained until the end of July, 1921, when its equipment was transferred to Dublin.

It was suggested that the Wassermann reaction should be continued in the interval at Cork, but this was resisted on the grounds that the extra equipment could not be accommodated, and chiefly that there was neither elbow room nor foot room for the test. It is essential that the worker in this test should have plenty of table space, and be seated comfortably with feet on a sure foundation.

Numerous cases of dirty gunshot and bomb wounds were brought into
Cork hospital during the period. In February, 1921, gas gangrene, with rapidly fatal results, occurred in an amputation case: *B. welchii* was found post-mortem in the wound and in the heart's blood, the anaerobic media, meat, milk, alkaline egg, and coagulated egg in broth, working well. In March, 1921, three further cases occurred: in two of these streptococci were associated with *B. welchii*, and these cases seemed to run a milder course. A few injections of T.V.W.¹ were given to all three cases, and two recovered, but whether recovery was assisted by the T.V.W. or not the surgical specialist was not prepared to say. From this on, on the advice of the Director of Pathology, half a phial of T.V.W. was administered prophylactically to seriously wounded men in the Division in place of antitetanic serum, and gas gangrene cases were less frequent. Officers were also advised to give T.V.W. in large doses for treatment of gas gangrene: it would have been impossible to give this relatively weak serum in such quantities as to equal in units of antitoxin the amount administered to cases reported from France in special Report Series No. 39 of the Medical Research Committee, moreover, the concentrated serum was unobtainable, yet it appeared that the T.V.W. had a good effect. No further case of gas gangrene arose until July, 1921; this was a mild case, received three phials of T.V.W. and recovered. The next patient in October, 1921, had an extensive wound over the left hip and gluteal region: after operation he showed signs of gas which extended from the crest of the ilium to the axilla. Twenty phials of T.V.W. were given subcutaneously, and two phials applied directly to the wound and the patient recovered, the recovery being entirely due in the surgical specialist's opinion to the T.V.W.

The records show that in both these cases the prophylactic injection was antitetanic serum not T.V.W.

The cases are too few on which to generalize but the experience gained points to the fact that in dirty wounds T.V.W. has a real additional advantage to plain antitetanic serum as a prophylactic, and that in gas gangrene surgical measures may be considerably assisted by its administration.

A word must be said with reference to administrative work as a D.A.D.P.

The administration of T.V.W. has been referred to above.

As a result of the typhoid epidemic instructions were received to encourage inoculation as much as possible and to be prepared to give figures as to the inoculation percentage of units when called upon.

As Army Form I 1246 (Quarterly Inoculation State) had been abolished a local proforma on the lines of a suggested War Office proforma was called for quarterly; this stated by units total strength on a given date,

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¹A phial of T.V.W. contains the following units: Tetanus, 1,500 units (U.S.A. standard); vibrio septique, 2,500 units; *B. welchii*, 2,500 units.
number protected, number inoculated with \(\frac{1}{2}\) cc. T.A.B., number inoculated but not protected, number never inoculated, as well as number protected on date of previous return.

A pamphlet describing simple staining procedure, methods of making up staining solutions, and equipment necessary for such, and the routine to be followed in regard to certain diseases was issued to the larger hospitals for the establishment of small clinical laboratories in furtherance of instructions received from the A.D.P. Irish Command. These however did not materialize owing to the threatened withdrawal of troops from the Divisional area.

On visits to outstations the following points were investigated, sera and vaccines on hand, enteric inoculation statistics, venereal laboratory, facilities for general routine staining, methods of taking of specimens, whether further bacteriological examinations were wanted for seriously ill patients.

Here one may mention that the D.A.D.P. in this Division is informed of seriously ill patients on Army Form A21a, and the officers commanding military hospitals are encouraged to send for him in consultation or for specimen taking; needless to say, he is also the officer responsible for investigation of cerebro-spinal fever in the Division.

When inspecting the laboratory in venereal treatment centres, officers frequently consult the D.A.D.P. as to treatment.

Useful talks are thus indulged in, in which the scheme of treatment for venereal patients suffering from syphilis, the keeping of venereal case cards, the significance of the Wassermann reaction, and the use of detoxicated and other vaccines play their part.

But to return to the laboratory. With the equipment so readily and generously supplied in response to the indents one was able to tackle most tests that might be required.

Routine examinations took the largest share from the statistical point of view. The numbers of specimens examined in the month grew from 150 to 450; amongst them might be mentioned that 706 cultural examinations were made for \(B.\) diphteria, and 233 films for tubercle bacilli in the sputum in the sixteen months.

In the beginning of the Autumn of 1921 the Klebs-Loeffler bacillus was found in the throat of one of the canteen workers admitted to hospital and diphtheria was diagnosed; examination of the contacts led to the discovery of Klebs-Loeffler bacillus in the throats of two others who though not suffering from diphtheria were then sent to hospital. An epidemic was feared, in association with the D.A.D.H. the workers were isolated, the Schick test was performed, and throat swabs taken, and the canteen was closed for a few days and disinfected, we were gratified that no further cases occurred. The pathogenicity of the organism must have been slight as one cubic centimetre of a pure culture in glucose broth failed to kill a guinea-pig when injected subcutaneously. The animal died however, of an intercurrent affection three weeks later, and then the suprarenals were found to be enlarged.
One is tempted to write a good deal about the more rare and interesting cases one came across, but in a general description this is hardly justifiable, however reference to a few must be made.

Blackwater fever occurred in a patient home from Constantinople—an old malarial patient—the urine answering to the text-book description. A few "rings" were seen in the thick drop slide on the first day and though no quinine was administered these did not reappear. So striking was this that one could well understand that in this case they might easily have been missed if one further day had elapsed. The suggestion occurred that malaria may be more often the cause of blackwater fever than is generally recognized. Can the malarial parasites in this disease have settled down to a local habitation (one would think of the convoluted tubules of the kidney), and be side-tracked from the blood stream and perhaps out of the reach of quinine? In this case the gradual recovery afforded very pretty blood pictures of a severe secondary anaemia not surpassed until the blood of a patient whose spleen had been excised was examined when he too became of the greatest interest.

To refer to a few more points of interest, sections were admirably cut by Mr. Southall, and cleared up some cases of doubt; lymphatic leukaemia on one occasion was "spotted" in the laboratory on seeing a blood slide with 94.8 per cent. lymphocytes (small and large) the total white cell count was 72,000 per cubic millimetre; an autogenous streptococcal vaccine was given with success for pyelitis, and prophylactic vaccination for colds was tried amongst men of the 2nd Staffordshire Regiment. However the constant drafting away of those under observation killed the benefits from the statistical point of view in spite of the keenness of the Commanding Officer of the battalion.

Three visits were made to outstations for suspected cerebrospinal meningitis and in two instances anti-meningococcic serum was administered by lumbar puncture. The recovery of the meningococcus was not effected though one case on clinical grounds was diagnosed as cerebrospinal meningitis; in this instance the contacts also proved negative.

One occasionally came across non-pathogenic organisms: being sent for to an out-station to see a case of septicæmia following middle ear disease, blood cultures into broth and MacConkey's medium were taken (the latter I found very useful for blood cultures for the typho-coli group): in both grew an organism which by its sugar reactions and its liquefaction of gelatin appeared to be of the proteus family: a few days later, a radical mastoid operation was performed and pus discovered: from this there was grown an organism similar to the first, but which did not liquefy gelatin nor change maltose (possibly B. morgan No. 1). Some days later from the ear discharge B. proteus was again recovered. The temperature was of the "spiky" variety, up to 105°F. and down again to normal, often associated with streptococcal infection yet no organism except the two I have mentioned could be found. Further operations were undertaken and no
extension of the suppuration was discovered either then or at the post-mortem. The \textit{B. proteus} organism was clumped by the patient's serum up to 1 in 125, but one cubic centimetre of a broth culture injected into a guinea-pig proved it to be non-pathogenic. Antistreptococcal serum was tried without success, and as I did not consider that the organism causing the septicæmia had been found I advised against the use of a vaccine which I thought would do no good and on which false hopes might be built. I was unable to be present at the post-mortem and my request for cultures miscarried; macroscopically there was nothing of note except a small abscess at the base of one lung: sections of the liver, spleen, kidney and lung showed clumps of Gram-positive bacilli principally in the blood vessels, but as there was no inflammatory reaction in their proximity they were thought to have circulated shortly before death, and the cause of the septicæmia remained a mystery.

Relative white cell counts became very popular and were frequently asked for in doubtful septic conditions, tuberculosis and pneumonia patients, also in men appearing before medical boards and claiming disability for old malaria.

I must not forget to mention that the routine hygiene examinations of water (chemical and bacteriological), milk and air, were performed in the laboratory.

I feel that but the briefest reference has been made to the particular cases mentioned, and many more of almost equal interest have not been touched on. This article, however, is intended to be an attempt to show the variety of work encountered in a D.A.D.P. billet and I have endeavoured to avoid wandering into statistics and into strictly technical details.

I was greatly assisted in three important respects (a) having no work outside that of D.A.D.P., (b) being very generously treated as regards equipment, (c) having an ideal assistant.