

A CLINICAL STUDY OF A PYREXIA OF UNCERTAIN ORIGIN.

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Captain A.C. Amy, M.B., R.A.M.C.

Ranikhet, U.P., India, 1912.

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## A CLINICAL STUDY OF A PYREXIA OF UNCERTAIN ORIGIN

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Apology. The readers of this paper may make the criticism that publication is hardly warranted while the origin of the pyrexia described remains so uncertain. No one will deny the justice of such a criticism; but the writer is of opinion that the pyrexia merits some sort of record because of the constant and curious clinical picture studied in 94 cases, with 27 deaths, over a period of 5 months.

DEFINITION. An acute general infection characterised by constant and severe signs and symptoms which, if taken together, are pathognomonic, and include:-

A moderate pyrexia for 8 or 9 days, falling by crisis.

A weak and unduly accelerated pulse.

Intense jaundice without any apparent liver lesion.

Extreme and rapid prostration and emaciation.

Protracted convalescence.

The disease frequently relapses. It usually takes the form of a systematic toxaemia, but sometimes the respiratory, intestinal or nervous tracts are specially affected. There is a high degree of infection at close quarters. The gross pathological lesions are, so far as it is at present known, not characteristic; and the bacteriology is still uncertain.

uncertain. The outbreak was confined to the natives of the cantonment.

AETIOLOGY - Predisposing causes. The epidemic broke out in the hill station of Ranikhet in the middle of March, and continued until the middle of August, 1912, i.e., it extended over the hot months and first half of the rainy season. The case incidence was greatest from mid-April until the end of July.

Both sexes were equally attacked.

Patients were of all ages from 12 months to about 60 years.

Practically no immunity was observed among residents in the same room, nor among occupants of closely adjacent houses. Near-range contagion was very marked, while distant infection was not seen. Those liable to contract the disease on the former account were, with few exceptions, attacked indiscriminately. However, one attack appeared to immunise the patient for at least 4 months: second infections were not observed in spite of frequent exposures of convalescents to the disease at close quarters for the above period.

The incidence figures for caste and occupation are of interest. There were 100 cases and, with two exceptions (water carriers) the patients were all low-caste Hindus. With four exceptions (two water carriers: one dealer in hides: and one cook) these people followed conservancy occupations, while in addition several of them were skin dressers. The cook was a sweeper who had been converted to Christianity; the two Mahomedan water-carriers were doubtless accidental infections. Overcrowding was common, but there was no lack of food.

Infecting agents. The bacteriological work done during

during the epidemic, and its results, are epitomised in Appendix 1. The investigations were carried out independently at the Brigade Laboratory, Bareilly: the Laboratory of the Enteric Convalescent Depot, Naini Tal: the Imperial Laboratory, Mukhtesar: and at the Station Hospital Laboratory, Ranikhet. My sincere thanks are due to the officers in charge of the three first named institutions.

In view of the uncertainty of the position it will suffice here to merely weigh up the bacteriological findings in a brief fashion, leaving the reader to draw what conclusions he can.

Three different bacilli, and one spirillum, have to be considered thus:-

- A. { 1. The true Anthrax Bacillus.  
2. Pseudo-Anthrax Bacillus.  
3. Bacillus Megatherium.

Bacilli of the above kinds were found by four observers at different times in many separate specimens.

A. 1. Evidence bearing on infection by the Anthrax Bacillus:-

	PRO.	CON.
(a) Bacteriological:-	Morphology. Staining reactions. Cultural characters.	Animal/inoculation sometimes negative. When positive, bacilli were not recovered.
(b) Epidemiological:-	Outbreak of anthrax among animals in 1911. In 1912 several patients were skin-dressers.	No Anthrax among animals in 1912.
(c) Clinical:-	Vide Appendix ii	Mortality about 29%.

2. A Pseudo-Anthrax Bacillus is described by the French. It is said to be identical with B.Anthraxis in the laboratory, except that it is non-pathogenic to animals. In the literature at my disposal I can find no account of its pathogenicity - if there is any - towards human beings.

3. The above remarks on the Pseudo-Anthrax Bacillus are also applicable to Bac.Megatherium. Major J.D.E.Holmes, D.Sc., the Imperial Bacteriologist at Mukhtesar gives a decided opinion for the latter organism and against Bac.Anthraxis. Bac. Megatherium is an air contamination. But specimens for laboratory examination were always collected personally under strict precautions: and they were taken from patients in different parts of the hospital and its compound over a period of 5 months. Under these circumstances one is tempted to protest against a charge of contaminating not one, two, or three only, but very many different specimens. Nevertheless one must bow to the authority which Major Holmes' dictum carries in this matter - consoling oneself with the knowledge that divers extraordinary, and often inexplicable, pitfalls beset one's technique in India.

B. A spirillum resembling the Spirillum of Relapsing Fever was found in a blood film by Capt.J.L.Wood, R.A.M.C., at Naini Tal, and also in sputum smears from two different patients by Major H.B.G.Walton, R.A.M.C., at Bareilly. This is most interesting and suggestive in view of the typical relapses which occurred in a number of the cases. As a matter of fact, and despite the high mortality, there is much evidence bearing on infection by Obermeier's Spirillum, both on clinical and epidemiological grounds; and there is little of importance to be said against this idea beyond the fact that, in certain parts

parts of the United Provinces a spirillum of this description is not uncommonly found in the blood of apparently healthy natives. The writer is of opinion that in all probability the disease was atypical epidemic Relapsing Fever.

MODES OF CONVEYANCE - Contagion is the most potent, if not the sole, factor. It has already been stated that practically all the patients (i.e. over 90 in number) were sweepers. For the benefit of those readers unacquainted with Indian conditions it may be well to explain that people of the lowest caste - that from which conservancy personnel is drawn - mix with each other indiscriminately, but are rigidly debarred from holding intercourse of any kind with their fellow men of other castes. Not only was the disease confined to the sweepers, but it was limited to three small areas in their special reserves - two in a small regimental, and one in the Sudder (main cantonment) bazaar. In addition, the actual houses infected generally yielded from two to five or six patients each. Everything went to prove a high degree of near-range contagion; while the immunity of the non-infected, albeit adjacent and crowded, parts of the bazaars showed that distant infection did not play a part.

Excreta, and especially expired breath and sputum, were probably specially infectious. It soon became apparent that clothing and bedding &c., and the air and dust in confined spaces were particularly dangerous.

It is possible that fleas and (or) bugs may have had some rôle in conveying the disease; at any rate they were not lacking in number or vitality! However, the writer passed through the epidemic safely in spite of many sanguinary encounters with these pests when examining patients, and inspecting their houses.

MORBID

MORBID ANATOMY - This was only roughly studied on the post-mortem table, as no appliances for preparing sections &c., were locally available. Such specimens as arrived at the Brigade Laboratory in a presentable state showed no characteristic changes. To the naked eye the gross lesions are such as one would expect to find in any acute general toxæmia. The meninges and cortex of the brain, the liver, spleen, and kidneys are always more or less congested. In several cases the spleen was noticeably, but not greatly enlarged; it is usually very friable; and in one case two abscesses - each about the size of a cherry - were found in its substance. There was one case of purulent lepto-meningitis. When the respiratory tract is specially affected in life, the post-mortem appearances in the lungs are either those of acute bronchitis or broncho-pneumonia. The fatal cases of intestinal trouble show nothing more than acute congestion of the walls of the large bowel.

VARIOUS TYPES. - As the infecting agent gains access to the system via the respiratory or gastro-intestinal tracts by breathing or swallowing, so the disease manifests itself accordingly, and is easily divisible into four readily recognisable and sharply differentiated clinical groups, viz:-

- (a) Toxæmia.
- (b) Toxæmia with lesions of the respiratory tract.
- (c) Toxæmia with lesions of the lower intestinal tract.
- (d) Toxæmia with lesions of the nervous system.

SIGNS AND SYMPTOMS - General Description - (1) Incubation. - The minimum period was not determined. The maximum, as observed in several "contacts", is at least 12 days. During this period no special symptoms are noticeable beyond loss of appetite



appetite and slight malaise.

(2) Onset. - Usually gradual, culminating with slight rigor, headache, a few bouts of vomiting and complete anorexia. Or there may merely be some shivering, headache, generalized and fleeting "pains" and anorexia.

(3) Course. - The patient feels weak, and seeks advice for "fever", and although the history is of only a day's duration, he looks very ill. The temperature is between  $101^{\circ}$  and  $103^{\circ}$ , and one is at once struck by the comparatively extreme rapidity of the pulse. The patient complains of anorexia, headache, and generalized fleeting "pains", but at this early stage there will probably be no other signs or symptoms.

Fever continues for from 7 to 9 - usually 8 to 9 - days. There is sometimes an exacerbation of temperature above  $103^{\circ}$ , accompanied by more or less mental disturbance. As time goes on the pulse volume weakens, while rapidity of rate is maintained.

General weakness and emaciation progress very quickly, so that by the 7th day the patient is quite unable to exert himself to any extent and he is literally a living skeleton.

Jaundice is a constant and early symptom, which persists well into convalescence. As a rule it is intense, but is unaccompanied by any signs indicative of functional derangement of the liver.

The tongue is soon covered with a thick, dirty fur, and the oral cavity is very liable to become coated with sordes.

The temperature falls by crisis usually on the 8th day, and the patient thereupon (a) enters upon a long convalescence: or (b) dies in a state of asthenia on the 3rd or 4th day after the temperature has fallen: or (c) lingers in a low state

state of vitality for from 3 to 7 days, when a typical relapse with recurrence of the above phenomena takes place.

Detailed Description.- The mode of onset is sufficiently described above. Although the symptoms are not violent, yet the general weakness produced in about 12 hours renders the patient unfit for work. Ambulatory cases are not seen.

The Facial Aspect from first to last is weary and listless, and indeed shows utter dejection at the end. Those cases in which the temperature rises to 104° or 105° are temporarily bright and alert - albeit quite irresponsible - before passing into a state of stupor.

Signs of anaemia are not evident.

The Fever is moderate - from 101° to 103° in typical cases. As a rule it is fairly continuous, but occasionally exacerbations to 104° or 105° occur on the 3rd or 4th day accompanied by signs of grave mental disturbance. Other variations are always due to respiratory or intestinal lesions, sepsis, &c., (for examples vide Appendix ii.) Sometimes the disease aborts with an early fall of temperature, and a very rapid convalescence; but in the great majority of cases a sharp crisis occurs on the 8th or 9th day, with profuse sweating. Although the crisis only occupies from 1½ to 3 hours, it is neither accompanied nor followed by urgent signs of collapse. Hypothermia is common during convalescence; sub-febrile pyrexia does not occur.

Skin.- Herpes is the exception, and only seen in those cases in which the temperature exceeds 103°. The skin remains hot and dry until the profuse sweating at crisis sets in. Oedema occurred in a fourth of the cases in hospital. It is specially marked in the loose tissues of the face, and in the legs

legs from the knees downwards. It is generally seen in convalescents who have suffered severely, and it doubtless arises from trophic disturbance; at all events it is unconnected with organic/ renal, or cardiac lesions. The oedema usually persists for from 2 to 3 weeks.

Circulatory System.- There is a slight relative increase of monoc<sup>mic</sup>uclear leucocytes in uncomplicated cases, and a marked increase of polynuclear forms in cases with septic lesions. From the outset the pulse-rate is increased out of all proportion to the degree of fever; thus, on the 2nd day a patient with a temperature of 101° commonly has a pulse-rate of 110 or 120 per minute. As the disease progresses the rate rises to 130 and 140, and not infrequently to 150 on the 7th and 8th days. The beats are distinct, small and somewhat "hard", but there is no irregularity. Crisis and convalescence merely produce a relative decrease, so that in the 2nd and 3rd weeks of convalescence the pulse-rate is generally 85 to 95 in the recumbent position, and from 90 to 110 when sitting up. No organic lesions of the heart, arteries, or veins were noted either in the course of the disease, as complications or as sequelae.

Digestive System.- Anorexia is an early, constant, and persistent symptom; a quick and complete recovery of appetite only takes place in the abortive or mildest cases. Thirst occurs, but is not urgent. At first the tongue is red and moist, and then covered with a thick white fur, and red at the edges and tip; this quickly changes to a thick brownish-black coating, while the oral cavity requires constant cleansing to keep it free from sordes, Gastric symptoms are not prominent. Fleeting, and often severe, epigastric pain is common. Vomiting sometimes occurs early in the disease, but it is neither violent

violent nor persistent.

Parotitis supervened in four cases. In each case it was a late complication, and began with a uni-lateral invasion, and later on became bi-lateral. In each case, also, it was accompanied by exacerbation of temperature, intense pain and tenderness, great swelling, and increase of general weakness. In two cases the inflammation was "simple" and cleared up in a fortnight; in the remaining two, suppuration eventually set in - uni-lateral in one patient and bi-lateral in the other. Both patients were exceedingly ill: the inflammation in the tissues adjacent to the glands was so intense that it extended as far as the lips and circum-orbital tissues, so that the mouth was only opened and closed with difficulty, and the eyelids could not be opened at all. The face and the head looked like a ~~large~~ <sup>large</sup> egg - in ludicrous contrast to its skin-and-bone support. Breathing was much embarrassed, so that tracheotomy appliances were kept ready for instant use.

The intestinal form of the disease invariably proved fatal. In this type, to the usual signs and symptoms are added abdominal pain and diarrhoea. The abdomen is sunken and not tender. Diarrhoea comes on gradually, with 6 or 7 loose stools daily. In a few days, however, from 20 to 30 motions are passed in 24 hours, and there is a constant desire to go to stool, with much straining and tenesmus and a certain amount of sharp abdominal pain. At first the stool is watery, and generally contains partially digested milk curd; later, on it becomes small in amount, and contains mucus and sometimes a little blood. In the end the motions become less frequent, and the exhausted patient dies in the 2nd or 3rd week in a terribly emaciated condition.

The Spleen was found to be slightly enlarged in some cases. However, tenderness, and pain of a severe stabbing, intermittent

intermittent character over the spleen region are frequently complained of.

Jaundice cannot at present be ascribed to derangement of the liver, as this organ is never found to be at fault either on clinical or post-mortem examination. It is probably of toxæmic (so-called "haematogenous"?) origin. Jaundice is invariable, and only in a few cases could it be described as mild. It usually sets in on the 3rd day, and by the 5th it is well developed; the conjunctivæ become bright yellow or dark greenish yellow, and the colour tinge is easily discernible even in the darker complexioned patients. As a rule it disappears by the middle of the 3rd week of convalescence. Colour of stools and urine is unaffected, and there is no staining of saliva, sweat or milk. Itching of the skin is often troublesome. Onset, course, and degree of jaundice have no effect on pulse-rate.

Respiratory Tract. Epistaxis occurred once, in early convalescence; the bleeding was profuse, and continued at intervals for three days. Patients who suffer from respiratory tract lesions are always very ill; the signs and symptoms of lung trouble indicate either typical acute bronchitis or broncho-pneumonia. These affections are doubtless specific, as no response is ever shown to the usual modes of treatment.

Nervous System. Frontal or ocular headache is invariable, intermittent, and frequently very severe. Occipital headache is uncommon. Mild delirium, especially at night, is frequent. One patient - a man of very fine physique - developed active, noisy delirium and was difficult to control; one day he escaped into the bazaar, and was only brought back after a struggle which ended in an almost fatal collapse. But in the typical "nervous" case the delirium is associated with high fever

fever and intense jaundice: to what extent these signs are inter-dependent it is impossible to say. At first the patient is bright and wakeful and babbles continually, but he soon passes into a quiet, stupified state, picks aimlessly at the bed-clothes, and rambles in a low muttering voice. Finally urine and faeces are passed involuntarily, and he lies like a log with but few brief intervals of semi-consciousness. It was surprising to find that this type of the disease did not always prove fatal. Convulsions occurred once only - in a case of purulent lepto-meningitis. Signs of neuritis are always present, and are somewhat peculiar. They take the form of severe, shooting or burning pains which persist for an hour or two in one part of the body, and subside only to recur somewhere else. The scalp, arms, and legs are most commonly affected, and the condition may persist for days in spite of treatment. In two cases temporary foot-drop resulted. As a rule neuritis is accompanied by extremely painful, cramping myalgia, generally of the calves and shoulder-girdle muscles.

The Genito-Urinary Tracts were not affected. Specimens of urine were frequently examined; albuminuria was never observed, and the urine showed no changes other than those to be expected from simple fever. Orchitis did not occur.

Special Senses - The Eye - There were three cases of paralysis of the upper division of the 3rd nerve; the resultant ptosis cleared up in a few weeks. One of the cases also had dilated pupil. Iritis occurred twice, but without sequelae, in spite of the fact that in one instance it was severe: gave rise to acute glaucoma: and threatened to end in panophthalmitis however the disturbance gradually subsided under energetic medication - one of the two <sup>solitary</sup> instances in which treatment was of real benefit throughout the epidemic!

Speech

Speech.- One patient developed what appeared to be motor aphasia, but the condition could not be accurately determined as it was associated with much stammering; these lesions persisted for nearly 2½ months.

PROPHYLAXIS.- The good effects which resulted from prophylactic action were due - as will be related later - to the fact that the first case which occurred was thought to be to (query) Plague. The second and third cases conclusively proved that this surmise was incorrect. But as at this time a laboratory report arrived to the effect that the disease was Anthrax, preventive measures were of course redoubled in consequence. The early recognition of the high degree of infectivity and seriousness of the outbreak, together with the urgent necessity for thorough and stringent prophylaxis were indeed matters of vital importance, for the most heavily infected areas lay within a couple of hundred yards of the barracks of the 1st Bn., King's Own Scottish Borderers, and the bulk of the patients belonged to the regimental conservancy establishment. Nevertheless, in the end the epidemic was confined to the latter and to a few cantonment conservancy men; none of the troops were attacked, although British soldiers - particularly battalion sanitary orderlies, &c., frequently come into close contact with the sweepers of their units. The following were the most important steps taken to limit the spread of the disease:-

(1) On the day after the first case was seen the regimental bazaar was placed out of bounds not only to the troops, but to battalion sweepers as well; this prohibition remained in force until the whole garrison - numbering about 3,000 - left for winter training in the plains in October. The sweepers were quartered in rough huts erected on an adjacent hill-side, but

but as their families, relatives, and friends still remained in the bazaar, clandestine visiting backwards and forwards took place to some extent, and was impossible to completely check. Later, ~~On~~ the same arrangements were made for the sudder bazaar, but it was only found necessary to keep <sup>them</sup> in force here for a short period.

(2) Special measures for dealing with the outbreak were taken under Section 183, Cantonment Code 1912, and under Section 208. Patients were detained and treated in the local isolation hospital; needless to say no alternative to reside in hospital was permitted. Those contacts who were deemed to be the most potentially dangerous were segregated in the hospital compound. The impossibility of segregating all contacts will be appreciated by those readers who have served in India, for the "bhais" (literally "brothers": actually of much wider significance) of any one native are usually as difficult to number as the pebbles on the sea-shore. Disinfection in hospital was very thorough and, in the case of patients, included the burning of all inflammable materials, such as bedding and clothing &c.

(3) Conservancy staffs were paraded and inspected daily, and their quarters were frequently visited. Instructions were given to all concerned for the early report of cases of sickness or death, and for the prompt removal of patients and contacts to hospital. In this work the medical officers in charge of the battalion and cantonment: the quarter-master and cantonment superintendent: and the kotwal and choudri (native head-men of the unit and bazaar respectively) co-operated; and last, but by no means least, the aid of the police superintendent and his subordinates was invoked, and proved



proved of great value.

(4) As soon as a house was known to be infected it was locked up, and kept empty for from 4 to 6 weeks. Twice during this period it was disinfected under supervision by burning a thick layer of pine-needles on the floor, and afterwards scraping the walls, and painting everything with strong solutions of cresol and lime. The ground adjacent to the building was dug up and saturated with the same solutions. On the house being re-opened, no persons were allowed to occupy it unless they had been resident in hospital either as patients or contacts. Nevertheless the disease broke out afresh in some of the houses which had been treated in the above manner, and in circumstances, too, which tended to show that the disinfection had not been successful in ridding these dwellings of the infecting agent.

By the foregoing means the epidemic was definitely localized, but its ravages proceeded unchecked within the infected areas which, moreover, were densely populated. This was obviously due firstly, to the resistance of the infecting virus, and secondly, to the difficulty of escaping contagion at close quarters. In addition, and in spite of our seemingly elaborate precautions, evasions among the afflicted were numerous, and people not only sickened and died, but were even buried by stealth, before the facts were noised abroad. In dealing with this class of native logical argument is useless; tact and diplomacy are usually successful in rendering coercion unnecessary. However in this case tact and diplomacy eventually failed, and coercive measures were often outwitted for the very good reason that the bazaar soon discovered that, whether the sick were treated in hospital or remained in their own homes, one in every three had to die. The facts and possibilities

possibilities of contagion were neither understood nor heeded, so that apathy and "Kismet" accounted for many cases and added not a little to the worries of those responsible for the health of the garrison. This impasse was too full of potential danger to be allowed to continue, and it was therefore decided to establish a:-

(5) Segregation Camp. Two days after this decision was arrived at (in May) the camp was opened - a very creditable performance for India, considering that it was situated 5 miles away from cantonments, and contained accommodation and equipment &c., for over 30 people. The site chosen was on a lonely pine-clad hill-side, and was approached by a fairly good path. There was an excellent water supply which was diverted and dammed, so as to prevent wayfarers and animals from gaining access to it down stream. Conservancy was entirely carried out by incineration; a special place was set apart for cremating corpses. The patients and contacts were accommodated in long huts which were sub-divided into family compartments; there were also store, dispensary, cook-house and staff huts. All these buildings were constructed of rough branches, leaves and pine-needles, and roofed with old iron sheeting, while deep trenches were dug to prevent flooding. The latter were very necessary, as heavy rain fell during the greater part of the period the camp was at work. Patients and contacts were not allowed to leave the camp precincts until they had a clean bill of health for at least 16 days. Prior to discharge all their belongings were burned, or disinfected by soaking in strong cresol solution. A police patrol prevented unauthorised visitors, &c., from approaching the camp boundaries. The effects of these rules were soon evidenced by a steady decline in

in the incidence and mortality rates until, at the beginning of August, the epidemic came to an end. The camp with its contents was burned on 20th August.

(6) Inspection of animals and hides, &c., was carried out in and around Ranikhet by officials of the Provincial Veterinary Service. No Anthrax was found.

TREATMENT. - There is little to be said under this heading. Every therapeutic measure which we thought likely to be of use was applied; recovery was never the outcome of our efforts, and it was even questionable if any appreciable alleviation or shortening of suffering resulted therefrom. In these respects the disease proved singularly intractable. Hence a discussion of the effects of hydrotherapy, ipecacuanha, morphia, arsenic, or of any of the hundred and one other general and symptomatic "remedies" which were tested, is unnecessary. Specific treatment for Anthrax was administered to a number of cases in the form of Anti-Anthrax Serum kindly supplied by Major Holmes; the results were too erratic to form material for useful analysis and report. Salvarsan was not tried - an omission which the writer will always deplore, and which was due to the fact that the possible significance of Obermeier's Spirillum was not fully realized until too late. A probable exception to the above record of failure may be open-air treatment, e.g., the death rate of patients in camp was comparatively low.

SUMMARY. i. In 1911 an outbreak of Anthrax occurred among animals in Ranikhet. In 1912 it did not re-appear.

ii. On 19th March, 1912, a dealer in hides died of the above-described "Pyrexia of Uncertain Origin". He also suffered from a lesion which resembled Malignant Pustule; this

this complication was not observed in any other case.

iii. The outbreak lasted from 19th March until 17th August, 1912; the incidence was greatest during April, May and June.

iv. Number of -

Cases in Hospital	.....	34
Deaths in Hospital	.....	9. % 26. 48
Cases in camp	.....	20
Deaths in Camp	.....	3. %15
Cases not in Hospital or Camp		40 <sup>x</sup>
Deaths " " "		15 <sup>x</sup> %37.5
Total number of cases		94.
Total number of deaths		27. %28.73

(<sup>x</sup>These figures are under-estimates, as there is no doubt that concealment took place.)

About 162 "contacts" who did not develop the disease were segregated from time to time.

v. All the patients were natives and, with the exception of two, all were of the lowest caste. They were of all ages and both sexes, with a slight preponderance of young adult males.

vi. Obermeier's Spirillum was found in specimens from three different cases; re Relapsing Fever cf. mortality rate, and note that this organism is not uncommon in blood of natives in the U.P.

A bacillus closely resembling Bac. Anthracis was found in specimens from 24 different cases; re Human Anthrax cf. mortality rate and results of animal inoculations.

vii. Prophylaxis was eminently successful in delimiting

delimiting infected areas but failed to check individual contagions, until a segregation camp was opened.

viii. With the possible exception of open-air treatment, no unequivocal benefits resulted from any of the numerous therapeutic measures employed; these latter included Anti-Anthrax Serum, but not Salvarsan.

ix. Finance. The epidemic caused an extra charge on hospital funds of Rs.268; and on the general cantonment funds of Rs.418 on account of camp expenses; that is, a total of about £45 odd.

Appendix 1. - Synopsis of Laboratory Reports.

A. An organism resembling Bacillus Anthracis in its -

1. Morphological characters and staining reactions was found in -

- (a) Blood smears from 3 different patients
- (b) Sputum " " 5 " "
- (c) Tissue " " 3 " "

2. Morphological and cultural characters and staining reactions was found in -

- (a) Blood cultures from 9 different patients; but inoculations of sub-cultures from some of these specimens did not prove fatal to animals.
- (b) Tissue emulsion cultures from 3 different patients; inoculations of sub-cultures from these proved rapidly fatal to animals, but the organism was not recovered after death.

B. Obermeier's Spirillum was found in 1 blood film,

and

and in sputum smears from 2 different patients.

N.B. A number of doubtful and contaminated specimens are not included in the above; many specimens were negative.

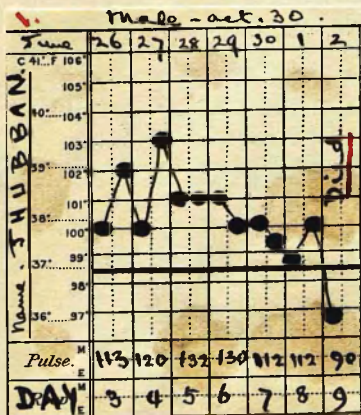
Appendix 2. Clinical Abstracts.

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1. The first case of the series.-

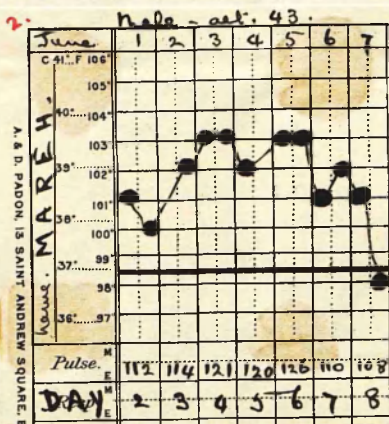
On 19th March a police notification was received to the effect that a man, recently arrived from Bareilly, was ill in the sweepers' lines of the regimental bazaar, and was suspected to be suffering from infectious disease. The patient was in extremis: temp. 102°, Pulse 152, respirations 31: intense jaundice: acute inflammation of parotid gland on right side, and abcess formation over cervical glands on same side: a deep sloughing ulcer, with a dark core about the size of a florin, on the right buccal mucous membrane (query - Malignant Pustule?) No other signs or symptoms of note except great emaciation. Relatives stated that patient had been ill for 8 days. He was a sweeper by caste; later on it was found that he was a dealer in hides by occupation. He died two hours after being seen; the body was cremated. Pus smears from the ulcer and abcess were crowded with Anthrax-like bacilli (mistaken at the time of examination for Bac.Pestis.)

2. Examples of Toxaemic cases.

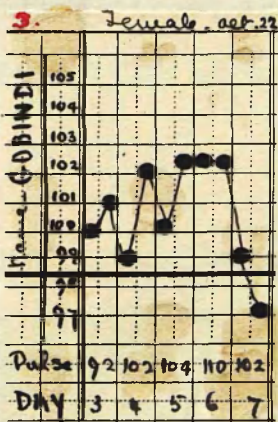


(1)

(1) A case with typical signs and symptoms. The patient seemed to be overwhelmed with toxin, rapidly went from bad to worse; and died in a "typhoid state" on the 9th day.

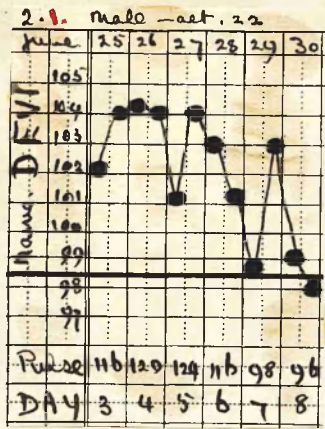


(2) This patient was a hospital sweeper who contracted the disease on nursing duty. A typical, severe toxæmia; the patient - a man of fine physique - appeared to be on the point of death for several days. He was, literally speaking, a crawling skeleton during a convalescence which lasted for nearly 3 months.

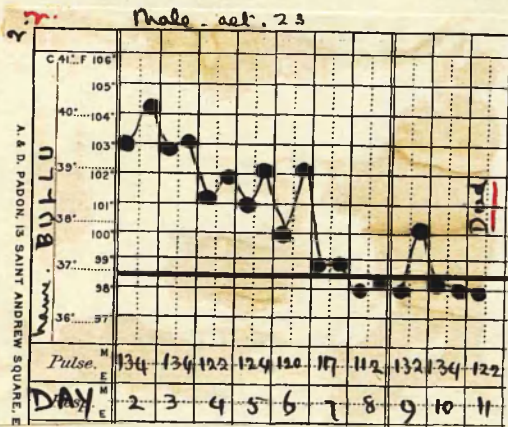


(3) A female patient who contracted a fairly severe, typical attack when nursing her husband. Vomiting and diarrhoea on 4th and 5th day.

(3) Examples of the Respiratory Variety.

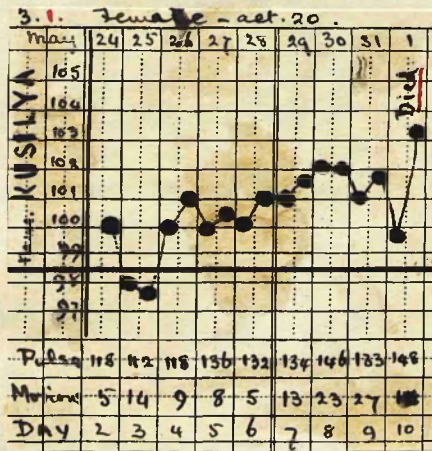


(1) In addition to the usual signs and symptoms this patient suffered from mild delirium and typical broncho-pneumonia, which cleared up quickly during convalescence.



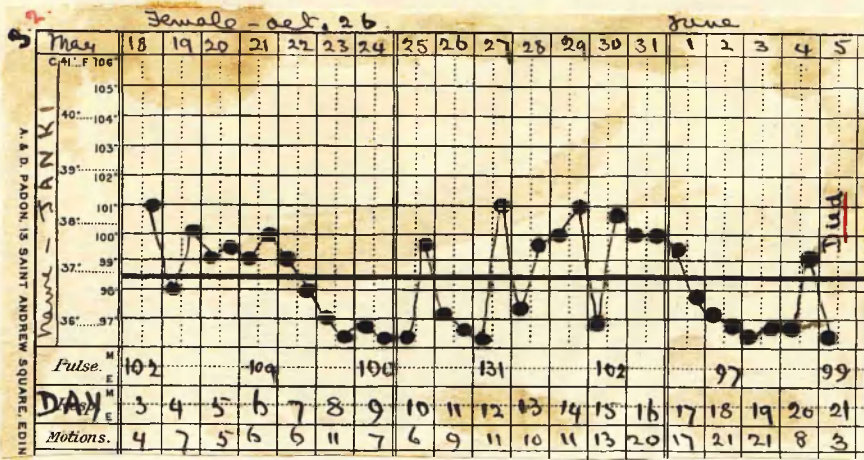
(2) Severe continuous pain in chest: racking cough with thin, scanty, blood-tinged sputum: signs of acute bronchitis: intense jaundice: delirium, "typhoid state", coma: death on 11th day.

4. Examples of the Intestinal variety.



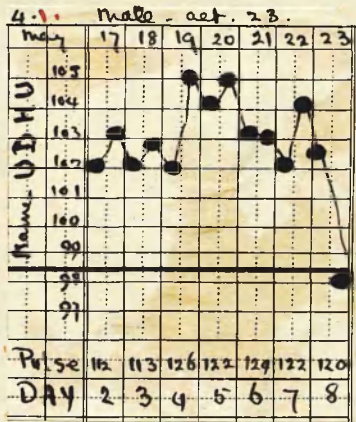
(1) Typical case: great prostration and emaciation: medication absolutely useless; intense jaundice, delirium, coma and death (N.B. Intestinal cases invariably proved fatal.)



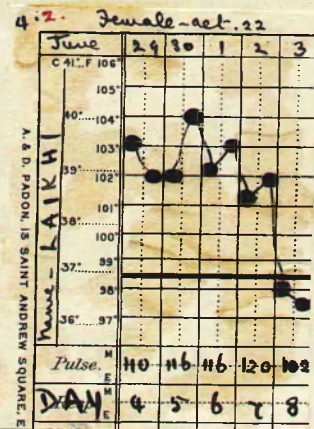


(2) A case like the above, but less acute.

5. Examples of the Nervous variety.

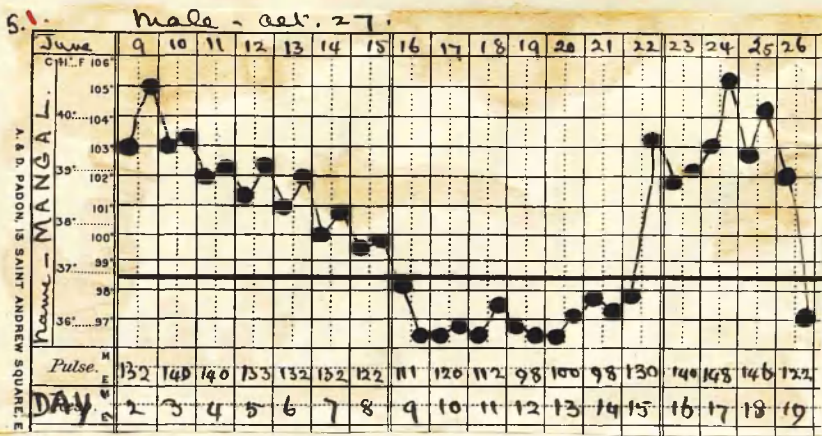


(1) The most prominent symptoms in this case were agonizing headache, delirium and prostration; there was also deep jaundice, emaciation, &c.

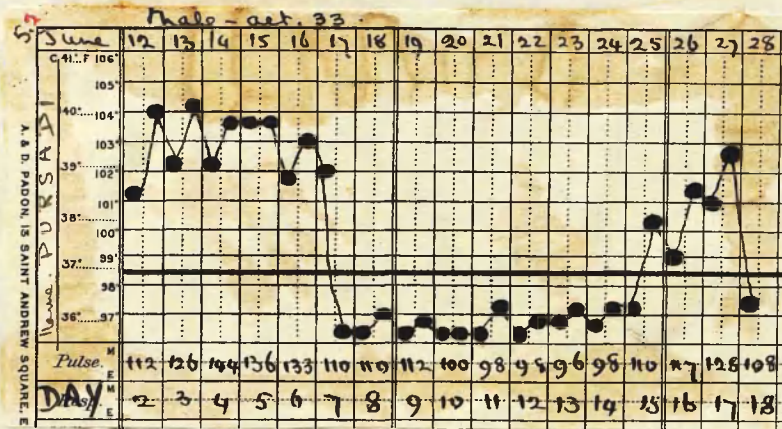


(2) Similar to the foregoing case.

6. Examples of Relapses.



(1) A very severe type of the disease: nervous variety; convalescence prolonged to nearly 2 months.



(2) Short summary of main features in this case -

12th inst., Furred tongue: severe headache: pains in limbs.

14th inst., Acute bronchitis with severe chest pain: very ill.

16th inst., Deeply jaundiced: emaciation and prostration.

25th inst., Acute, lapsing into quiet, delirium: jaundice more intense.

27th inst., Severe irido-cyclitis - right eye: ptosis right eyelid: odema right side of face: delirium passing off.

28th inst., Patient in "typhoid state": appears to be dying; panophthalmitis present.

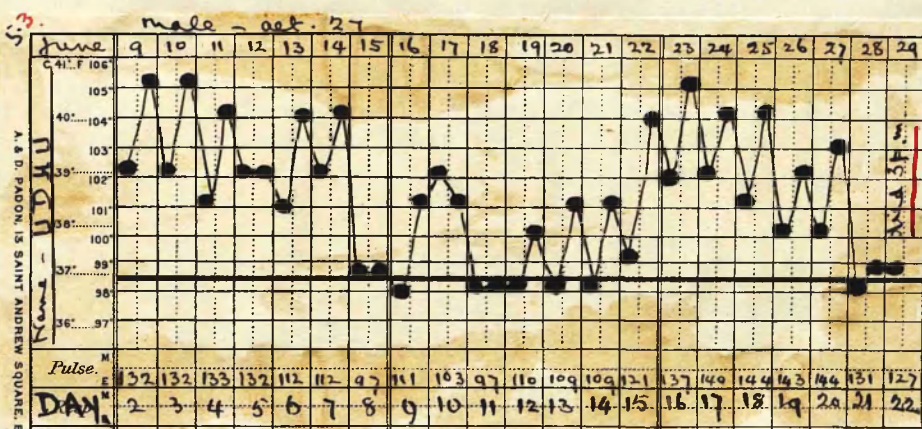
30th inst., Very weak and emaciated: occasionally delirious; eye improving.

9th July, Myalgia of calves: oedema of both feet and legs: paralysis of upper division, 3rd nerve: motor aphasia: patient

patient seems to be of unsound mind - a pitiful object.

15th Nov., Patient returned from leave to duty; he is less robust than he used to be, but otherwise appears to be quite cured.

(N.B. This patient was the widower of case 3 (1) (vide above) the latter before marriage with case 5 (2) was the widow of the first case of the series.)



(3) In addition to the usual symptoms in severe form, this patient developed double parotitis: on the 9th day signs of pus formation occurred: on 12th and 14th days the abscesses were incised, and a great deal of pus evacuated; patient died on the 22nd day in a state of asthenia.

The above examples of "types" might be multiplied indefinitely. Considerations of space forbid the inclusion of cases showing unusual features.