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THE IMMEDIATE FACTOR OF TUBERCULIN IN THE SANATORIUM TREATMENT OF PULMONARY TUBERCULOSIS.

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by

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The need for further inquiry into the therapeutic value of tuberculin.

The treatment of tuberculosis, and more especially of pulmonary tuberculosis by tuberculin, while never discontinued altogether since its introduction in 1890 by staunch believers in its therapeutic value, has been brought very prominently before the notice of the medical profession during the past three or four years. Tuberculin in one form or another is being most widely used, in the special institutions devoted to the treatment of tuberculosis, i.e. Sanatoria and Dispensaries, and also to a lesser extent in private practice. According to many authorities two questions, more important now than ever, in view of the dangerous and ill-controlled potentialities of the drug, still remain unanswered. (1) Has tuberculin proved its value sufficiently to warrant its general use without risk? (2) Can a definite place and value be ascribed to tuberculin in the treatment of tuberculosis, and especially of pulmonary tuberculosis? That there is no unanimity is proved by the opinions, often diametrically dissimilar, given on these questions by various authorities on the subject. Among these three schools may be distinguished:

Firstly there are the tuberculin enthusiasts, in whose/

whose eyes tuberculin ought to be the principal weapon in the war against tuberculosis, and of whom Wilkinson in this country may be quoted. According to them tuberculin is practically a specific for all but advanced cases of phthisis, and the hygienic-dietetic treatment, previously the most important element in sanatorium treatment, is of minor value. Wilkinson[1] states that he is convinced that in stage I and stage II of phthisis tuberculin can do more for the patient than sanatorium treatment. The results of sanatorium methods alone, according to him, in diminishing the number of cases with tubercle bacilli in the sputum are disappointing. Wilkinson[2] even believes that tuberculosis of the lungs in stage I can be cured with certainty by tuberculin.

Secondly there are the downright opponents of tuberculin, and those who, while still using the drug in treatment, are sceptical as to its value. H. Batty Shaw[3] states that there is no evidence to support the fact, that the future outlook of the phthisical patient with tuberculin plus sanatorium treatment is any better than with sanatorium treatment alone.

Mackenzie/

1. Wilkinson. Tuberculin treatment as the essential method of dispensing sanatorium benefit. B.M.J. 1912, v. 1, 804.

2 Wilkinson. Tuberculin in diagnosis and treatment. p. 235.

3 H. Batty Shaw. Present evidence for and against the use of tuberculin as a specific cure. B.M.J. 1913, v. 1, p. 921.

Mackenzie[1] says that tuberculin as a remedy must be put on a far lower plane than many remedies which we possess for the treatment of disease, such as salicylate of soda in acute rheumatism, quinine in malaria, or antitoxin in diphtheria. In his own words "I still feel uncertain as to the value of tuberculin. The results with tuberculin so far are not brilliant, certainly not convincing". To illustrate the dangers attendant on the ill-advised, and reckless use of tuberculin, Fowler[2] describes 12 cases in which actual harm was done to the patients, so much so as to cause a bad prognosis in several.

Thirdly, a large and increasing body are those who, while preserving an open mind on the subject, are using tuberculin, because they are convinced that, in conjunction with the other methods of treatment now in use, it acts as a factor for good, more or less powerful according to different observers, in the ultimate issue of the case. Thus Sahli[3] says that tuberculin treatment is only possible for a section of cases, and it has frequently to be abandoned. "Blind enthusiasm can hardly be laid to my charge, but I honestly believe that it is the best weapon of modern times in the fight/

1 Mackenzie. Tuberculin treatment. General survey.. Lancet (Lond). v. II. 1913, p. 521.

2 Fowler. Value of tuberculin in pulmonary tuberculosis. Lancet (Lond.) 1913 v. II, p. 378.

3. Sahli. Tuberculin treatment, p. 105.

fight against tuberculosis". Sir Robert Philip[1] states that he is satisfied that tuberculin is a specific remedy of much significance, provided its purposes, its possibilities and its limitations are understood by the user, and provided the treatment is commenced at a suitable stage, and is maintained in properly regulated dosage for a sufficient period.

These widely divergent opinions on the value of tuberculin amply emphasise the necessity and importance of further critical inquiry into its therapeutic value, and also indicate that its present position in the treatment of tuberculosis cannot by any means be said to be yet definitely settled.

THE SCOPE OF THE PRESENT INQUIRY.

The present inquiry is restricted to one branch of the subject, namely the results on discharge, estimated as exactly as possible by several criteria, which were obtained by sanatorium treatment, combined with tuberculin, in a group of 137 cases of pulmonary tuberculosis. It is proposed to analyse the cases, according to the various stages of the disease, and to consider the results on discharge according to the following criteria; (1) the clinical results as estimated by the physical signs/

1 Philip. Tuberculin. Its range of application. Transactions 5th Ann. Conf. 1913. Nat. Assoc. for Prevention of Consumption, p. 101.

signs in the chest, and the general condition of the patient; (2) the presence or absence of tubercle bacilli (T.B.) in the sputum; (3) the amount of restoration of working power; (4) the average gain of weight. Special attention will be given to the consideration of cases, systemic on admission, i.e. those cases which showed signs of febrile or other constitutional disturbance. It has generally been maintained that such cases react with difficulty to any form of treatment, and more especially to tuberculin treatment. In fact many authorities go so far as to state that under no circumstance should systemic cases be given tuberculin. The results obtained in the cases, systemic on admission, will be compared with the results of the non-systemic cases, and with those of all cases taken together. Results which other observers have obtained both with and without tuberculin will be compared with the results obtained in this series. In addition, certain cases, in which the administration of tuberculin seemed to have a bearing, more or less evident in the results, whether for good or for evil, will be described more fully. A short description of the reaction, difficulties, and dangers met with in the course of the treatment will be given, but no theoretical disquisition on the action of tuberculin will be undertaken, except such as is necessary to explain points of theory arising in the cases under consideration./

consideration. The final results of tuberculin treatment can only be discovered by actuarial methods - e.g. by the consideration of the numbers alive, and in good health, after a certain number of years of different groups of cases, treated with and without tuberculin. This of course does not come within the scope of this inquiry.

SHORT DESCRIPTION OF THE METHOD OF SELECTION OF PATIENTS AND THEIR GENERAL TREATMENT.

The cases of pulmonary tuberculosis, 137 in number, and mainly adults, were treated in the Leeds Sanatorium, Gateforth, from December 1912 to January 1914. In this institution are 60 beds, 40 for adults and 20 for children who attend an open-air school, and are not included in the series. Only cases which might reasonably be expected to react to, and benefit materially from sanatorium treatment are recommended by the Honorary Medical Staff at the Dispensary for admission; such cases being, as a rule, those with early definite disease and good resisting power. Systemic cases are not usually looked upon as suitable, and are only selected, where there is a very reasonable chance of their becoming non-systemic by rest in bed and other appropriate treatment. When a systemic case remained systemic after 6 weeks treatment by strict rest, it was generally after consultation either transferred to hospital or at the patient's request sent home. Accordingly, if it/

it be granted that systemic cases, as such, are unsuitable, the problem of the selection of cases suitable for tuberculin treatment was naturally solved, as practically all the patients who remained for any length of time were of a type to whom, according to most authorities, tuberculin might be safely given.

The 137 patients who remained for longer than 6 weeks, and were treated with tuberculin, may be simply classified for purposes of analysis according to the presence or absence of tubercle bacilli in the sputum, on admission, viz. - Class A. 60. T.B - Class B. 77. T.B.+. The relatively large proportion of Class A is explained by the fact that the institution aims to be as much a "preventorium", as a sanatorium. Only cases clinically positive as regards physical signs, or in which the suspicion of disease is very strong, are admitted. If the case was pronounced definitely negative from an exhaustive consideration of every point, including the specific tuberculin tests, the patient after 5 or 6 weeks stay was sent home, and is not included in the present series.

The treatment aimed at was the customary hygienic-dietetic, in combination with a course of tuberculin. In systemic cases, except in a few febrile cases, where tuberculin was given tentatively, a reduction of fever, and evidence that a non-systemic condition was approaching were considered essential, before tuberculin was commenced. To summarise a gradual progression, due attention/

attention being paid to the appearance of fever or any other warning of danger, from rest in bed, gentle walking exercise, hard walking, light work to hard manual labour was aimed at, in fact the graduated labour method now adopted in most sanatoria. The administration of tuberculin caused little or no interference with the graduated labour scheme, there being no evidence, with the system of dosage used, that any special precautions, in the way of rest or abstinence from work after injections, were necessary, except in particular cases.

THE WORKING THEORY OF TUBERCULIN ADOPTED AND THE ATTITUDE TOWARDS REACTIONS.

In a subject so full of debatable points and conflicting theories, it is necessary to adopt a working theory of the action of tuberculin. Firstly it is held, according to Sahli[1] and others, that all the well established tuberculins, while differing in minor points, are essentially alike in their nature and action, the active principle being the protein of the tubercle bacillus. Acting on this, Bacillary Emulsion Human, and Bovine (for convenience later called B.E. (B) and/

1 Sahli. Theses on Tuberculin treatment. Lancet (Lond). 1913, vol. II, p. 379.

and B.E. (H) respectively), which had previously been used in this institution with apparent success, and was preferred by the honorary staff, was given in practically all the cases noted in this series.

Secondly, tuberculin is not in any way to be regarded as a specific, i.e. actually as combining with, or neutralising the toxins developed in the body fluids of the patient; but rather it may, as Béraneck[1] states, be said to stimulate the body both in a general and particular way:

A. The body defences generally are stimulated, as by a tonic, and the resistance is increased.

B. The cells and juices which are normally concerned with the neutralisation of the toxins of the tubercle bacillus are particularly stimulated.

C. The processes of healing and cicatrisation, under control of the special cells at the seat of disease are stimulated, and curative action is thereby hastened, and possibly even initiated by the influence of tuberculin.

Thirdly, unless with the administration of tuberculin there is evidence of a certain stimulating effect, there is no proof that good is being done. This introduces the question of the tuberculin reaction, and whether it is possible to obtain this stimulating effect without getting reactions, or at any rate the possibly injurious general reaction. With efficient tuberculin treatment/

1 Béraneck. Tuberculin. Rationale of its use. Its Possibilities and Limitations. Transactions Nat. Assoc. Prev. of Consump. 5th Ann. Conf. 1913, p. 54.

treatment Riviere and Morland[1] frankly recognise with Turban the impossibility of avoiding reactions altogether, at the same time insisting on absolute rest when they do occur; if this be done the reaction is often the starting point of more rapid progress. In the following series a middle course was taken between the school which recommends a lengthy reactionless course, and the "intensive" school which disregards all but the most severe reactions. As an adherent of the latter school Wilkinson[2] says he does not use extreme care to avoid reactions, gives as large doses as possible, and thinks an occasional reaction with fever often does good. In the present series, the minimal or slight reaction, the clinical features of which might be some redness in the needle line, the rise of the temperature .5° F on the day of injection, slight malaise, and rarely slight increase in the cough or sputum was welcomed, but was at the same time looked upon as a warning sign of sensitiveness, and of the approach of the major reaction, and never disregarded.

THE METHOD OF ADMINISTRATION AND DOSAGE.

Hamman/

1 Riviere and Morland. Tuberculin Treatment, p. 96.

2 Wilkinson. Tuberculin in Diagnosis and Treatment, p. 245.

Hamman and Wolman[1] in their description of Bacillary Emulsion or B.E, the tuberculin used in practically all the cases of the series, state that it is assumed to contain the entire contents of the bodies of the tubercle bacilli, without any of the soluble excretions into the culture medium, and also to retain the extractives lost in the preparation of New Tuberculin or T.R. by washing. The dosage is reckoned in decimal parts of a milligramme, 1 c.c. original B.E. containing 5 mgrs. of bacillary substance. The dilutions adopted were:-

1. - - - 1 in 5 - - - - - - 1 c.c. = 1 mgr. B.E.
2. - - - 1 in 50 - - - - - - 1 c.c. = .1 mgr. B.E.
3. - - - 1 in 500 - - - - - 1 c.c. = .01 mgr. B.E.
4. - - - 1 in 5000 - - - - - 1 c.c. = .001 mgr. B.E.
5. - - - 1 in 50000 - - - 1 c.c. = .0001 mgr. B.E.

No definite scheme of increase of dosage was adopted, as it was found by experience that it was essential to treat every case absolutely on its merits; but in favourable cases the following scheme of dosage in each dilution was regarded as an approximate standard. .1 c.c, .14 c.c., .2 c.c., .3 c.c., .4 c.c., .6 c.c., .8 c.c. The whole scheme of dosage, of course, depended on the sensitiveness or tendency to reaction of each case. In the slightest or minimal reactions the dose was/

1 Hamman and Wolman. Tuberculin in Diagnosis and Treatment, p. 216.

was repeated, and the next increase made smaller. In moderate reactions the next dose was omitted, and after the interval of a week the dose causing the reaction was repeated. The rule in severe reactions was to wait 10 days before giving the next injection, and generally a slightly smaller dose was tried; at the same time the suitability or otherwise of the patient for tuberculin treatment was considered. These principles are not to be looked upon as fixed, but rather as guiding and elastic.

The initial dose in a favourable case, i.e. non-systemic on admission was .0001 mgr. B.E., in systemic cases generally .00001 to .00005 mgr. B.E. Up to.1 mgr. injections were given twice weekly; above that dose once weekly or every 10 days. The largest dose given was .7 mgr. B.E., and the average maximum or perhaps better optimum dose was from .1 to .3 mgr. B.E. The principle adopted was as seen above a moderately slow increase of dosage, and experience showed that this cautious administration, practically never interfering with the ordinary routine of exercise and work, gave better results, and even attained to large doses more quickly, than the "intensive" method, with its rapid increase of dosage, and frequent stoppages of treatment owing to reactions. The actual details of the technique employed, which vary but little among different workers, are practically those of Riviere and Morland[1], and need/

1 Riviere and Morland. Tuberculin Treatment, p. 53.

need not be detailed.

EXAMINATION OF PATIENTS AND SPUTUM.

Patients were examined once a fortnight by routine for changes in the physical signs of the chest, and always for focal signs after a reaction. In addition patients were supplied with a list of the symptoms which often herald or accompany a mild, and give warning of a severe reaction, such as headache, pain in the chest, increase of cough or sputum, and were asked to report such at once. Sputa, after being definitely declared T.B.+, or T.B. - on admission, were examined once a month by routine by the Ziehl-Neelsen method, and more frequently if there were any question of tubercle bacilli disappearing. In such cases the antiformin method was used; only on one occasion were tubercle bacilli found by this method and not by the older. The temperature was taken by mouth 4 times a day; in cases on exercise or work the pulse was recorded once weekly; in bed cases twice a day. Patients were weighed once weekly.

AN ANALYSIS OF THE CASES TREATED WITH TUBERCULIN.

The following tables show (1) the distribution of the cases, according to the stage of disease, (2) the number of systemic cases in each group on admission, (3) the average length of stay, (4) the age distribution.

I.

Distribtuion of cases according to stage of disease.

	Number.	Average stay in weeks.
Group A. T.B.- on admission	60	14.25 weeks.
Group B. T.B.+ " "	77	18 "
Group B. sub-divided into:-		
Turban Stage I	34	17 "
" " II	23	18 "
" " III	20	20.18 "

II.

The initially systemic cases.

	Total in Group.	Number Systemic.	Average stay of systemic.
Group A. T.B.-	60	10	16.6 weeks
Group B. T.B.+	77	33	18.6 "
Group B. (Stage I.	34	8	18.2 "
Group B. " II	23	7	16.5 "
Group B. ' III	20	18	18.6 "

III.

Age and sex distribution.

	10-15	15-20	20-30	30-40	40+	Total.
Group A. T.B.-	17	21	13	5	4	60
Group B. T.B.+	4	8	27	25	13	77

	Males	Females.
Group A.	31	29
Group B.	50	27

COMMENT/

COMMENT ON ABOVE TABLES.

In a sanatorium utilised more especially for phthisis in its earliest forms it was to be expected that a certain proportion - 60 out of 137 cases - should either have no sputum, or have sputum in which tubercle bacilli could never be found. The subcutaneous tuberculin reaction was used at first in 8 cases to assist in the diagnosis of these cases, either Old Tuberculin (T) or Albumose Free Tuberculin(T.A.F) being used in the following doses: .0002 c.c., .001 c.c., .005 c.c., .01 c.c. given every second day until a reaction local, focal, or general took place, all the usual precautions as regards temperature etc. being taken. This method, although undoubtedly helpful was dropped, as being not altogether free from risk; according to Sahli[1] "The use of Tuberculin for diagnostic purposes ought to be condemned. Diagnostic injections are dangerous". The remaining 52 cases were judged to have early phthisis from the history, the clinical signs, and a positive Von Pirquet test, the latter proving at any rate the presence of a healed or active tuberculous focus. Early cases of this type do exceedingly well on sanatorium treatment alone, and it is not to be expected that their results on tuberculin will show any material/

1 Sahli. Theses on Tuberculin Treatment. Lancet (Lond). 1913, v. II, 379.

material advance on those of the hygienic-dietetic method. It has however been stated by several authorities that closed phthisis properly treated with tuberculin remains closed. Dogmatic conclusions as to the value of tuberculin can hardly be drawn from such cases, as the only certain diagnostic criterion of phthisis is the presence of tubercle bacilli in the sputum.

For purposes of analysis, the 77 cases, T.B+, on admission, were put into the following three stages, approximately those of Turban.

Stage I. Slight disease of one lobe, or very slight both apices.

Stage II. More extensive disease affecting one whole lobe, or moderately severe disease affecting two lobes.

Stage III. All cases with disease more extensive than the above, and all cases with cavitation.

In estimating results with tuberculin, the division of cases into systemic (S) and non-systemic (s) is of some importance. The non-systemic case generally does well on sanatorium methods alone, and has on the whole a good prognosis; the systemic case as a rule has a bad prognosis; immediate and post-sanatorium results are disappointing. The factors taken into count in pronouncing a case to be systemic were as follows:- (1) febrility - evening rise above 99.4° F, (2) rapidity of pulse - over 100, (3) hectic or toxic appearance, (4) night sweats, (5) symptoms of digestive upset, (6) symptoms of nervous upset, (7) any other symptom or sign pointing to general poisoning. Evidence of all or a combination/

combination of these symptoms and signs made the case systemic on admission; their persistence, after several weeks treatment in bed made the case definitely systemic, and not, as a rule, suitable for tuberculin treatment. The systemic cases enumerated above gave evidence of toxaemia on admission, but improved so far that a tuberculin course was initiated, though not in all cases persisted in. On the whole, their treatment with tuberculin was difficult, as with the slightest provocation there was, in several of them, a return of the systemic symptoms, and the results, so far as estimated, were rather disappointing.

NUMBER OF CASES ON EACH TUBERCULIN USED.

The following table shows the number of cases treated with the tuberculins used in the series. In accordance with a previous statement that all tuberculins are alike both in their essential proportion and therapeutic effects, the results will be considered together.

	B.E.(Human)	B.E.(Bovine)	Spengler's I.K.	A.F.
No. of cases -	122	15	5	4

B.E. (Bovine) was substituted on seven cases for B.E. (Human) and with apparent advantage, when the latter caused difficulty with frequent reactions, or when clinical progress was slow. I.K. was only used in cases/

cases originally systemic. For purposes of analysis it is classed with the tuberculins, although strictly speaking not a tuberculin, and not a product as such of the tubercle bacillus, but an immune serum.

Table showing number of doses received.

1.Group A. 60 cases T.B- Average No of injections = 18

Of the 60 cases 17 received - - - - 15-20 injections

14 " - - - - 20-25 "

14 " over 25 "

15 " less than 15 "

2.Group B. 77 cases T.B.+ Average No of injections = 22

Of the 77 cases 24 received - - - - 15-20 injections

23 " - - - - 20-25 "

21 " over 25 "

9 " less than 15 "

The following table analyses the tuberculin course in each group of cases according to the amount of tolerance or sensitiveness shown.

Tuberculin Course.	Group A. 60 cases T.B-		Group B. 77 cases T.B+		All systemic cases.	All non-systemic cases.
	All cases	systemic cases.	All cases.	systemic cases.		
1. Reactionless.	11	0	8	5	5	14
2. Minimal reactions only.	23	1	23	5	6	40
3. One general + minimal reactions.	10	2	10	2	4	16
4. 2 - 3 general reactions.	11	3	20	7	10	21
5. Difficult, but successful course.	4	3	6	5	8	2
6. Difficult, moderately successful or unsuccessful.	1	1	10	9	10	1
Total	60	10	77	33	43	94

Several very significant facts are disclosed by the above table. It shows very clearly that the initially non-systemic case has a very much greater chance of a smooth tuberculin course, than the initially systemic case, in whose immunisation difficulties are frequent. Thus 28 out of 43 systemic cases or 65%, and of the non-systemic only 24 out of 94 cases or 25%, showed difficulties representing more than one general reaction during the course. In tuberculin administration, which attempts to utilise the minimal reaction, and just to avoid the general reaction, with its/

its local, focal and general signs, and all its possibilities of danger, this general reaction must of necessity overshadow the whole treatment. Experience undoubtedly, in this difficult form of therapy, does teach how to avoid the major reactions, and at the same time to obtain all the benefit hoped for; but in a certain proportion of cases, however careful the administration, reactions appear unavoidable. A table will be given later, to show the relation of the clinical and other results of the cases to their tuberculin course.

THE RESULTS OF TUBERCULIN TREATMENT.

The results of the 60 cases, without tubercle bacilli in the sputum on admission will be considered separately, and shortly, being of much less importance from the point of view of a critical estimate of the value of tuberculin. The following analysis deals only with the 77 cases, having tubercle bacilli in the sputum on admission.

I. THE CLINICAL RESULTS ON DISCHARGE.

The following criteria were adopted:-

1. Disease apparently arrested, i.e. no active signs in the chest; apparent complete restoration to health.

2. Very much improved, i.e. slight active signs remaining; great improvement in general health.

3. Improved. i.e. physical signs slightly lessened in activity; health improved.

4. (a) In Statu Quo. i.e. physical signs practically as on admission; general health often improved.

(b) Worse. i.e. physical signs advancing; no improvement in general condition.

Clinical Results 77 Cases T.B.+

	No of Cases	Disease apparently arrested.	Very much improved.	Improved.	In Statu Quo or worse.	Average stay in weeks.
Stage I.	34	21	9	3	1	17
" II.	23	6	9	3	5	18
" III.	20	1	7	6	6	20.18
Total	77	28	25	12	12	18.

The comparison of the results of the three stages is seen better if the table be arranged according to percentages.

	No of Cases.	Disease apparently arrested.	Very much improved.	Improved.	In Statu Quo or worse.
Stage I.	34	62%	26%	8.8%	3.2%
" II.	23	26%	39%	13%	22%
" III.	20	5%	35%	30%	30%
Total	77	36.3%	32.5%	15.6%	15.6%

As immediate results these appear satisfactory - at any rate in the cases of stage I and stage II. Unfortunately it is quite impossible to predict with any/

any certainty the future lifetime and prognosis of any case on discharge. It is significant also that only one case in 20 in stage III left the sanatorium without active signs of tuberculosis in the chest.

The following tables show the clinical results of the systemic cases (S) as compared with those of the non-systemic cases (s).

Results of Systemic Cases.

A.	Total cases S + s.	Total cases S.	Disease apparently arrested.	Very much improved.	Improved.	In Statu Quo or worse.
Stage I.	34	8	2	4	1	1
" II.	23	7	0	2	1	4
" III.	20	18	0	6	6	6
Total	77	33	2=6%	12=36.3%	8=24.2%	11=33.3%

B.	No of Cases	Disease apparently arrested.	Very much improved.	Improved.	In Statu Quo or worse.
S+s.	77	36.3%	32.5%	15.6%	15.6%
s.	44	63.7%	25%	9%	2.3%
S.	33	6%	36.3%	24.2%	33.3%

Tables A. and B. show very conclusively that initially non-systemic cases do very much better than initially systemic cases, as far as clinical results are concerned, both classes being treated with tuberculin. Of the non-systemic cases 88.7% were discharged with either/

either apparently arrested or very much improved disease, as compared with 42.3% of the systemic cases. Sutherland[1], whose cases however were treated with tuberculin at a dispensary, found very much the same result, as regards systemic cases, according to the following table.

All Cases T.B+.

	Disease arrested.	Improved.	In Statu Quo.	Worse.	Total.
Non-systemic cases.	2	12	0	8	22
Systemic cases.	0	5	3	5	13

Bardswell[2] has compared the clinical results of (1) 606 cases T.B+ on admission to sanatorium, treated without tuberculin, (2) 172 cases T.B+, 65% receiving tuberculin treatment, (3) 130 cases T.B+, treated with tuberculin.

	Arrested or much improved.	Improved.	Stationary or worse.
1.606 cases T.B+on admission, no tuberculin treatment	52.3%	22.9%	24.7%
2.172 cases T.B.+on admission, 65% treated with tuberculin.	51.7%	19.7%	28.4%
3.130 cases T.B+on admission, all treated with tuberculin.	64.6%	17.6%	17.6%
The present series 77 cases T.B+ all treated with tuberculin.	68.8%	15.6%	15.6%

1 Sutherland. Use of Tuberculin in Dispensary Practice. Trans. Nat. Assoc. Prev. Consum. 5th Ann. Conf. 1913, p. 82.

2 Bardswell. Prelim. Rep. Treatment of Pulm. Tuberc. with Tuberculin, pp. 73, 74, 77 and 78.

In Bardswell's series of cases, it is to be noted that the cases in stage II, the moderately advanced, account for 60% of the total number, while in the present series 49% of the total cases were in stage I. This fact may account for a slightly higher percentage of arrested or much improved disease. The above table shows a slight but definite improvement in the results of the tuberculin treated cases, though it has to be kept in mind that there was a certain amount of selection of cases for tuberculin treatment in both series.

In the following two tables is shown a comparison of the results of cases treated with tuberculin, and cases treated without tuberculin, both sets of patients being otherwise under precisely similar conditions. Rigg[1] took 19 cases of pulmonary tuberculosis, 10 of which were treated with tuberculin, 9 without tuberculin, the cases being chosen by lot. The tuberculin used was T.R., given every second day up to .1 mgr., then every fourth day up to .7 mgr. His results as regards tuberculin seem unfavourable.

	Improved.	Worse.	In Statu Quo.	Total.
Treated with tuberculin	1	4	5	10
Treated without tuberculin	4	3	2	9

The/

1. Rigg. Controlled therapeutic use of New Tuberculin in Treatment of Pulm. Tuberc. B.M.J. 1913, v. 1, p. 213.

The number of cases treated, however, is rather too small to form any definite conclusion.

Stockdale and Hodson[1] have attempted a comparison between tuberculin, and non-tuberculin treated cases on similar lines. Their results are as follows:-

A. PHYSICAL SIGNS.

	No of cases.	Improved.	Worse.	In Statu Quo.
1. Afebrile cases				
with tuberculin	9	5	3	1
without tuberculin.	9	2	5	2
2. Intermittently febrile				
with tuberculin	20	3	6	11
without tuberculin,	20	7	8	5
3. Febrile cases				
with tuberculin	2	0	2	0
without tuberculin,	2	0	1	1

B. GENERAL CONDITION.

	No of cases.	Improved.	Worse.	In Statu Quo.
With tuberculin	31	13	10	8
Without tuberculin	31	16	9	6

It/

1 Stockdale and Hodson. Controlled Use of New Tuberculin in Treat. Pulm. Tuberc. B.M.J. Vol.II, July 25th, 1914.

It is to be noted in this series that there was a large proportion of what might fairly be called systemic cases. The non-systemic cases did better with tuberculin than without tuberculin, while the systemic cases did better without tuberculin.

To sum up the evidence given by the previous tables as regards clinical results, it may be said that the administration of tuberculin does not lower the proportion of good results; but, taking into account any selection of cases made, a slight but definite improvement in the results may be claimed. The tables given by Bardswell show this most clearly. This improvement takes place more especially in cases of stage I, and stage II; there is no evidence of any improvement in the results of the more advanced, or initially systemic cases. Occasionally, however, a systemic case may, as will be described later, show an improvement, which may without prejudice be ascribed to tuberculin.

2. RESULTS ACCORDING TO LOSS OF TUBERCLE BACILLI.

The fact that on discharge the tubercle bacillus cannot be found in the sputum, or that sputum originally containing the bacillus has entirely disappeared, is both of practical and scientific value. The loss of infectivity is of much importance to the community at large, while the absence of tubercle bacilli on discharge is probably the best criterion we have as regards results, both of sanatorium treatment alone, and of/

of any particular treatment in addition. It must be kept in mind, however, that tubercle bacilli may be found at one examination of the sputum, and not at another; in the present series no case is called free, unless tubercle bacilli have been absent for a month, and after several examinations. Again, it is admitted that in a certain proportion of cases tubercle bacilli will reappear in the sputum after discharge. At the same time, if the difference in the sputum examination results of several series of cases, treated with and without tuberculin, be carefully estimated, a comparison can be very fairly made.

The following tables give the results, as regards loss of tubercle bacilli in the sputum, of several series of cases treated with tuberculin, and others treated without tuberculin.

A. Without Tuberculin.	No of cases	Average stay in days.	Percentage T.B+ on admission.	Loss of T.B. Stage I.	Stage II.	Stage III.	Total loss of T.B.
(1) Statistics Private(1) Sanatoria, Germany 1902-1904.	3004	125 days	72½%	57%	29%	8½%	-
2. King Edward VII Sanat. (2)	606	120 days	100%	32.7%	15.3%	1.1%	15.3%
B. With Tuberculin.							
1. Private Sanatoria (1) Germany, 1912.	203	183 days	44%	61%	52%	29%	-
2. Bandelier (3)	202	-	100%	100%	87.3%	44.2%	63.8%
3. Bardswell. King Edward VII. Sanat. (2)	130	147 days	100%	59%	33.3%	7.4%	32.3%
4. The present series	77	126 days	100%	65%	35%	10%	41.5%

Hamman and Wolman[4] quote the following results obtained by Kremser. Of 110 patients with tubercle bacilli in the sputum, 55 were treated with tuberculin, alternate/

1 Armstrong. I.K. Therapy, p. 42. 43.

2 Bardswell. Prelim. Rep. Treat. Pulm. Tuberc. with Tuberculin, p. 78.

3 Bandelier. Beiträge zur Klinik der Tuberculose, 1910. Band. XV. Heft 1, p. 17.

4 Hamman and Wolman. Tuberculin in Diagnosis and Treatment, p. 252.

alternate patients being selected for tuberculin treatment as they were admitted, without selection. On discharge 40% of the cases treated with tuberculin had lost tubercle bacilli, as against 29% of those not so treated. Löwenstein[1] quotes a series of 682 open cases treated with tuberculin, of which 53% lost tubercle bacilli.

A study of the above tables shows clearly that, even allowing for a certain selection of cases, tuberculin treated patients lose tubercle bacilli more readily than those not treated with tuberculin. It is not practicable to estimate this superiority exactly, but sufficient to point out that the difference is appreciable. Bandelier's figures are certainly remarkable, and it is questionable if they have ever been equalled, especially in stages II and III. Bardswell shows a slight but definite increase in the percentages of cases losing tubercle bacilli in every stage.

Loss of tubercle bacilli in the cases of the present series, in detail:-

	Number of cases.	T.B- on discharge.	Average stay.
Stage I.	34	22 = 65%	17 weeks
" II.	23	8 = 35%	18 "
" III.	20	2 = 10%	20.18 "
Total	77	32 = 41.5%	18 "

1 Löwenstein. Deutsch. Med. Wehnschr. 1910, XXXVI, 1654.

Loss of tubercle bacilli in cases systemic (S) on admission:-

	All cases.	Systemic cases.	T.B- on discharge.
Stage I.	34	8	4 = 50%
" II.	23	7	3 = 43%
" III.	20	18	1 = 5.5%
Total systemic cases		33	8 = 24.2%

A comparison of the systemic (S) and non-systemic cases (s) as regards loss of tubercle bacilli:-

	Number of cases.	T.B- on discharge.	Stay in weeks.
S + s.	77	32 = 41.5%	18
s.	44	24 = 54.5%	17.6
S.	33	8 = 24.2%	18.6

From these tables, if results be judged by loss of tubercle bacilli, it is apparent that treatment with tuberculin does not alter the initial advantage, which the non-systemic case has over the originally systemic case - 54.5% of the former losing tubercle bacilli on discharge, as against 24.2% of the latter class. At the same time it is to be noted, as seen above, that German workers appear to have had fair results in the tuberculin treatment of stage III cases, which generally at some period of their stay present systemic symptoms; in Bandelier's series 44%, in that of the German Private Sanatoria/

Sanatoria 29%, of the cases in stage III lost tubercle bacilli, as against 7.4% in Bardswell's and 10% in the present Series.

3. RESULTS ACCORDING TO RESTORATION OF WORKING POWER ON DISCHARGE.

For purposes of analysis cases are put in the following classes:-

Class A. = Hard manual work or full exercise, 8 - 10 miles a day.

" B. = Light work: or moderate exercise, 4 - 6 miles a day.

" C. = Walking exercise, 1 - 4 miles a day.

" D. = Walking exercise under 1 mile, or no exercise.

	Number of cases all T.B.+ .	A.	B.	C.	D.
Stage I.	34	27	1	6	0
" II.	23	7	10	2	4
" III.	20	5	2	6	7
Total	77	39	13	14	11

The following table shows the amount of restoration of working power in originally systemic cases (S), as compared with that of non-systemic cases:-

	Number of cases.	A.	B.	C.	D.
S + s.	77	39	13	14	11
s.	44	30	7	7	0
S.	33	9	6	7	11

Bandelier[1] gives the proportion of cases recovering complete working capacity in a series of 500 cases treated with tuberculin, 40% having tubercle bacilli in the sputum. A similar analysis of the present series is added.

Complete earning capacity.

	Nq. of cases.	All cases.	Stage I.	Stage II.	Stage III.
Bandelier	500	69.8%	90.4%	80.7%	32.8%
Present series	77	50.6%	80%	30.4%	25%

The above tables show that in the earlier stages of open phthisis some restoration of working power, as the result of sanatorium treatment plus tuberculin, is the rule. It is to be noted also, that 30 out of 44 or 68% non-systemic cases in the present series, as opposed to 9 out of 33 or 27% originally systemic cases, were fit for ordinary out-door occupations on discharge. Very little disturbance of the scheme of exercise and graduated labour was caused by the administration of tuberculin, and except in a few special cases, no interruption of work on the day of injection. As regards unfavourable results, 64% of the systemic cases, and 23% of the non-systemic cases were considered on discharge to be economically useless; i.e. in all liklihood unable to work for some considerable time, if at all.

1 Bandelier. Beitr.zur, klin. d. Tuberk. 1910, XV. I.

4. THE RESULTS ACCORDING TO INCREASE OF WEIGHT.

	No of cases	Average gain in lbs.	No of cases with decrease.	Cases gaining over 14 lbs.	Cases gaining 0 - 7 lbs.	Cases gaining 7 - 14 lbs.
Stage I.	34	10.6	2	9	9	14
" II.	23	9.8	2	7	5	9
" III.	20	9.6	0	4	8	8
Total	77	10.05	4	20	22	31

The average gain of weight according to clinical results.

	Number of cases.	Average gain in lbs.
1. Disease apparently arrested.	28	11.8
2. Very much improved.	25	11.2
3. Improved.	12	5.9
4. In Statu quo or worse.	12	7.5
Systemic cases.	33	9.5
Non-systemic cases.	44	10.4

It is questionable if these figures give much information as to the value of tuberculin, as it is a well known fact that increase of weight is not a good criterion as estimating the prognosis of a case of phthisis. A case with systemic symptoms, and poor nutrition on admission, may as the result of rest and good/

good feeding, go out with considerable gain of weight, but without any improvement in the clinical signs, or future prognosis. One such case, E. H. G. with extensive cavitation and signs of mixed infection, febrile for two months, went out after 18 weeks stay, with clinical signs unchanged, but with a gain of 15 lbs. On the other hand,it is a fact of some importance,that the combination of a steady course of tuberculin with exercise, or hard gardening work did not prevent patients from gaining weight, or cause them to lose weight already gained.

The results according to the course of tuberculin, 77 cases T.B+.

Class.	No of cases	Disease apparently arrested.	Very much improved.	Improved.	In Statu quo or worse.	T.B-.
1. Reactionless	8	2	2	1	3	2
2. Minimal reactions	23	11	8	3	1	13
3 One general reaction + minimal reactions	10	5	2	3	0	6
3. 2 - 3 general reactions.	20	7	8	3	2	8
4. Difficult but successful course	6	3	1	0	2.	2
6. Difficult; moderately successful, or unsuccessful course, owing to intolerance or reappearance of systemic signs.	10	0	4	2	4	1

This table shows that the absolute smoothness of a tuberculin course does not insure a favourable result to the patient. Of the 8 patients who gave not the slightest indication even of a minimal reaction, 4 belonged on discharge to the Improved, I.S.Q. or Worse group, and thus had a bad prognosis, while only two lost tubercle bacilli. Bardswell[1] also lays stress on/

1 Bardswell. Prelim. Rep. Treat. Pulm. Tuberc. with Tuberculin p. 30.

on this fact. Successful immunisation of patients in classes 2, 3, 4, and 5 (see above table) seemed to have a bearing on the ultimate result, both as regards the chest condition, and the loss of tubercle bacilli. Of these cases 14 only out of 59 had a bad prognosis on discharge, while 29 lost tubercle bacilli. The cases which come under class 6 - difficult tuberculin course - with 6 out of 10 having a bad prognosis on discharge, and only one case with loss of tubercle bacilli, compare unfavourably with the above. These 10 patients were all systemic on admission, and showed either advanced or very active disease. Tuberculin was commenced cautiously, only after a certain amount of improvement in the systemic symptoms. Four of these patients were discharged still febrile; in their case the number of injectious given was small, 5, 6, 12, and 13. From a consideration of these facts the general statement may be made that the best results with tuberculin treatment appear to be obtained in the cases, which at some period of their course display signs of reaction, or activation of the drug in their system; but while some cases get well, and do well in spite of much intolerance to the drug, other cases show no sign of improvement in the face of a progressive and easy induction up to a moderate dose. This really means that no true specificity can be claimed for tuberculin.

Results in Group A. 60 Cases T.B- on admission.

These results will be considered only shortly, for reasons stated before. The average stay was 15.6 weeks. Of the 60 cases, 10 showed slight systemic symptoms on admission.

1. Clinical Results.

	All cases.	Systemic on admission.
1. Disease apparently arrested.	37 = 61.6%	4
2. Very much improved.	20 = 33.3%	3
3. Improved.	3 = 4.9%	3
4. In Statu Quo or worse.	0	0
Total	60	10

2. Working Capacity on Discharge.

	All cases.	Systemic on admission.
1. Full work, or walking 8 - 10 miles per diem	37	2
2. Light work or walking 4 - 6 miles per diem.	18	3
3. Walking exercise 1 - 4 miles per diem.	5	5
4. Walking under 1 mile or no exercise.	0	0
Total.	60	10

3. Average gain of weight.

All cases 7.2 lbs. Systemic cases 6.5 lbs.

Almost all early cases of phthisis coming under the above category do very well on sanatorium treatment alone. The exhibition of tuberculin in addition does not appear to prejudice the results, and it is to be noted that the only indifferent results are to be found in cases showing slight systemic signs on admission.

ILLUSTRATIVE CASES.

A certain number of the cases dealt with will be described shortly. It is not proposed to look at those cases purely from the aspect of a successful or unsuccessful tuberculin course, but rather to correlate the clinical progress, and the immediate results, with the tuberculin course. In several of the cases the tuberculin chart is added, the full chart not, as a rule, being given, but only such parts as are necessary to illustrate the cases.

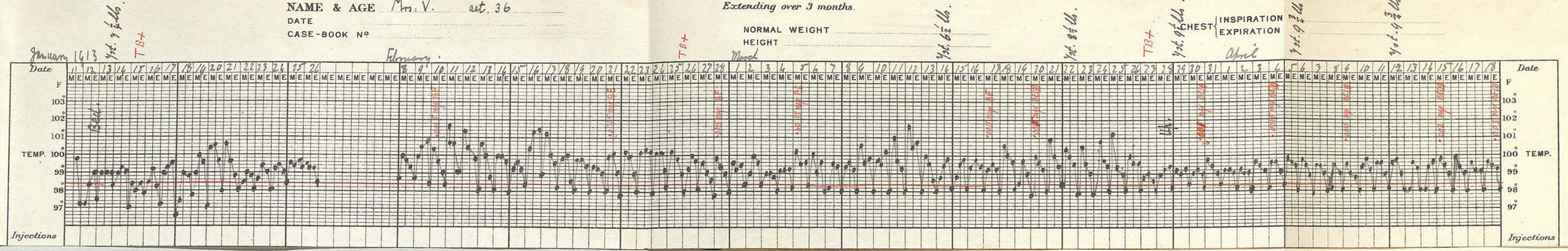
Case I Chart I.

SANATORIUM CHART.
Extending over 3 months.

NAME & AGE Mrs. V. aet. 36
DATE
CASE-BOOK Nº

NORMAL WEIGHT
HEIGHT

CHEST { INSPIRATION / EXPIRATION



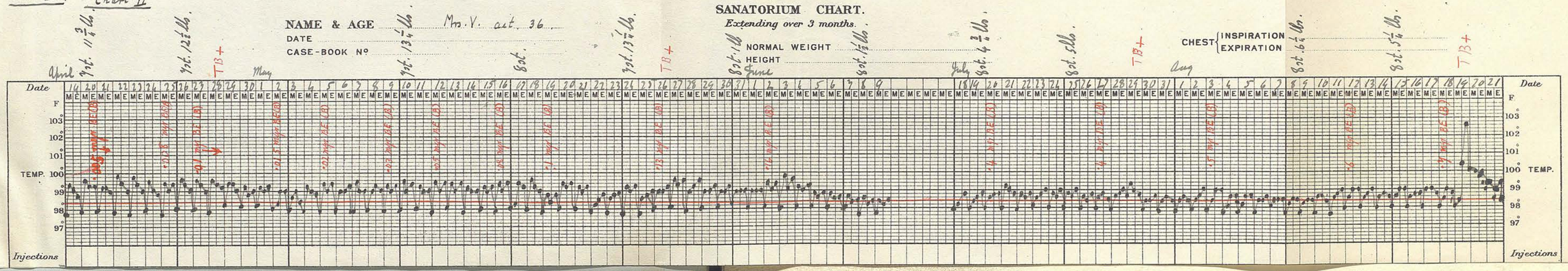
Case I. Chart II

SANATORIUM CHART.
Extending over 3 months.

NAME & AGE Mrs. V. aet. 36
DATE
CASE-BOOK Nº

NORMAL WEIGHT
HEIGHT

CHEST { INSPIRATION / EXPIRATION



I.

GROUP B. STAGE III. T.B+. SYSTEMIC.

The patient, a female, aet. 36, housewife, was admitted Jan. 11th, 1913, with signs of a large cavity right upper lobe, infiltration left apex, and active signs both bases. She was distinctly febrile, with evening rise generally 100° F., and had a hectic appearance. B.E. was started cautiously without any apparent effect on the temperature or symptoms. When .0015 mgr. B.E. was given, there began some decided intolerance, with rises of temperature to 101.6° F. During this time the patient was of course in bed, looking ill, with troublesome cough, and fairly abundant sputum. Tuberculin was now discontinued for 11 days, and then the dose .0015 mgr. B.E. was repeated 4 times during the next 4 weeks without effect. A change was now made to B.E. (Bovine), the first dose being .001 mgr. At once (see chart), began a striking improvement in the temperature, and in the progress of the case generally. A steady course of B.E. (Bovine) was now continued till her discharge, with no untoward feature, except minimal reactions. The most remarkable point about the case was the marked improvement in the general condition, beginning soon after the first dose of B.E. (Bovine), and continuing to the end of her stay, when she was able to walk 8 miles a day. Towards the end of her course/

course, injections were given once weekly, and evidently .6 mgr. B.E.(B) was her optimum dose, as with .7 mgr. there was a pronounced general reaction (see chart). On discharge, after 32 weeks stay, she looked in robust health. The physical signs of a cavity, with very few rales remained; tubercle bacilli were still found, but sputum was much reduced; gain of weight was 12 lbs. She is reported, 9 months after discharge, to be well, doing housework, and to have gained other 10 lbs. in weight; she is having a second course of tuberculin at a tuberculosis dispensary.

Case 2.

SANATORIUM CHART.

Extending over 3 months.

NAME & AGE M. R. aet. 38.

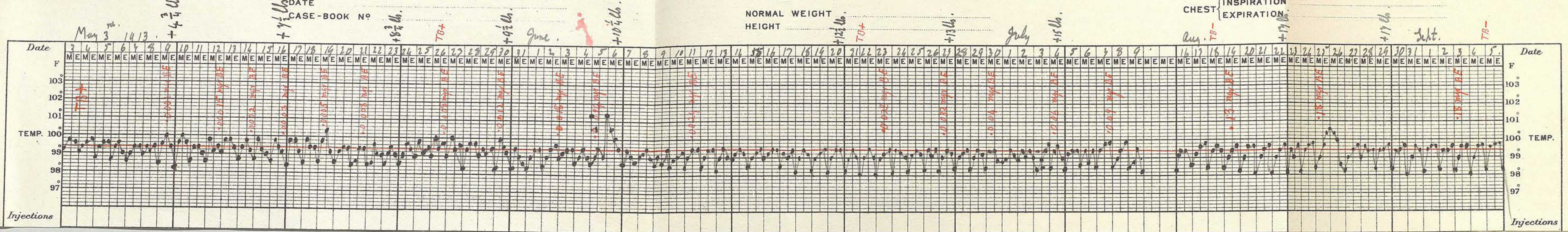
DATE

CASE-BOOK Nº

NORMAL WEIGHT

HEIGHT

CHEST { INSPIRATION / EXPIRATION



2.

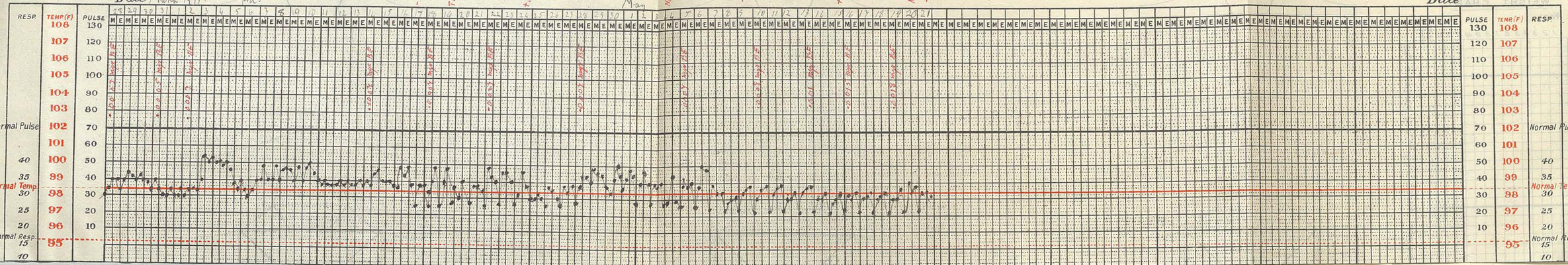
GROUP B. STAGE II. T.B+. NON-SYSTEMIC.

This patient, a male, aet. 38, tailor, showed on admission well marked infiltration, right upper lobe; tubercle bacilli in the sputum. His case is given as an example of a straight tuberculin course, with practically no reactional difficulties, and co-existing continuous improvement in the clinical signs, in a non-systemic case, with good resisting power. On discharge after a stay of 18 weeks, there were no active signs in the chest, and tubercle bacilli were not found; he had gained 17 lbs., and had full restoration of working power.

Case 3. Partial chart.

THE LEEDS CHART.

NAME & AGE Mr. T. aet 33



3.

GROUP B. STAGE I. NON-SYSTEMIC T.B+.

The patient, a male, aet. 33, labourer, was a non-systemic case in stage I, with tubercle bacilli in the sputum. He was put on B.E., and up to his 5th injection, when .0007 mgr. was given, took tuberculin well. With this dose, (see chart) there was a smart reaction, the temperature kept at 100° F. for two days. After two days stay in bed, the temperature fell to 99° F, and kept between 99°F. and 100° F. for a week, during which the patient did not feel well, and was kept at rest. After an interval of 12 days the dose was repeated, but the temperature still remained unsteady. Tubercle bacilli, however, were not found in the sputum, and the general condition began to improve; there were no focal symptoms. Between April 13th, 1913 and May 5th the dose .0007 mg. B.E. was repeated 4 times without much improvement in the temperature. The dose was then slightly increased, without any further signs of trouble, and the administration remained smooth till discharge. After 14 weeks stay, there had been no sputum for 4 weeks; active signs had disappeared, and the patient was fit for hard work. The improvement in this case appeared to coincide with a series of small reactions.

4.

GROUP B. STAGE III. SLIGHTLY SYSTEMIC T.B+.

The patient a female, aet. 32, tailoress, was admitted January 1913. She had had a cough for 14 months, and haemoptysis twice. There was well marked bilateral disease, with cavitation left upper lobe; active signs right apex, and left base, along with moderate systemic infection, the evening rise on admission being from 99 - 99.4° F. Tuberculin was ordered to be given very cautiously after a fortnight's stay in bed.

Feb. 6th., 1913.	.0001	mgr.	B.E.		slight reaction. Temp. 99.8° F.
Feb. 9th.	"	.00015	"	"	Slight reaction. Temp. 99.4° F.
Feb.14th.	"	.0002	"	"	No rise of Temp. gradual fall now.
Feb.17th.	"	.0003	"	"	Slight rise of Temp. 99.4° F.
Feb.21st.	"	.0005	"	"	General reaction day following injection. Temp. 101°F. fell slowly.
Feb.26th.	"	.0005	"	"	No rise of Temp.
March 3rd.	"	.0007	"	"	Temp. 100°F. day of injection, slight reaction.
March 7th.	"	.0007	"	"	Temp. 99.4°F. day of injection.
March 10th.	"	.0007	"	"	No Rise.
March 14th.	"	.0009	"	"	Temp. 99.4°F. day of injection.
March 17th.	"	.0012	"	"	No rise.
March 21st.	"	.0018	"	"	Temp.99.2°F. day of injection.

At this point of her treatment the tuberculin sensitiveness seemed to have been well overcome. A steady general improvement was taking place. The systemic symptoms had disappeared. The patient was now taking walking exercise - 2 miles, twice a day, and had gained 4 lbs. Tuberculin was continued on the same scale of dosage. On May 2nd, when the dose reached was .2 mgr. B.E., tubercle bacilli were not found in the sputum, and active signs were disappearing from the right apex, and left base; the patient was on full exercise, 7 - 10 miles a day, and had gained 8 lbs. On June 23rd with a dose of .45 mgr. B.E., there was a smart reaction - with local and focal signs - temperature 100.8° F; but further weekly doses .45 mgr, .48 mgr, .5 mgr. and 54 mgr. B.E., till her discharge on July 26th after 26 weeks stay, were reactionless. The only physical signs on discharge were those of a "drying" cavity at the left apex; tubercle bacilli were found intermittently; there was apparent restoration of working power; gain of weight amounted to 8 lbs. A continuous improvement, therefore, was noted throughout the treatment of a patient in stage III, with slight systemic symptoms, and some initial sensitiveness to tuberculin, with on discharge, having regard to the nature of the case, a satisfactory result.

5.

GROUP B. STAGE III. SYSTEMIC T.B+.

The patient, a male, aet. 19, was on admission in stage III. with systemic signs, evening rise 99° - 100° F. Treatment on strict rest principles, with two months in bed, reduced this febrile tendency, and the evening rise became occasional only. Tuberculin with an initial** dose of B.E. .0001 mgr. was now tried, and was borne moderately well, being given weekly in small doses with slight increase of dosage. At the same time there was slight improvement in the general condition. When .001 mgr. was reached, the temperature again became swinging, with evening rise to 101° F. After two further tentative doses without any improvement of .001 mgr., tuberculin was discontinued, 13 injections in all having been given. After this the temperature slowly fell, and remained normal till discharge, after a stay of 30 weeks. The signs in the chest were as on admission, although there was some general improvement, and a gain in weight of 10 lbs. The patient died 6 months after discharge. In all probability this patient would have been better without tuberculin, although, at the time, an apparent improvement in the case appeared to justify a cautious trial.

6.

GROUP B. STAGE III. SYSTEMIC T.B +.

The patient, a male, aet. 33, a coal-hawker, had on admission bilateral disease with commencing cavitation at the right apex. There was no great fever, evening temperature 99°F. Tuberculin B.E. was given cautiously, the initial dose being .0001 mgr. B.E. At no period during the course of tuberculin administration did the patient acquire any degree of toleration. We may characterise the course as presenting a series of minor reactions with rise of temperature generally to 100° F, associated with malaise; and after 12 injections lasting 8 weeks, the last dose being .0012 mgr. B.E., tuberculin was discontinued. His condition on discharge, after a stay of 18 weeks, during which he had gained 5 lbs, was very much as on admission, except that adventitious sounds in the chest were more numerous, and there was more tendency to febrility. The patient felt much better without tuberculin, and certainly after its omission there was some improvement in his general condition. In this case it is certain that tuberculin did no good, and it is a question whether the minor reactions did not do actual harm.

Case y. Partial Chart.

NAME & AGE Mr. G. aet. 45.

DATE

CASE-BOOK Nº

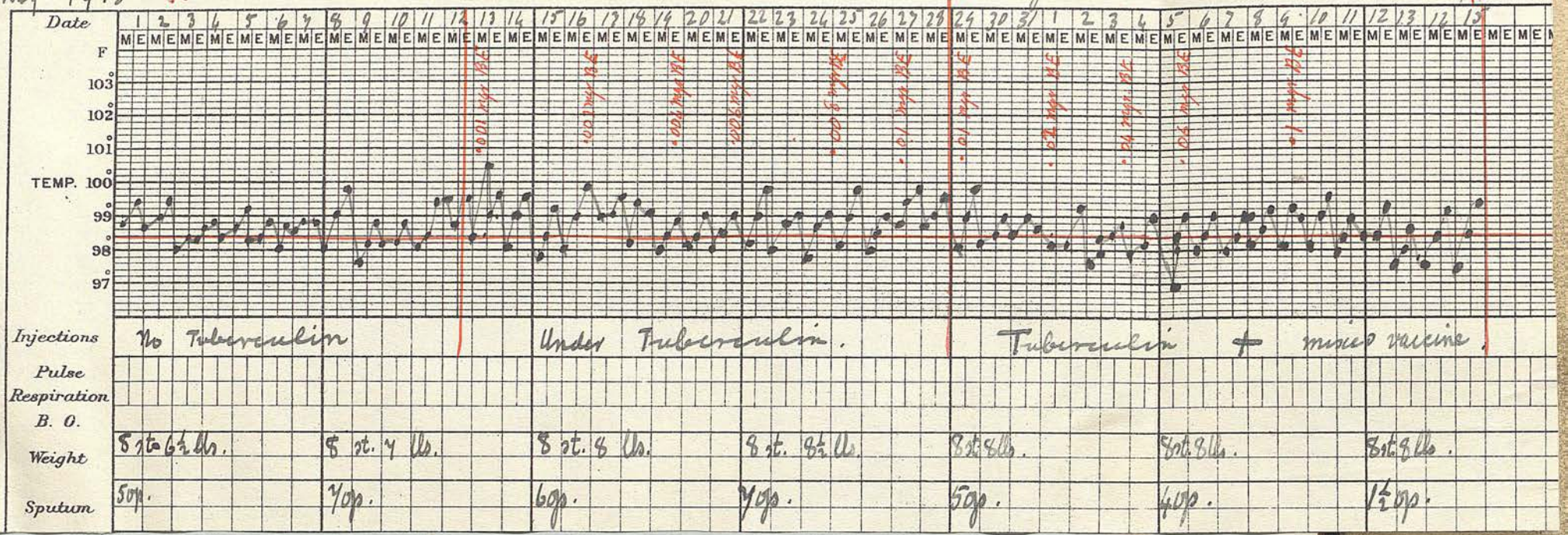
SANATORIUM CH

Extending over 3 mo

NORMAL WEIGHT

HEIGHT

May. 1913 — June



7.

GROUP B. STAGE III. SYSTEMIC T.B+.

The patient, a male, aet. 45, iron worker, had on admission, on March 4th, 1913, a large cavity right upper lobe, and active signs left apex, and both bases. He was coughing up large quantities of sputum - 4 - 6 ozs. per diem, crowded with tubercle bacilli and was slightly systemic with occasional evening rise of temperature to 100° F. B.E. was tried cautiously in April, 5 small doses .00005, .00007, .0001, .00015, and .0002 mgr. being given without any effect on the temperature, the patient meantime being kept strictly at rest in bed. Tuberculin was then discontinued, and restarted on May 13th at .001 mgr. B.E. On May 29th in addition to tuberculin, a mixed vaccine, staphylococci 100 mills, streptococci 5 mills, was administered with each dose, and with apparent advantage, (see chart) the temperature becoming steadier, and the sputum less in amount. He received 5 doses of this mixed vaccine, before his discharge on June 13th, after a stay of 16 weeks. In this case it appeared that tuberculin alone did no good, but in association with the mixed vaccine effected a certain amount of improvement in the symptoms. The physical signs in the chest were as on admission, and from the nature of the case all that could be expected was a temporary improvement.

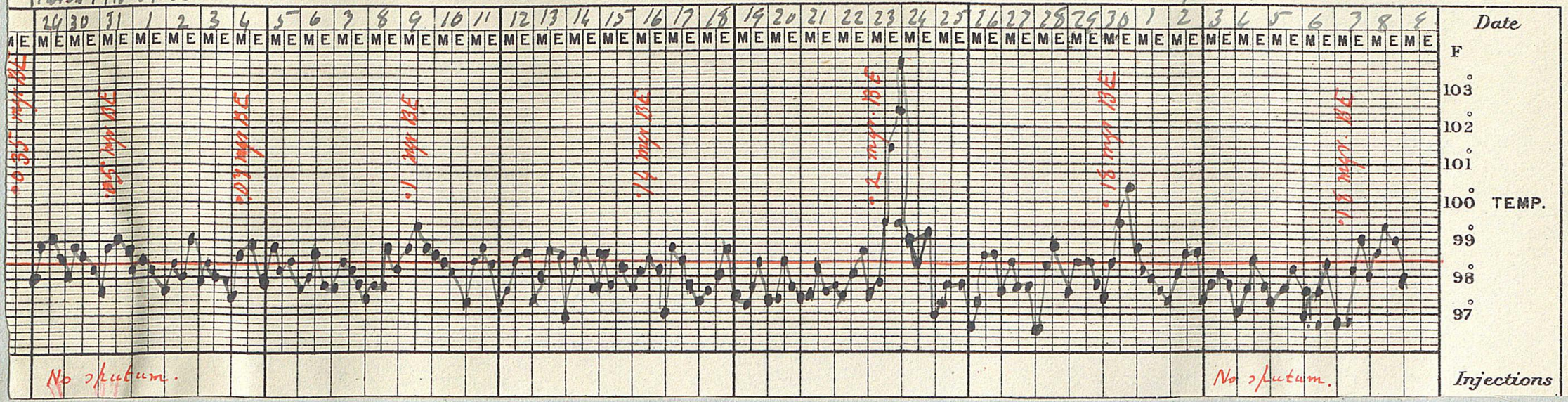
Case 8. Partial Chart.

ART.
nths.

L. T. aet. 10.

CHEST { INSPIRATION ..... / EXPIRATION .....

March 1913 April May



8.

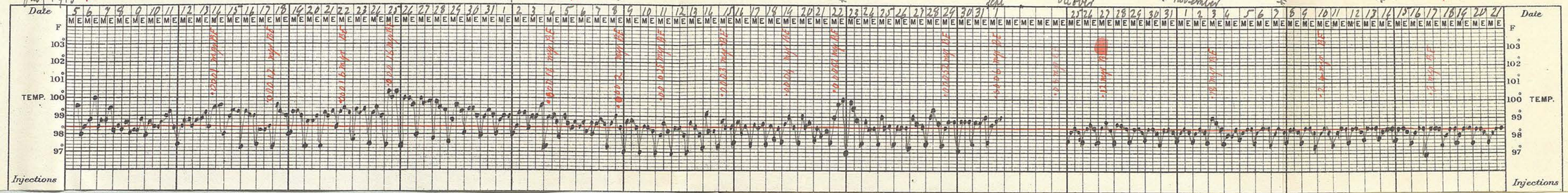
GROUP A. T. B.- NON-SYSTEMIC.

The following chart is given to show the approach of the "optimum" dose of tuberculin. The patient, a girl, aet. 10 was admitted on Jan. 11th, 1913 - a definite early case, with impaired note, and rales right apex - no tubercle bacilli; Von Pirquet reaction violently positive. The tuberculin course starting with .0001 mg. B.E. up till the time of the general reaction had been quite smooth, with the exception of an initial reaction and several minimal reactions, and the patient was remarkably well, having lost all active signs, and gained $4\frac{1}{2}$ lbs. With the general reaction were local and focal signs, and it is to be noted that the next two doses, given at intervals of a week, and reduced in amount, caused a slight response.

Case 9.

SANATORIUM CHART.
Extending over 3 months.

NAME & AGE Miss B. aet. 25.
DATE
CASE-BOOK Nº
NORMAL WEIGHT
HEIGHT
CHEST { INSPIRATION / EXPIRATION



9.

GROUP B. STAGE III. VERY SLIGHTLY SYSTEMIC T.B+ .

The patient, a female, aet. 25, tailoress, had on admission well marked bilateral signs, with pleurisy, slight effusion at right base, tubercle bacilli positive. She was slightly febrile, but could not be classed as systemic, as her resistance was good. Her tuberculin course at first was slightly difficult, as the chart shows, but after .00016 mgr. B.E. had been repeated, she had practically a straight course, receiving towards the end of her stay .3 mgr. B.E. On discharge, after 20 weeks stay, tubercle bacilli were still found, but active signs were much reduced, and working capacity seemed fully restored. Six months after discharge she reported herself as feeling very well, to have kept the weight she had gained - 14 lbs -, and to be having a second course of tuberculin. Her case is included, as an example of the initial difficulty often found in the slightly febrile cases, where tuberculin does not appear to be contra indicated, and where, after, by judicious dosage, this difficulty is overcome, general improvement is co-existent with, though not necessarily due to a successful course of tuberculin.

Case 10

NAME & AGE W.D. aet. 18.

DATE

CASE-BOOK Nº

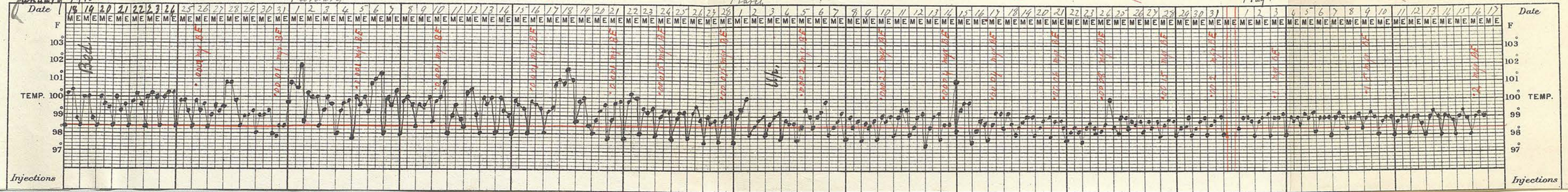
SANATORIUM CHART.

Extending over 3 months.

NORMAL WEIGHT

HEIGHT

CHEST { INSPIRATION / EXPIRATION



10.

GROUP B. STAGE I. SYSTEMIC T.B+.

The patient, a male, aet. 18, stage I, tubercle bacilli in sputum, with infiltration right apex, showed systemic symptoms -, night sweats, cough, and fever, - quite disproportionate to the amount of disease in the chest. After a month's rest in bed, without any good effect, tuberculin was tried, .0001 mgr. B.E. on Jan. 26th., 1913. This dose was repeated 4 times, causing, as the chart shows, each time a decided rise in the temperature, with in addition slight focal reactions. With the 6th injection of .0001 mgr. B.E., there began an improvement in the temperature, which continued in spite of a cautious increase in the dosage. Only one further general reaction at .0004 mgr. B.E., and a slight reaction at .0008 mgr. B.E. took place. At this period, 12 weeks after admission, he was taking exercise, and doing very light work. His progress during the following 8 weeks was rapid. On discharge, there were no active signs; sputum and cough had disappeared; gain in weight amounted to 16 lbs., and he left to emigrate to Canada.

The main points about this case seem to be:-

(1) Rest in bed for a month did not reduce the initial fever or systemic signs.

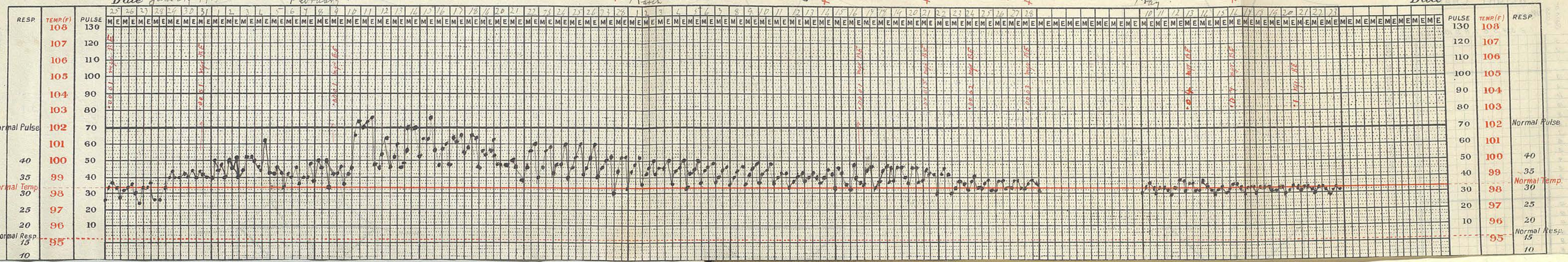
(2) The initial sensitiveness to tuberculin.

(3) Pari passu with tolerance to tuberculin - rapid improvement in every feature of the case.

Case 11

THE LEEDS CHART.

NAME & AGE W. H. aet. 25.



11.

GROUP B. STAGE II. NON-SYSTEMIC T.B+ .

The patient, a male, aet. 25, labourer, had on admission on Jan. 18th, 1913, well marked infiltration right upper lobe; tubercle bacilli in the sputum. After a week's stay in bed, tuberculin B.E. .0001 mgr. was commenced. On Jan. 28th, three days after the first injection the temperature rose to 99.4° F, and remained elevated. The original dose was repeated on Jan. 31st, without any effect on the temperature. The patient was put at complete rest, and as the temperature appeared to be subsiding, .0001 mgr. B.E. was again given on Feb. 9th. The following day, the patient got up, and went out of bounds without permission. He came back late at night, feeling very ill, with pain in the right side. The temperature rose rapidly to 102.4° F, and remained high. On examination of the chest, pleuritic friction was found at the right base behind, with exacerbation of all the signs of his original disease. The pleurisy rapidly spread, and on Feb. 14th there was dulness up to the 5th interspace, right mid-axillary line, and fluid, clear amber coloured, was found on exploration. Cough and sputum were much increased. The temperature remained elevated, and the patient looked very ill. On Feb. 28th, the temperature began to fall, and an improvement in the general condition began. A note was made on March 8th that/

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that dulness was now found only at the 7th interspace right mid-axillary line, and the signs in the chest were otherwise as on admission. On March 13th the patient, now feeling well, was allowed up at rest. Tuberculin was resumed on March 17th with .0001 mgr. B.E. without any untoward result, and after the 3rd dose .0002 mgr. B.E. on March 24th the temperature became normal. The remainder of the tuberculin course was quite smooth, the final dose being .1 mgr. B.E. On discharge, May 23rd. after a stay of 18 weeks, tubercle bacilli were not found in the sputum; weight was increased 13½ lbs; only an occasional rale was heard at the right apex, and the pleuritic fluid was practically absorbed. He was fit for moderate work. The interest of this case lies in the question whether the initial doses of tuberculin had any bearing on the attack of acute pleurisy. In all probability the attack was influenced by some sensitiveness to tuberculin; it was held however at the time that the main factor was not this, but the getting up, and breaking of bounds for several hours. This theory was supported by the fact that when the acute pleurisy subsided, tuberculin was resumed with perfect safety, and the tuberculin course was co-existent with a gradual, and consistent improvement all round.

C O N C L U S I O N S.

The following conclusions, as to the immediate factor of tuberculin in the sanatorium treatment of pulmonary tuberculosis, are made.

1. Cases of open phthisis in stage I, and stage II give better results with tuberculin than without tuberculin.
2. The tuberculin treatment of open phthisis in stage III gives slightly better results than sanatorium treatment alone.
3. Non-systemic cases give better results with tuberculin, than originally systemic cases; loss of systemic symptoms does not always mean that a tuberculin course in free from danger.
4. Early cases, without tubercle bacilli in the sputum, respond satisfactorily to tuberculin treatment; but no better immediate results are claimed in this class, than with sanatorium treatment alone.
5. The factor of tuberculin in the treatment of pulmonary tuberculosis can only be estimated by a consideration of cases en masse. In particular cases, an inference may be made that tuberculin has been harmful or beneficial.

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