TUBERCULIN DIAGNOSTIC REACTIONS, 654 CASES COMPRISING THE CONJUNCTIVAL, CUTANEOUS AND PERCUTANEOUS TESTS.

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History of Tuberculin.

In the history of tuberculosis a series of monuments has been erected which will remain as a tribute to the elaborate investigation, painstaking research and deductive reasoning of those eminent scientists who all have added their discoveries in building up the knowledge which gradually threw light on a disease which had baffled all efforts until a comparatively few years ago. It has been known for long that tuberculosis was conveyed from one individual to another. The gross changes produced in tubercular subjects were well understood from pathological research, but the cause of the disease, the infective material, how infection was conveyed, remained as mysteries. In 1843 Klencke showed that tubercular changes could be produced in rabbits by inoculation with morbid tissue from a human subject suffering from the disease, thus proving its infective nature. In 1857 Buhl concluded that tubercular disease might occur in other inflammatory conditions if caseous foci were

produced, he regarded the process purely as a production of the tissues themselves; if the individual for some unknown reason spontaneously produced caseous foci, these would elaborate a poison which would spread to other parts of the body; but if these were not produced no tubercular poisoning would result. In other words these foci, and they only, were capable of forming this lethal toxin. Villeman in 1865 made some very elaborate experiments on animals; he enhanced the value of his investigations by employing controls. He confirmed the observations of Klencke by introducing tubercular material under the skin of rabbits resulting in the production of the disease, and placing its infective nature on a more sound basis. Villeman's conclusions were thoroughly tested by others such as Cohnheim, Fränkel and Sanderson, who not only proved the accuracy of the former results, but produced tubercular lesions by insertion of material which they thought was non-tubercular. This we now know must have been contaminated with tubercle bacilli as a result of imperfect technique, as indeed was suggested at the time by Klebs. Sanderson unwillingly admitted that tubercular disease could be produced by non-tubercular material, but was of opinion that infected material

was necessary to produce certain results.

Fränkel and Cohnheim repeated the experiments and failed to produce the disease with non-tubercular material. Cohnheim and Salomonsen "in a moment of inspiration" selected the anterior chamber of the eye as a suitable point for inoculation in rabbits where the effects could be watched from day to day and proved that only tubercular material will cause the disease. This was confirmed by Cohnheim and others. Tuberculosis was now regarded as an infectious disease, and the next question which naturally arose was what is the infective agent which produces it. Notable investigations for a parasite were made by Klebs in 1877, Toussaint in 1881, Aufrecht in 1881, and others. The results of Aufrecht are interesting, as he isolated a bacillus which he stained with fuchsine, but in too weak solution to show the tubercle bacillus. The year 1882 opened a new epoch in the history of bacteriology, for in this year Robert Koch published the brilliant discovery which rewarded his careful researches, and he demonstrated the infective agent to the civilised world, known as the tubercle bacillus, together with the overwhelming proofs which placed the discovery beyond all doubt. Koch's work did not cease here; he continued his

research with the object of finding a curative substance. Suspensions of dead bacilli obtained from pure cultures were injected into guinea pigs; if the animal was healthy small suppurating foci alone were produced at the site of puncture, even though large quantities of the suspension were used, but if the guinea pig had previously been inoculated with tubercle bacilli, the suspensions even in small doses produced fatal results in 6 to 48 hours; even if the dose was not lethal widespread sloughing occurred with the site of puncture as the starting point; if the dose was very minute the animal improved daily and any ulceration rapidly healed. From such experiments it was evident that the organisms contained a highly virulent substance which, however, if used in suitable dilution, might possess some therapeutic properties. The next evolutionary step was to isolate this substance. What remained to be done was to produce the process of the bacilli outside the body, and obtain the products of bacillary metabolism in as pure a form as possible. A large series of experiments was necessary in order to find a substance capable of dissolving out the active principle. Koch's labours were again rewarded, and after numerous failures, he found that glycerine was a

solvent; he obtained the active principle by extraction with glycerine forming a 40 to 50% glycerine extract; he proved that he actually had extracted the toxin by repeating the experiments he had previously made with the suspensions and obtaining similar results. The solution obtained contained the substance still known as Koch's old tuberculin. Thus in 1890 was first isolated an extract which contained a substance, the action of which on the tuberculous organism, to quote the words of Koch himself "far surpasses that of the strongest known drugs."

Preparation of Koch's Old Tuberculin.

The original mode of preparation of Koch's old tuberculin is essentially the same as the present method of production. Cultures and sub-cultures of tubercle bacilli are made until purity is obtained. 5% glycerine broth is inoculated with a pure culture and incubated for 4 to 6 weeks; the broth is then carefully filtered, and the filtrate is concentrated to $\frac{1}{10}$ of its original volume, so that the toxins are obtained dissolved in 50% glycerine together with other bodies formed by the bacilli.

Characters of Tuberculin.

The glycerine extract has been analysed to ascertain what bodies besides the active principle are contained in it. Tuberculin is a sticky, syrupy liquid, brown sherry in colour, and inclined to be foamy; aqueous solutions show a greenish fluorescence. The specific gravity is about 1015. Tuberculin has a distinct, unpleasant, animal-like odour which has been said to resemble that of leaven; however, the tuberculin odour is heavy with a sweetish admixture. If gently heated the fumes are much more agreeable, having a distinct fruity aroma; if still further heated they resemble those produced by the combustion of albuminous matter; complete combustion results in only 1% of ash. The reaction of tuberculin to litmus is neutral. It also contains several other substances, small quantities of mucin and albumin; acids and ptomaines are apparently not present, but peptones are found in considerable quantity. Fehling's solution if gently heated shows slight reduction with tuberculin. In the glycerine extract one obtains mineral salts, various extractives, of which tuberculin is one, and pigmentary bodies. Some substances can be separated by the addition of absolute alcohol where the insoluble

bodies are precipitated; these consist of tuberculin itself and some of the other extractives. The colouring matter can also be separated. The purification of the glycerine extract is, however, of no practical advantage, as the other substances have been proved to be without action on the human subject. The active principle is present in the glycerine extract in the proportion of 1%.

The Evolution of Tuberculin as a Diagnostic Agent.

The prime object of the isolation of tuberculin was a therapeutic one. Injections were made into animals and observations made in both the tuberculous and healthy states. It was found that if injected into a healthy animal no result ensued so long as the dose was not excessive. If excessive, however, an inflammatory reaction resulted as demonstrated by malaise and pyrexia; but if the animal employed was a tuberculous one, a much smaller dose than that used for the healthy animal produced a marked reaction. As a consequence of numerous observations on animals tuberculin was employed in the human subject with similar results. Koch stated that if 0.01 c.c. were injected into a healthy human being no reaction or at most a very slight reaction

occurred, but the same dose injected into a tuberculous patient produced a violent local and general reaction, so that the site of puncture showed marked inflammatory changes severe enough in many cases to produce sloughing. At the same time the patient complained of malaise, temperature rose accompanied by a certain amount of dyspnoea and cough which passed off in 24 to 48 hours. The injection of .25 c.c. into a healthy individual would produce almost as much result as 0.01 c.c. in a tubercular patient. The use of tuberculin as a therapeutic substance thus paved the way for its employment as a diagnostic agent. In fact, its diagnostic properties were the outcome of the experimental stage of its therapeutic career.

I shall now place before you the series of observations made with tuberculin as a diagnostic substance comprising three methods of its application, namely, the conjunctival, the cutaneous and the percutaneous tests.

THE CONJUNCTIVAL TEST.

The conjunctival reaction was pointed out first by Wolff-Eisner in a sitting of the Berliner Medizinische Gelleschaft, May 15th, 1907. Shortly afterwards a safer form was introduced by Calmette of Lille, to whom we owe the method as a diagnostic reaction. He modified the tuberculin by freeing it from glycerine, resin and wax, by a complicated process, the object being to remove substances liable of themselves to produce irritation. The tuberculin itself was precipitated by 95% alcohol. The materialwhich I used for this test consisted of old tuberculin desiccated and freed from glycerine; its strength was 0.1%. The preparation was manufactured by Farbwerke Vorm Meister Lucius and Brüning. It has been proved that the glycerine or carbolic acid used as diluents do not produce inflammatory phenomena in the conjunctiva. Subsequent to my employment of this preparation, Citron has issued a warning against it, characterising it as unreliable and highly irritating.

It is sent out in small glass bulbs containing as a rule sufficient for two tests; the quantity in each bulb, however, varies. The fluid is expressed

from the bulbs by short pieces of thin rubber tubing patent at one end only, supplied with the preparation.

Method of Application.

The method of applying the test was as follows :-

Both eyes and eyelids were carefully examined to ensure absence of disease. The test was not applied to any eyes showing the slightest sign of morbidity ocular or palpebral. The patient was instructed to direct the eyes upwards, and with the finger the lower lid was gently drawn down. Two or three drops of the solution were inserted close to the inner canthus; the lower lid was held down for 30 to 60 seconds in order to avoid any tight closure of the eye which might cause the fluid to be expressed before it had opportunity to become distributed. The inner canthus was selected as offering a suitable receptacle. The lower lid is released, and the test is completed. No control was used in the other eye which itself served that purpose for comparison. The original tests of Calmette were carried out with a 1% solution, 10 m.gm. of tuberculin being dissolved in 1 c.c. of water. Subsequent experiments, however, proved that this solution was too strong for many eyes. Others have used a dilution of .5%

which also, however, seems to be too strong. Solutions of 2% and even stronger have been employed.

The Reaction.

The first difference which the patient notices after the instillation is a little irritation followed by lachrymation as a rule a few hours after the application of the test. The irritation increases, and it is found that the caruncle shows slight redness and swelling. It loses its shiny appearance, due evidently to some exudation; at the same time, if the lower lid is examined and compared with the opposite side, it is noticed to be injected. The condition gradually becomes more marked, and the congestion spreads to the ocular conjunctiva. By this time the irritation has increased, and a sensation as of foreign body in the eye is experienced, causing a feeling of "roughness" of the palpebral surfaces. The mucosa of the upper lid partakes in the general uneasiness and hyperaemia. This is the typical condition which I have found in the majority of cases.

The reaction as a rule begins to make itself obvious in about 4 hours, and the maximum is reached in 12 to 18 hours. After this the hyperaemia and other

phenomena gradually subside until the eye is restored to its normal condition, the process as a rule taking about 3 days.

Time of Reaction.

In my series of 203 cases, there was no suspicion of any reaction earlier than 3 hours after instillation, and no case which reacted had failed to do so within 30 hours, the average being about 4-15 hours, the maximum on an average being present in 9 to 12 hours. It is well known, however, that a reaction may appear at an earlier period. MacLennan published cases which gave results as early as 2½ hours; Webster and Kilpatrick observed reactions in 2 hours; Butler, on the other hand, had no reactions under 3 hours. Calmette gives the reaction time as 3 to 12 hours, disappearing in 2 to 3 days.

The cases should be examined hourly for the first few hours, and when reaction has definitely shown itself, longer intervals may intervene. The majority of my cases had become clear in 3 days; some few persisted for 5 days, but in no case was there any sign of reaction beyond that time. Webster and Kilpatrick report cases persisting to 7 days or even longer; MacLennan has observed them lasting for 10

days, These, however, were with stronger solutions. None of my reactions lasted for less than 24 hours - a few did not react until this period had elapsed. Woodcock's cases showed their maximum at about 24 hours. Doubtful reactions are reported by Stephenson; these I have not observed.

Nature of the Reaction.

The reaction obtained is inflammatory in nature, resulting from the local absorption of a definite irritant. The condition is explained by Wolff-Eisner by assuming that tubercular individuals manufacture a body which produces lysis upon fragments of tubercle bacilli contained in the tuberculin, and from them sets free poisons, which produce the reaction, differing in different individuals according to their reactive power. Wasserman regards it more in the sense of a reaction of cells in producing antibodies to meet a toxin which had previously stimulated them to form these bodies, and the capacity of such cells to more readily form antibodies than cells which had no previous acquaintance with the particular toxin. That such bodies are formed has been scientifically demonstrated. Both of these suggestions will explain the reaction; both also assume that to obtain

the reaction either a previous or present infection with tubercle bacilli has occurred; but they will not entirely account for cases which have reacted, but which at the autopsy offer no evidence whatever of a tubercular lesion either active or healed. That the reaction is in many cases specific there is no doubt, but it is equally clear that it occurs in some cases without obvious reason, and devoid of adequate scientific explanation.

Other Results Obtained.

(i) Without harmful effects on the Eye.

Besides the ordinary reactive results as stated above, other features may be observed. Sometimes the reaction is excessive, and a severe conjunctivitis is produced where the eye is painful, accompanied at times by headache and pyrexia. Brons and MacLennan both report cases of excessive reaction; Webster and Kilpatrick had similar cases accompanied by a "soreness" at the back of the nose. Seven of his cases exhibited a moderate degree of pyrexia. Others have reported similar results. The above mentioned observers were using a 1% solution. It is possible, however, that the pyrexia was due to the disease and not the reaction. A severe

conjunctivitis, however, is quite sufficient of itself to cause a rise of temperature. These excessive reactions were obtained in eyes which were free from disease. None of my cases showed an excessive reaction.

(ii) With harmful effects on the Eye.

Reactions have been obtained which expose the eye to serious risk of permanent damage. Calmette considers the test a safe one so long as the eye is healthy, and if severe reaction persists after 48 hours, he considers that it may be easily controlled by suitable treatment. In his series, 80 cases developed serious conditions of the eye which are explained by him as due to want of care. Webster and Kilpatrick mention a case in which phlyctenules developed subsequent to the test. Siegrist reported 4 cases where miliary nodules developed on the conjunctiva remaining for weeks and months. Some of these contained giant cells of Langhans type with central caseation. Goerlich mentions an infant who developed phthisis bulbi as a result of the test with a ½% solution. Vallée, who was one of the first to employ the test in cattle in the Veterinary School at Alfort, used 10% tuberculin, and, owing to

unfavourable results, issued a warning against its use in animals or human beings. Wiens and Günther observed severe lesions with 1% solution.

The above cases appeared in eyes which presented no signs of disease before the test was employed. It is, however, not surprising to find that alarming results have been obtained in morbid conditions of the eye. Kalt refers to a case before the Paris Ophthalmological Society, in which an old tubercular condition of the eye was lighted up by the test. Morax, however, regarded this as merely a coincidence, as the reaction has been employed to diagnose tubercular conditions of the eye. Schille obtained alarming reactions in trachoma. Walskin issued a warning against the reaction as a result of severe lesions both inhealthy and pathological eyes. Bandelier and Roepke noted the occurrence of phlyctenules and similar inflammatory phonemena in scrofulous children. Follicular and trachomatous catarrh of the conjunctiva often remain latent for years, These, according to Collin, are aggravated by tuberculin leading to formation of new follicles accompanied by great irritation. Others have observed corneal ulceration, and purulent discharge from the eye. Terrien and Barbier also had experience of severe

injury occurring in pathological eyes. MacKay at the meeting of the British Medical Association, 1912, stated that on account of its dangers he had abandoned the test. Butler announced that he had come to the same conclusion.

In contrast to such results the reaction has been employed largely in ophthalmic practice with impunity. Aubaret and Painblan have used it extensively in ocular disease. Lafon and Franke report favourable and harmless results both in tubercular and non-tubercular conditions of the eye. Painblan has used it in tuberculosis of the conjunctiva itself. Brunetière and Stephenson have used it extensively in ophthalmic practice. Walstein and Stuelp never employ it where there is suspicion of tubercular conditions of the eye. No serious general results have been reported. It has been suggested by Wolff-Eisner that the danger might be minimised or abolished entirely by employing instillations of 1 in 100,000 and gradually increasing the strength until a reaction was obtained.

The Value of the Conjunctival Reaction.

The results obtained by different observers in many particulars are in agreement, but laws laid down

by one set of clinicians are completely disregarded or contradicted by others. Stephenson published results obtained in 24 cases - 4 of them being tubercular. The tubercular cases reacted and 3 out of 15 doubtful cases responded to the test. Aubaret and Lafon obtained positive results in 4 cases of healed phlyctenular conjunctivitis. Out of 45 cases of known tuberculosis MacLennan obtained 3 failures, while 4 out of 20 non-tubercular cases gave positive results. Mantoux observed 8% of reactions in 200 healthy children. Letulle reports 72 positive results out of 75 tubercular individuals; 2 of the 3 failures were moribund. Webster and Kilpatrick found that all their tubercular cases in which they could find bacilli reacted, but that half their cases with definite signs, but where they failed to demonstrate the organism gave no result; 2 healthy cases gave reactions. They found that quiescent cases might or might not react. In Stephens' series of 106 cases of pulmonary tuberculosis all reacted with the exception of 2. Woodcock observed only 2 failures out of 200 tubercular cases. Eyre, Webb and Hertz were able only to obtain rather more than 50% of reactions in tubercular subjects. Calmette found an error of 8% in tubercular cases, whilst he obtained

positive results in 18% of non-tubercular individuals. His experience is based on 20,000 observations. MacNalty reports as many as 6 failures in 17 tubercular pulmonary lesions. These results will suffice for comparison with my own, which I will now place before you. Out of 203 cases in my series of conjunctival tests 93 were tubercular, 91 being examples of pulmonary tuberculosis. In 19 of these the sputum was examined, and the bacilli demonstrated. The others showed definite physical signs of the disease. The non-tubercular cases were chiefly examples of other lesions mostly cardiac and non-tubercular pulmonary lesions. In a few cases the test was applied a second or even a third time; one or two cases were injected subcutaneously with Koch's old tuberculin.

My series is as follows :-

Disease.	No. of Cases.	Reaction. Positive	Negative.
Pulmonary Tuberculosis	91	82	9

One of the negative cases had the test applied twice but both failed. One case reacted only on the third application of the test.

Disease.	No. of Cases.	Positive.	Negative.
Doubtful Pulmonary Tuberculosis	10	3	7

Tubercle bacilli were not demonstrated in any of the doubtful cases. I have included among them cases of pleural effusion. One of the doubtful cases showed distinct mottling of both apices with the X Rays. Another case with haemoptysis was injected subcutaneously with tuberculin on three occasions with increasing doses, but gave no result. Two of the positive reactions were in pleural effusions; the other was a case perfectly well 3 years afterwards.

The 2 tubercular cases which had not pulmonary lesions were tubercular laryngitis and peritonitis; both responded.

Disease.	No. of Cases.	Reaction.	
		Positive	Negative.
Healthy individuals	9	3	6
Non-tubercular cases	93	8	85

Thus 3 healthy individuals gave a reaction, and 8 non-tubercular cases, not so high a percentage as obtained by Calmette.

The subject of tuberculosis is an important one. The early stages, no matter where the origin, are so minute and produce such localised changes that no clinical evidence of the disease is manifest until the condition has produced comparatively well marked lesions. Pulmonary tuberculosis is curable if obtained in sufficiently early stages; hence any test or tests which can offer a certain indication of the presence of the disease before signs are evident will prove of the utmost value and significance, both with regard to therapeutics and to methods adopted for the prevention of spread of the disease.

The object of the above investigations was to ascertain whether or not the ophthalmic test could be regarded as a true and reliable indicator. Here is a test which can be carried out by anyone; no skill is required in its application. The reaction is definite and can be seen - these are points of importance. Elaborate tests lose much of their value owing to impossibility of application except by those who have specialised. Tuberculin in its action on the human subject is little understood; it is possessed of marked toxic properties, more marked, it is true, in tubercular subjects, but also marked on healthy individuals if the dose is sufficiently large, so that

we are dealing with a virulent animal poison, the product of a virulent organism.

The optical apparatus with which the human subject is supplied is a delicate one; at the same time its value, even if markedly inefficient, cannot be over-estimated. The conjunctival test consists of the application of a toxic body to this highly specialised organ to induce inflammatory phenomena. This prepares the way to glance shortly at the safety of the test.

An Unsafe Test.

Is an eye which has given a positive reaction restored to its former condition when the reaction has subsided ? Calmette considers the test a safe one, safe even after repeated tests on the same eye. His conclusions are based not only on clinical observations but also on experiments on dogs, and he states that the eyes experimented on will in no way become sensitised, although second and third reactions were found to be more intense than the original one. My experience shows that there is no doubt that an eye which has once reacted has undergone some change, which renders it hypersensitive. I use the term eye, but it would be more correct to say conjunctiva.

Two of my cases will serve to illustrate this point. A woman of 28 (case 101) in whom there was a suspicion of pulmonary tuberculosis, gave a reaction. Two or three months later she got a cold, accompanied by a recurrence of the conjunctival reaction. This she informed me occurred on each occasion that she was suffering from cold; this was taking place as late as 2 years after the application of the test. Another patient with definite signs at one apex was injected with tuberculin foradiagnostic reaction some weeks after the ophthalmic test. He gave a moderate febrile reaction - at the same time his eye was lit up. He informed me that subsequently this occurred on two occasions, once in each eye (case 21). Such cases as these show beyond all doubt that the eye in some cases does not return to its former condition up to at least 2 years after the test. The eye has sustained some damage. If hypersensitiveness is produced in a healthy eye, how much more likely is damage to result in an eye already the seat of inflammatory conditions, tuberculous or otherwise. The case above (case 21) contraindicates the application of the test in a healthy eye if the other is diseased as the morbid eye may react.

If one instillation is going to produce a

hypersensitive condition, the probability is that second or even third applications are almost certain to, and subsequent reactions must be viewed with doubt. Hypersusceptibility has been referred to by Cohn, Klieneberger and Levy, who consequently regard second instillations as incorrect. The two latter are of opinion that a sensitised condition is produced in 70 to 80% of healthy individuals. They are contradicted by Hamburger, Schmorl, Lubarsch and Naegeli, who state that, as a result of post mortem examinations, they find that hypersensitised cases were subjects of previous infection with tubercle bacilli, which may, or may not, be active at the time. Bandelier and Roepke found that cases actually free from tuberculosis did not exhibit the phenomenon after repetition of the test even with a solution of 4%.

It is interesting that hypersusceptibility to horse serum can be obtained in guinea pigs by the injection of minimal repeated doses. One of my series, a patient with definite signs of pulmonary tuberculosis, failed to react until the third instillation (case 19); such a result cannot be of much diagnostic value. Reliance is placed on subsequent instillations by Stephens, Woodcock and

others. Calmette recommends repetition after initial failure, and considers a positive following upon no result as indicative of a minute focus. The case of mine quoted above, however, did not possess only a minute focus. None of my cases showed any constitutional symptoms. A febrile reaction is a condition which is a significant feature in pulmonary tuberculosis. It serves as an indicator of the activity of the lesion. A test which may produce such a result may reasonably be regarded as one which is likely to be detrimental to the welfare of the patient. Injection of tuberculin has been proved to cause renewed activity in the lesion. That a similar result may be produced in some of the cases reported with pyrexia accompanying the conjunctival reaction is a logical deduction. How are we to explain the relighting up of the conjunctiva after injection of tuberculin ? Fresh activity has occurred at the lesion; fresh toxin is thrown into the circulation in sufficient quantity possibly to react on the eye already weakened by previous instillation. Pyrexia associated with the ophthalmic reaction may possibly be due to anaphylaxis, which we know may be accompanied by pyrexia.

Reliability.

The test varies in different individuals both in degree, intensity and in rapidity of onset, no doubt due to the personal equation as compared with variation in reaction to medicinal substances in different individuals. However, some interpretations other than this have been offered and clinical significance attributed to them.

Calmette considers that the test can appreciate the degree of infection, that is, if the infection is recent, and the patient's resistance good, a clear and intense reaction will be obtained. Theoretically, this is reasonable; a patient in the early stages of the disease will probably possess more resistive power, and this may be shown by ready reaction to the toxin, for which he already is forming antibodies. This, however, is not always so; many cases with widespread lesions readily react, sometimes giving better results than more recent cases; e.g., cases 20, 3, gave good reactions, whereas cases 37 and 49 both early cases in young vigorous adults, gave results of medium intensity only; no definite law can be laid down. Younger individuals as a rule give better reactions, irrespective of the stage of the disease. Calmette states that advanced cases are almost

always negative. Many of my cases of several years standing with steady progression of the morbid process gave satisfactory reactions, except in those advanced in years. Calmette states that a positive result indicates a focus in active evolution or incompletely cured. He remarks that the test fails in acute cases or appears late. Cases 15 and 34, the only two acute cases in my series, reacted readily in the usual time. The only quiescent case (case 25), a patient with an old cavity apparently healed, who was unaware of any pulmonary complaint, gave no reaction. Wolff-Eisner maintains that the ocular method is the only one which reveals active as opposed to quiescent foci. This is opposed by Bandelier and Roepke, who affirm that a reaction indicated a tubercular focus without any discrimination as to activity or the reverse. Inman has arrived at a similar conclusion. My cases which reacted were in numerous stages of evolution and activity, and less active lesions, and lesions which progressed rapidly, gave precisely similar results. Cases of early pulmonary tuberculosis react in many instances, although it is stated that early cases usually fail. Whether cases react before a clinical diagnosis can be made is doubtful, but the test often fails to detect the

disease, even when early signs can be made out, and cases presenting no signs at the time or subsequently give good reactions. 50% of early cases are said to fail to respond; hence reliance cannot be placed on the reaction to detect the disease at a stage previous to recognition by other means. The majority of cases of pulmonary tuberculosis give a positive reaction; but these are usually cases where confirmatory aid is unnecessary. If a case is doubtful, it will be treated as tubercular, and the presence or absence of a conjunctival reaction should in no way prejudice the treatment. My results, and those of others, show that a definite percentage of tubercular patients do not respond to the test, and, at the same time, not a few cases of those clinically free from the disease give the reaction. Prognostic significance has been attributed to the test. Wolff-Eisner states that a pronounced positive reaction offers a more favourable prognosis, and that the absence of reaction in obviously tubercular patients is a serious sign. Many of my cases which became steadily worse gave as good reactions as those which seemed at a standstill or improving. I am unable to attribute any prognostic significance to the test. My cases show that reactions may be obtained not only

in healthy individuals, but in individuals with other morbid processes; similar results have been published by others. My cases also show that cases of pulmonary tuberculosis may fail to respond. Once a test fails without any excuse, its value is reduced to practically nil. The opinions on this reaction are very varied. McWirney is the only observer who appears to have had a series of unbroken successes, and never had a tubercular case which failed to give a positive result. All other observers have met with failures. Wilcox weakens his statement as to the reliability of the test by stating his preference for the opsonic index. Butler prefers subcutaneous injections and considers the results more reliable, but regards the eye test as parallel with the Widal in typhoid. Fehsenfeld has shown by postmortem examination that many cases which should have reacted failed to do so; likewise that numerous cases entirely free from any tubercular infection had reacted during life. MacLennan found that cases which gave a positive result also reacted to injection of tuberculin. All, I think, including Calmette and Wolff-Eisner, agree that a negative result by no means excludes tuberculosis. Second and even third instillations in tubercular patients may be entirely abortive.

The advantages of the test are said to be (1) Simplicity of application; this I think no one will dispute. (2)Unaccompanied by constitutional symptoms; this has been disproved. (3) Safety; I have endeavoured to show the fallacy of this assertion. (4) That it is evanescent; my cases bear out this, but others have had a contrary experience. (5) Accuracy; my results, and those of others, demonstrate that the test is inaccurate.

Pyrexia does not seem in any way to affect the test. It is reasonable to suppose that moribund cases will not give a result owing to loss of resistive power.

Conclusions.

1. That the majority of cases of pulmonary tuberculosis react.
2. That early cases cannot be diagnosed by the test.
3. That the reaction is unreliable.
4. That negative results do not exclude pulmonary tuberculosis.
5. That it is of no prognostic value.
6. That the majority of advanced cases react.

7. That reactions appear more often and with greater intensity in young individuals.

8. That pyrexia in no way affects the reaction.

9. That the test is unjustifiable in the human subject, consequently I have abandoned it.

10. That the intensity of reaction bears no relation to the degree of the disease.

11. That subsequent reactions are unreliable owing to a hypersensitive condition of the conjunctiva produced.

THE CUTANEOUS REACTION.

The cutaneous reaction was introduced by Von Pirquet, who published the test in Berliner Medizinische Gesselschatt, 1907. It consists of vaccination with tuberculin, said to be followed in tuberculous subjects by inflammatory phenomena.

The tuberculin employed.

I employed two solutions of tuberculin of different dilutions, making a series of observations with each. The weaker solution consisted of 25% solution of Koch's old tuberculin, the diluting medium consisting of 0.3 to 0.5% of carbolic acid in normal saline solution drawn up in fine sealed glass capillary tubes supplied by the Clinical Research Association; the stronger solution consisted of undiluted Koch's old tuberculin issued in similar form to the previous by Parke, Davis and Co. Small rubber bulbs are supplied to facilitate expression of the fluid.

Application of the test.

The method which I employed in applying the test may be shortly stated as follows. The flexor surface of the forearm was selected as the site.

This was thoroughly cleansed with ether, a sterilised large surgical needle was used and the skin in two places about 2 inches apart was gently scarified sufficiently to remove the surface epithelium, leaving a reddish area composed of the deeper layers of skin, care being exercised to avoid the effusion of much blood. It is an advantage to see very slight presence of blood, as it ensures a small lesion having been produced and renders the absorption of the tuberculin more certain. On one of the areas the tuberculin was applied a few drops being sufficient, on the other a few drops of glycerine were placed. This served as a control. No dressings were applied; the patient was instructed to keep the arm extended uncovered until the solutions had dried. Sometimes the tuberculin was applied first and scarification performed through it; it makes no difference which method is adopted. The denuded areas were about ½ inch in diameter, and more or less circular in outline. The flexor surface of the arm is chosen on account of its ready accessibility, the comparative absence of hairs and the delicacy of the skin. Most methods are the same in essentials, but differ in some minor aspects. Von Pirquet makes three scarifications. To two of them he applies tuberculin and

the third is left free forming the control. He also applies a few fibres of cotton for five minutes, with the object of preventing flow of the fluid. Any tendency to flow, however, canbe avoided by a little care on the part of the patient. If the patient be a child, the attentions of the nurse are quite sufficient. The fibres of cotton do not absorb sufficient tuberculin to be of any practical importance. McNeil rubs in tuberculin by boring into the skin with a blunt pointed instrument, such as a knitting needle. Others employ a special chisel-shaped scarifier. The kind of instrument used, however, is of no great importance so long as it is efficient.

The Reaction.

The scarification of the skin at once produces a slight hyperaemic flush round both denuded areas. This is evanescent and disappears in the course of 20 to 30 minutes. A few minutes after the test has been applied, it is observed that both areas have risen up in a raw, fleshy looking wheal, which subsides in 10-15 minutes. Both these phenomena are purely traumatic. In an hour or so, however, in some cases, and a few hours in others, a faint erythematous ring gradually makes its appearance round the

area which had the tuberculin applied. This very slowly increases in intensity and in breadth, until a narrow pink area surrounds the test. This occurs in the majority of cases, whether the case is going to react or not, but does not, as a rule, occur round the control. It and it only may be present at the end of 14 or 15 hours, when one of two things will happen, either it will gradually disappear or the redness will increase and a definite red zone will form round the area, ¼ to ½ inch in breadth in a typical case. It varies, however, in different individuals. This definite zone is the first phenomenon of a positive reaction. It shows definitely in 15 to 16 hours; from 15-24 hours one finds some slight swelling of the area and its immediate surroundings. This slowly increases until 48 or 50 hours, when it has reached its maximum and a reddish or brownish papule presents itself, which can be seen and felt. The brownish hue is due to coagulation of serum effused and to the pigment contained in the tuberculin. This, however, in some cases is not the final stage of growth. The edges of the papule may separate into smaller discrete papules, which may or may not be surmounted by vesicles. As these appear the original papule seems to some extent to subside

at its summit, so that we have a partial or complete ring of papules surrounding a depression, the whole being encircled by an erythematous zone. The edge of the papule may simply be raised without any subdivision. These subsidiary papules appear on the second or third day. One rarely gets a papule earlier that 18 to 20 hours, but it may be delayed in its appearance until the third day. Meanwhile the control should be healing. None of my controls gave any reaction, with the exception of an occasional evanescent hyperaemic ring. Von Pirquet observed several positive reactions in his controls, which occurred only if the test was positive. These he explains as contaminations from the tuberculin areas. The majority of cases do not show any papulation of the edges. Other cases do not produce a papule at all, but simply a persistent injected area, which may, however, subside at the end of the second day. A well-formed papule begins to fade at the end of the third day, and in a week or ten days a scaly brown quiescent area remains, which daily decreases, until at the end of three to four weeks a small brown pigmented area alone remains. The control has entirely disappeared in five to seven days. The pigmentation which persists for several weeks or even months is due

to pigmentary bodies contained in the tuberculin and not to pigment derived from the blood, as no such appearance presents itself on the control. Such is the course of a cutaneous reaction. It is painless, but sometimes slightly itchy, unaccompanied by any constitutional symptoms and in no way inconveniences the patient. I regard cases as positive which have, after 24 hours, even a slight amount of raising with an erythematous ring, or absence of raising, but where a persistent hyperaemic zone is present.

Abnormal Reactions.

Types of reactions are sometimes observed which depart markedly from the normal, and are sufficiently striking to make them worthy of comment. They are not, however, of common occurrence. In some cases, instead of having a roseate ring fading at the circumference gradually until it merges with the natural skin, we find that the injected area may have a very irregular outline sharply delineated. In one case (case 122), this zone was a crimson colour at first, slightly resembling a "port wine" stain, and appeared on the sixth day in a non-tubercular subject. Scattered over the area were some small haemorrhages. Several other cases (e.g. cases 31, 32, 52) also

showed small haemorrhages which had occurred in the raised edge of the papule. These appeared on the fourth and fifth days. Never have I observed any haemorrhages in the controls. These are not evidently due to trauma, as the controls remained free from them. The violence of the reaction is unlikely to produce them and they did not occur in particularly marked cases. They are evidently a result of some destructive influence of the tuberculin on the capillary walls. In one case (case 181), the centre of the papule was surmounted by a crop of well formed vesicles, which subsided in twelve hours. The only violent reaction which I have seen occurred in a young woman with mitral disease (case 30) with no evidence of tuberculosis. In 48 hours the test area was converted into a red oedematous swelling measuring 5 x 8½ cm., the centre of which was occupied by the papule. From this swollen area a red lymphatic vessel could be traced up to the axilla. Pain was experienced; there was no pyrexia, no constitutional disturbance, and no enlarged lymphatic glands could be detected. Fomentations were applied, and within 12 hours all, with the exception of the papule, had disappeared. In such a case it is impossible to say whether or not pyogenic organisms had gained entrance.

This is doubtful on account of the precautions exercised. It was in all probability due only to the tuberculin in a subject presenting marked susceptibilities to the toxin. These abnormal results occurred in cases which gave a positive reaction. Four out of the six cases showed no evidence of tuberculosis. Four of the cases were tested with 25% solution and two with the undiluted fluid. The violent reaction was obtained with the 25% tuberculin. There is another manner in which atypical results may manifest themselves, namely, in the reaction time, exhibited either by a pronounced latent period on the one hand and on the other by rapidity of onset. Early reactions may be regarded as those which show definite activity, irrespective of the erythematous flush already referred to, in a few hours. For example, in a few hours a definite elevation may appear, which is maintained for two or three days without any appreciable decrease or increase. That is to say, the maximum result of a good reaction may be attained a few hours after inoculation. Any attempt at papulation which is in evidence within twelve or fourteen hours I regard as an early reaction. Three of my cases come under this heading, two non-tubercular cases (cases 135, 136) and a case of tubercular

empyema (case 81). Case 81 showed the earliest reaction which I have observed. Three hours after inoculation a well formed papule had appeared, which was maintained for five days before it showed any signs of subsidence. Of the other two, case 135 had matured in seven hours, case 136 having attained its maximum in about twelve hours. These three cases were in children aged 12, 12 and 3 years. In contrast to these, the condition may be delayed either in onset or maturation. Four of my cases were late in giving results (cases 16, 44, 110, 122). None of them were tubercular cases, but three out of the four had renal lesions, two subacute Bright's disease and one a case of calculus. Two cases will serve, one as an example of delay in onset, the other an instance of protracted development. Case 110 in twenty hours showed a slight erythema surrounding the site of scarification. After about sixty hours had elapsed, a papule made its appearance. The other case gave no signs of activity until the third day, when some redness appeared, but not until ninety hours was there any sign of a papule. McNeil observed two cases of delayed reaction, both in cases of abdominal tuberculosis, appearing in 72 to 90 and 72 to 120 hours respectively. Few abnormal results are mentioned in the literature. Raw has

published a few severe reactions. Four of his cases had violent reactions attended by high temperature and brawny cellulitis extending up to the axilla. One case developed pus. Wolff-Eisner and Kronig both had cases of lymphangitis following the reaction. Furunculosis of the forearm was observed by Roepke and Bandelier; Von Pirquet, Pfaundler and Oppenheim have seen ulceration occur on the site of the test; phlyctenules and generalised lichen scrofulosorum have been noted by Doganoff and Moro. Such results are extremely rare, but require to be taken into consideration as a point against the absolute safety of the test. A late reaction has been observed to appear sometimes on the abortive primary site; after the second application of the test this occurs according to Von Pirquet in children in cases where the tuberculosis cannot be clinically demonstrated.

Nature of reaction.

This reaction is also regarded as a specific one in the sense of the formation of antibodies stimulated by the extra toxin supplied to a tubercular individual. That this is so seems likely, but in a similar way, as in the ophthalmic reaction, it will not account for results obtained in non-tubercular

subjects. The papules which appear have been examined histologically by Saels, and he was able to demonstrate the presence of giant cells of Laughan's type surrounded by epithelioid and round cells changes in close resemblance with those characteristic of a tubercular nodule. Such a condition is brought about either by the toxic material or bacillary fragments in the tuberculin, but it is possible that the papules which were examined were true tubercular lesions produced by living bacilli contained in the tuberculin. Living bacilli have been demonstrated in such preparations. There is no reason why a healthy patient should not react to the toxin as well as a tubercular one.

Results obtained with the cutaneous reaction.

Von Pirquet out of 1,000 cases obtained 88% of positive reactions in tubercular subjects, and 10% in non-tubercular individuals. Of 1,600 tubercular children the reaction appeared in 97%; 200 of these cases were confirmed by post mortem examination. Mills obtained 95% of reactions in tubercular patients, whereas his non-tubercular cases, without exception, gave no result. McNeil out of 155 cases obtained 65 positive reactions, but only 10 out of

20 tubercular cases reacted. Bride obtained about 70% of reactions in tuberculosis, but 20% of his non-tubercular cases gave results. In my series of nearly 200 cases, about 50% of the tubercular cases gave positive results, whereas a reaction appeared in about 36% cases which gave no evidence of tubercular infection. Feer has never observed a typical case of scrofula which failed to react and Impallomeni never saw a reaction in a case slinically free from tuberculosis. About 2/3 of my tubercular cases consisted of pulmonary lesions. The others were various tubercular infections. They may be tabulated as follows :-

Disease.	No. of Cases.	Positive.	Negative.
Pulmonary tuberculosis	53	24	29
Tubercular disease of bone	22	12	10
Tubercular glands	2	2	0
Lupus	1	1	0
? Tubercular disease of larynx	4	3	1
Tubercular empyema	1	1	0

Some of the cases of pulmonary tuberculosis were of old standing, and many had fairly advanced lesions. Having placed these facts before you, it behoves me to endeavour to ascertain what conclusions may be drawn from them, and in what way they bear our or contradict

the results arrived at by others. All my other cases presented no signs of tuberculosis.

Value of the test.

The cutaneous reaction is an ingenious attempt to offer a solution to the difficult and important problem of the early recognition of that subtle and widespread tubercular process. Like the ocular reaction, it possesses that simplicity so essential to the practical value of a clinical test, which embraces so large a field. It contrasts with the previous test in being almost absolutely devoid of discomfort and especially owing to the fact that, although not entirely free from untoward results, it is void of those tragic manifestations which, of necessity, must condemn the conjunctival reaction. What is its value as a diagnostic aid ? Here again chaos reigns. Result after result has appeared, a mass of contradictions. The reaction of the skin to tuberculin does not always appear in tubercular subjects. This has been shown by the majority of observers. In my series the total among tuberculous cases reacting was less than that of those which failed to respond. It has been affirmed that very advanced and moribund cases fail to react. This is certainly true in many

instances, the reason, no doubt, being exhaustion of resistive power resulting from prolonged toxaemia. The terms advanced and old standing seem to have been employed synonymously. This is misleading, as advanced lesions not infrequently react, whereas old standing cases seldom do so. The older the patient, the less probability is there of obtaining a response. This may be seen by the following table:-

Tubercular cases giving a positive reaction with age periods :

4-6 yrs.	7-10 yrs.	11-15 yrs.	16-20 yrs.	21-30 yrs.
7 +	11 +	7 +	5 +	7 +
0 -	2 -	0 -	4 -	13 -

31-40 yrs.	41-50 yrs.	51-60 yrs.	61-70 yrs.
2 +	4 +	0 +	1 +
9 -	7 -	8 -	3 -

This table shows the proportional decrease of reactions as age advances, and conversely the increase in absence of results. Von Pirquet states that the reaction is not obtained in advanced and cachectic cases, whereas, on the other hand, McNeil claims to have had good results in chronic cases. Mills obtained marked persistent reactions in cases which he regarded as old healed lesions. In the

above table it can be seen that the best results were obtained in individuals under 21 years of age, and that those between 4 and 6 years and between 11 and 15 years, without exception, gave reactions. That in younger life the powers of resistance, and consequently of reaction, are greater is in many ways true, as these patients have not had their reactive faculties taxed to the same extentas the majority of older cases. At the same time, I would suggest that the skin in a young individual is more liable to react than in one of more mature years. This is partly borne out by the results I obtained in non-tubercular cases, as shown by the following table :-

Non-tubercular cases with age periods :

4-6 yrs.	7-10 yrs.	11-15 yrs.	16-20 yrs.	21-30 yrs.
0 +	1 +	6 +	10 +	13 +
1 -	7 -	11 -	10 -	12 -

31-40 yrs.	41-50 yrs.	51-60 yrs.
3 +	1 +	1 +
14 -	8 -	1 -

This table shows that a considerable number of individuals between the ages of 11 and 30, who are not the subjects of tuberculosis, react readily, while above the age of 30 there is a rapid fall in

the positive results. My experience shows that many tubercular cases from a few years of age up to 60 years do not respond, whereas many cases which show no evidence of the disease at similar ages give a positive reaction. Hence at these age periods no reliance can be placed upon the test. That a patient is clinically free from tuberculosis, however, does not prove its absence in the body, but, as many cases which are obviously tubercular fail to react, the suggestion that many of the cases, clinically free, which give a result are non-tubercular is a deduction which, in many ways, is legitimate. Von Pirquet obtained positive results in ¼ of all children aged 1 to 2 years, 1/3 in children aged 3 to 4 years, ½ in those aged 5 to 6 and 2/3 among those aged 11 to 14 years, a gradual increase as the age of the child advances, which corresponds with the results I obtained. Hamburger made 848 post mortem examinations on children of varying ages in order to ascertain how far these results corresponded with actual lesions.

The following table gives his results :-

Hamburger's post mortem examinations in children :

Age.	Number with tubercular lesions.
1-3 months	4%
3-6 "	18%
6-12 "	23%
2nd year	40%
3-4 years	60%
Puberty	70%

These valuable statistics are in close agreement with the test results obtained by Von Pirquet, and also are a revelation of the enormous number of children who exhibit evidence of tubercular infection. Naegeli, from post mortem experience, says that 72% of all individuals show evidence of tuberculosis. My results show that the majority of children clinically tubercular between the ages of 4 and 15 years react, although failures are not uncommon. Bandelier and Roepke state that, as the age of the child advances, the more reactions are obtained. This agrees with my results up to the age of 14 years. Von Pirquet has shown that 20% of children clinically free from tuberculosis give positive results. None are obtained up to the age of six months, but between the years 10 to 14, 55% react, as compared with my results, where nearly 60% of positive

reactions were obtained up to the age of 14, and between the ages of 11 and 15 years nearly 40% gave results. Between the ages of 4 and 6 years, my results were true; beyond that they were variable. Calmette is of opinion that the cutaneous test is only reliable in children under three years of age, although it is admitted that an error of 4% has been obtained in infants. Contrasting his test with the cutaneous, he holds that the ophthalmic reaction appreciates active lesions only, whereas the cutaneous reveals latent or healed lesions. His reasons are based on clinical and post mortem experience. Stern is in agreement with him. It is unreasonable to suppose that the same substance introduced into the individual is going to differ in so important a detail according to the manner of introduction. Blumer has pointed out that latent tubercular lesions are exceedingly rare under two years of age. I have not had opportunity to make observations on children under three, but an admitted error of 4% proves at once the unreliability of the test at that age. I have already demonstrated its want of accuracy at other ages. If it could be shown that a positive reaction indicated always tuberculosis, it would be of great value, even though all tubercular cases did not react.

However, it has been proved otherwise. Radcliffe, who attended Von Pirquet's clinic, reports that the cutaneous method is considered reliable in children under two years of age, also that, during specific tuberculin treatment, the test is used at regular intervals and treatment continued until the reaction is negative. The advantage of this is not quite clear. If the test fails to react owing to saturation with tuberculin, it does not signify cure; if it is considered to become negative as a result of cure, this surely completely destroys the view that the test appreciates latent lesions or previous infection. As regards its value in adults, Von Pirquet is supported by Blumel, who places reliance on it up to two years of age only, but his position is weakened by his assertion that it is more reliable when negative. Raw regards negative results as valuable, even in adults. Roepke and Bandelier's statement that a cutaneous result signifies that at some period infection with tubercle bacilli had occurred has been amply disproved. My results show that females more often give the reaction than male individuals; 66% of the tubercular females reacted as compared with 35. males. Among the cases clinically free from the disease, reactions occurred in 35%

females, as opposed to 30% results among male patients. Among females, as many positive results can be obtained in non-tubercular cases as among male tubercular subjects. The fact that females react more readily supports the suggestion that the delicacy of the skin is a factor which cannot be ignored. McNeil claims that hard skin and consequent imperfect scarification explain some of his late reactions. I do not find, however, that late results can be accounted for by this means. The degree of scarification should vary with the quality of the skin. Imperfect technique will no doubt account for some failures, but certainly not the majority. Two of my late reactions were in males and two in females. In pulmonary tuberculosis there was a larger percentage of negative than positive results in my series. Some of the cases were of old standing and 2 or 3 were moribund. Excluding these, however, many cases which ought to have reacted failed to do so. Here, as in the whole series, the majority of reactions were obtained among young individuals. Bride considers the test of great help in the early diagnosis of pulmonary tuberculosis; Bandelier and Roepke do not consider it of much value in this type of lesion. In skin diseases I had only opportunity of testing one

tubercular case, namely lupus. It gave a marked reaction, and repetition one week later produced an equally good result. It is to be expected that a skin already the site of a tubercular infection will react to inoculation with the same toxin. Define obtained positive results in 50 cases of lupus. Marked reactions were obtained in skin lesions by Moro, Doganoff, Oppenheim and Pfaundler. Out of 26 cases of tubercular disease of the skin, 22 positive results were obtained by Kreibich and Baudler. They also refer to the severity of the reaction usually obtained. The four which failed were cachectic and also had some miliary spread. In pleural effusion two out of my three cases reacted; the one which failed had definite signs of pulmonary tuberculosis. One case of tubercular empyema gave a positive reaction. Bride regards it as valuable in recognising the cause of pleural effusion or empyema. McNeil agrees with him, nearly all his cases of effusion having reacted. My results in tubercular osseous lesions were not superior to those in lesions in other situations, almost as many failures as results being obtained. Impallomeni, however, found the test almost always positive in such cases in adults and children, especially if the case was cured

or improving. At the same time, he expresses the unique experience of having never seen a reaction in a case clinically free from tuberculosis. Curshmann obtained 10 reactions out of 11 cases, the failure being a cachectic patient. Surgical tuberculosis has given good results in the hands of Bandelier and Roepke, and severe reactions are recorded by them. I did not observe this in similar cases of mine. They also draw attention to the fact that, if a case has tubercular glands and also effusion into a joint of a simple nature, a good reaction may be obtained owing to the glandular disease, and so an erroneous diagnosis of tubercular joint disease is liable to be made. McNeil places considerable reliance on the test in obscure traumatic joint affections. My experience with the test hasshown that rheumatic cases very frequently give good positive results. Out of 13 cases reactions were obtained in asmany as 8, but the cases of chorea failed entirely to respond. Among other diseases in my series results were obtained in cardiac cases, plumbism, carcinoma, etc. Three syphilitic patients failed to react. These are of interest as Farre and Nicholas record as good results in syphilis as in tuberculosis. I performed the test on 12 cases of enteric fever, but in only

one did I obtain a reaction. Von Pirquet affirms that results do not take place in tuberculosis complicated with enteric. In fact, any superimposed toxaemia, according to Holt, will interfere with the test. In tubercular peritonitis two of my cases reacted, whereas three failed. McNeil found that similar cases reacted well. Bandelier and Roepke obtained unsatisfactory results in this disease. Bride finds it valuable not only in the early diagnosis of these cases, but in distinguishing them from enteric fever. Its unsatisfactory nature in renal tuberculosis is shown by the fact that out of 10 cases of nephritis 4 reacted, none of them being tubercular. The two tubercular cases produced no result. Tubercular meningitis has given unsatisfactory results in the experience of Bandelier and Roepke. Bride had similar experience. The reaction is most marked as a rule in vigorous individuals, and better marked in females than males, but the intensity of infection bears no relation to the degree of reaction. The reaction possesses no prognostic value. Early and late reactions have no significance. Wolff-Eisner regards a rapid response or absence of it as indicating an unfavourable prognosis, and a delayed reaction as suggestive of a healed or latent lesion. Some of

my cases were tested with 25% solution of tuberculin, others with the undiluted fluid. Similar results were obtained with each. Impallomeni found that no blood changes accompany the reaction. Bovine tuberculin seems to behave much as the human variety.

Conclusions :

1. That the cutaneous reaction from the age of 5 upwards is of no practical value.
2. It is of no value in prognosis.
3. It much more often fails than the conjunctival test.
4. 25% Solution of tuberculin gives similar results to those obtained with undiluted tuberculin.
5. The reaction is more often obtained in females than males, whether tubercular or not.
6. The older the patient the less likely is a positive result to be obtained, that is to say, children react more frequently than adults.
7. That late and early reactions have no clinical significance.
8. That cases of rheumatism (subacute) will give more positive results than tubercular conditions.

9. That a large percentage of non-tubercular cases, both adults and children, give positive results.

10. Advanced lesions frequently react, but old standing cases usually fail.

11. That pyrexia does not interfere with a reaction.

THE PERCUTANEOUS REACTION.

The percutaneous diagnostic reaction is a modification of the use of tuberculin ointment employed by Splengler as a therapeutic measure. The method as used for diagnostic purposes was introduced by Moro and Doganoff. Moro published his observations in February, 1908, and his method of procedure appeared in June of the same year.

Tuberculin Ointment.

The material which I utilised for this test consisted of a mixture of tuberculin with anhydrous wool fat according to Moro's formula, in the proportion of 5 c.c. of Koch's old tuberculin to 5 grammes of anhydrous wool fat. This vehicle is employed as it allows of the greatest concentration, but care has to be exercised in the preparation of the ointment so that the lanoline is heated to 20° or 30° C. The ointment keeps well in a cool place, but if exposed to damp changes occur in it. It is clear brown in colour, translucent, partially transparent and possesses the marked tuberculin odour. The preparation I obtained from Parke Davis and Co. in small collapsible tubes.

Application of the Test.

The front of the chest was selected as the site of application in the majority of my cases. In a few instances the abdomen was chosen in cases where, for some reason, it was more convenient. A portion of the ointment about the size of a pea was placed on the finger and firmly rubbed into the skin over an area of about 4 square inches, as directed by Moro. The process of rubbing was continued for 30 to 60 seconds; 60 seconds should be the minimum in adult males; in children and women less time will usually suffice. No application was made to the skin previous to the test, with the exception of the ordinary routine measures of cleanliness; no dressing was applied to the area. The thoracic and abdominal regions are of advantage for the application of the ointment, owing to the breadth of area which can be obtained; but other sites, such as the arm, have been utilised.

It has been advocated, and reasonably so, that cleansing of the skin with ether before inunction may be of advantage, and Bandelier and Roepke claim to have obtained improved results subsequent to the adoption of this measure. In some cases I employed a control in the form of boracic or zinc

ointment, but in no case did I observe any activity in the control area. Moro and Heineman have employed ointments containing chrysarobin and soft soap as controls without result; similarly lanoline free from tuberculin has been employed, but no reaction has been reported. I am unaware of any reactions having been observed on control sites.

The Reaction.

On the area to which the ointment has been applied, nothing as a rule for the first 12 hours can be observed. After that period, however, and usually under 24 hours, some small papules begin to make their appearance. These, on an average, in my cases, appeared in about 14 to 16 hours. They are scattered irregularly over the area, and may extend just beyond its margin. They may be very numerous or scanty. If the papules are well formed, they develop into pustules with or without an intermediate vesicular stage. They are often surrounded by an area of erythema, which varies greatly in different cases, and occasionally is entirely absent; at other times very pronounced and blotchy in appearance. The onset of the rash is usually accompanied by itching. The maximum

development is attained in about 48 hours. Towards the end of the 5th day the crop begins to fade, the pustular element dries up, and small crusts are formed. The skin in the neighbourhood becomes scaly, and slight peeling takes place similar to what was observed in the previous reaction; the more marked the reaction, the greater is the desquamation. In a week a scaly skin with scattered brownish pigmentation is all that remains. In some cases the rash never progresses beyond the papular stage. The rapidity of pustular formation varies greatly, more rapid in children than adults. Any case which shows no sign of activity until after 24 hours I regard as a late reaction; an early result may be looked upon as one which has reacted under 12 hours. I have never observed any early reactions. Several of my cases showed delay in appearance of the reaction even up to the 8th day.

Abnormal Reactions.

Apart from early or protracted results, other phenomena are sometimes met with. I observed petechial haemorrhages in 3 of my cases; 2 of them occurred in tubercular subjects, the third in a case clinically free from the disease. In one case

(104) the haemorrhages in the skin were the only evidence of reaction. In the other cases (cases 96 and 105), the petechiae were accompanied by the eruption which, however, in one case did not appear until the 8th day, the haemorrhages having by that time been absorbed. No abmornal results seem to have been reported in the literature. Those I have mentioned may be compared with analagous phenomena met with in the cutaneous reaction. Here, as in it, no special type is prone to become haemorrhagic. Chlumsky refers to late reactions occurring on the 4th and 5th days in his cases. Seven of my cases were late in giving results ranging between the 3rd and 8th days.

Value of the Test.

The percutaneous reaction is the most simple of all the tuberculin tests; at the same time it appears to be entirely devoid of any harmful results. Here again, as in the other test, numerous results greatly at variance have been obtained by different observers. Of the 255 cases in my series, 95 presented definite signs of tubercular disease, comprising lesions in various parts of the body. Of these cases only 33 reacted, leaving 62 tubercular

cases which gave no result, whereas 17 out of 160 cases which were clinically free from the disease responded; 9 of these were doubtful cases, and 4 of them responded. Its unreliability is shown by the fact that only 34% of positive results were obtained with tubercular cases, whereas between 10 and 11% of non-tubercular individuals exhibited the reaction. As compared with the Von Pirquet reaction, this test does not give so many positive results in tubercular cases, but in non-tubercular subjects it is in striking contrast to the previous test, clinically non-tubercular cases reacting at the rate of 8 or 9% as compared with 36% with the scarification method. Weil prefers this method to either of the other two. Moro claims to have obtained as good results with his method in 338 children as can be obtained by the Von Pirquet reaction. He also considers it as good as the ocular test. In non-tubercular cases Moro's results coincide with my own, much fewer reactions being obtained than with the scarification method. Von Pirquet, however, obtained unique results with the ointment; he failed to produce any reaction in children, with the single exception of one in a child very susceptible to tuberculin. Heinemann considers the ointment test

as valuable as the conjunctival. Chlumsky, on the other hand, places little faith in it, having found that 6 out of 23 non-tubercular children reacted, and obtaining only 14 reactions out of 24 tubercular cases. He also applied it to 6 healthy adults, and obtained 2 positive results. Roepke and Bandelier observed 54% of positive results in adults. The cases, they state, were proved to be tubercular either by demonstration of bacilli in the sputum, or by reaction to subcutaneous injection of tuberculin. The injection, however, can hardly be accepted as absolute proof. Patterson agrees with my results that fewer clinically free cases give results as compared with the cutaneous reaction. He regards it as valuable as the ophthalmic test. The female sex react much more readily than males; 73% of the positive results were in females, as against 28% in males. Children react more readily than adults; practically all the reactions both in tubercular and non-tubercular cases occurred in individuals under the age of 20. Two cases of intussusception appear in my series. They are of interest from the fact that at the operations one was found to have enlarged meseuteric glands. It gave a positive reaction, whereas the other

failed. In pulmonary tuberculosis the results were bad, 34 out of 43 cases failing to respond. In osseous tubercular lesions only half the cases reacted, although Moro considers the test as particularly accurate in lesions of this nature. The majority of cases of tubercular peritonitis failed ~~similarly~~. Other tubercular conditions showed numerous failures. I applied the test to 21 cases presenting no signs of any pathological condition. Four of these gave good positive results, mostly children. The cases reported by Verge from the skin department of the Royal Infirmary, Edinburgh, are of interest where the ointment was applied in cases of lupus, the eruption appearing on the skin surrounding the diseased areas, activity at the same time occurring in the morbid tissues. He considers the test superior to injection. However, a tubercular skin will probably react in the majority of cases. The only case of lupus in my series gave a good reaction. Rheumatic cases do not show the large number of reactions with this test which I obtained with the cutaneous test. All the cases of enteric fever gave negative results. Six cases of pleural effusion failed to react. Two of them had definite signs of tubercular pulmonary disease. The

best reactions are usually obtained in well nourished individuals, especially children. Chlumsky is in agreement with this. Cases of old standing or old individuals usually fail to give a reaction, probably due to inability of the skin to absorb the ointment, either from chronicity of toxaemia or trophic changes in the skin, concurrent with advancing years. I have already shown that females react more often than males, pointing to the delicacy of the skin as a factor. I made observations to ascertain whether fairindividuals, as opposed to those possessing a larger share of pigment, were more liable to respond, but no such relation exists. It is a well known fact that injections of tuberculin will in many cases produce a reaction when the dose is increased, where they had previously failed. Both skin reactions and the ophthalmic test probably would give better results if the dose could be regulated, some requiring more, others less. When the results with this test are regarded according to the age periods, the same gradation is not found as appeared with the Von Pirquet method. Among the tubercular cases all the positive results, except five, occurred in individuals not older than 14 years, whereas, although many cases failed to respond which were under 15 years of age,

the majority of failures occurred between the ages of 15 to 40. This illustrates the fact that more numerous reactions are obtained in children or at least in those under about 20 years of age. The age periods of the non-tubercular cases which reacted are rather variable. These may be shown by the following tables :-

Tubercular cases with age periods and reactions.

1-3 yrs.	4-6 yrs.	7-10 yrs.	11-14 yrs.	15-20 yrs.
5 +	5 +	11 +	7 +	2 +
1 -	5 -	5 -	6 -	10 -

21-30 yrs.	31-40 yrs.	41-50 yrs.	51-60 yrs.	61-70yrs.
2 +	1 +	0 +	0 +	0 +
15 -	10 -	6 -	3 -	1 -

I have made observations on 132 cases to which both the cutaneous and percutaneous reactions were applied, in order to compare the two more closely; 51 of these cases were definitely tubercular, 13 of them only gave a reaction to both tests and 20 failed to respond to either. Eighteen cases reacted to the Von Pirquet method alone, but I have never observed a tubercular case which reacted to the ointment fail to react also to the Von Pirquet method. Moro himself reports a similar experience. Out of the cases clinically free from tuberculosis, six responded to

both tests, fifty failed to react to either and twenty-three reacted to the scarification only. But only two reacted to the ointment alone. These results may be shown more clearly in tabular form.

Tubercular cases giving	Von Pirquet and Moro reactions	13
" "	Von Pirquet only	18
" "	Moro only	0
"	failing with both	20
Non-tubercular cases giving	Von Pirquet and Moro reactions	6
" "	Von Pirquet only	23
" "	Moro only	2
"	failing with both	50

From the above it is clear that the Von Pirquet test gives a larger number of reactions among tubercular subjects than the ointment test; but, at the same time, it gives a much larger number of false results in non-tubercular cases. The ophthalmic test gives a large number of true results much greater than either of the skin reactions, and the reactions produced by it in non-tubercular cases are exceedingly small. It is undoubtedly the most certain of the three. The chief difference between the skin reactions is the large percentage of cases

with no clinical signs of tuberculosis which react to the Von Pirquet test, as compared with the ointment. Both tests, however, agree in the particular of being exceedingly inaccurate. The three reactions have been performed on the same individuals by others, e.g., Hamill, Carpenter, Cope, etc. Some regard them of equal value, others do not. My observations demonstrate the variations between the three tests. The ocular test is the most dangerous. The ointment test seems to be entirely devoid of harmful results. The skin reactions occur chiefly in women and children, as contrasted with the more general results of the conjunctival reaction.

Conclusions.

1. The ointment test is exceedingly inaccurate.
2. It does not give nearly so many reactions in non-tubercular cases as the Von Pirquet test.
3. Most reactions are obtained in women and children.
4. It is of no value in prognosis.
5. More often fails in tubercular cases than the cutaneous reaction.

6. Old standing cases and elderly patients usually fail to react.

7. Late and early reactions have no clinical significance.

8. Tubercular cases which react to the ointment also react to the Von Pirquet method.

9. Pyrexia does not interfere with the reaction.

10. The test is free from danger.

11. The best results are obtained in bone tuberculosis, but only 50% react.

12. It is much inferior to the conjunctival reaction.

CASES OF CONJUNCTIVAL REACTION.

1. John S. aet. 9. Pulmonary tuberculosis whole of right lung, vomica right upper lobe, duration 3-4 years. Bacilli demonstrated in sputum. Good reaction, 4-10 hours. Clear at end of 3rd day.

2. Winnie M. aet. 20. Pulmonary tuberculosis left upper lobe, duration 9 months. Bacilli demonstrated in sputum. Good reaction, 3-12 hours. Clear on 3rd day.

3. John J. aet. 31. Pulmonary tuberculosis, signs in both lungs, duration 4 years. Good reaction. Bacilli demonstrated in sputum. Reaction 3 to 12 hours. Clear 3rd day.

4. Fred R. aet 22. Pulmonary tuberculosis (acute), duration 3 months. Good reaction. Bacilli demonstrated in sputum. Reaction 3-12 hours. Clear at beginning of 3rd day.

5. Jane S. aet 38. Pulmonary tuberculosis right upper and middle lobes, duration 4 years. Good reaction, 4-15 hours. Clear end of 2nd day. Bacilli demonstrated in sputum.

6. Wm. S. aet 27. Pulmonary tuberculosis both lungs, duration 3 years. Bacilli demonstrated in sputum

Good reaction, 4-15 hours. Clear 3rd day.

7. Herbert T. aet 32. Pulmonary tuberculosis right lung, vomica right upper lobe, ~~left upper lobe~~, duration 5 years. Good reaction, 4-15 hours. Clear 3rd day. Bacilli demonstrated in sputum.

8. Jane K. aet 27. Pulmonary tuberculosis right upper lobe, duration 1½ years. Good reaction, 3-12 hours. Clear 2nd day. Bacilli demonstrated in sputum.

9. Albert S. aet 42. Pulmonary tuberculosis R. lung, left lower lobe, duration 4 years. Medium reaction, 4-15 hours. Clear 2nd day. Bacilli demonstrated in sputum.

10. Katherine G. aet 25. Pulmonary tuberculosis both lungs, duration 2½ years. Good reaction, 4-15 hours. Clear 2nd day. Bacilli demonstrated in sputum.

11. Charles B. aet 19. Pulmonary tuberculosis, L. upper lobe, duration 3 months. Good reaction. Bacilli demonstrated in sputum. Reaction clear 3rd day. Reaction time 3-12 hours.

12. Albert W. aet 44. Pulmonary tuberculosis, vomica right upper lobe. Good reaction, 4-15 hours. Duration of disease doubtful. Reaction clear 3rd day. Bacilli demonstrated in sputum.

13. John W. aet. 26. Pulmonary tuberculosis right upper lobe. Medium reaction, 3-12 hours. Clear 2nd day. Duration of disease 8 months. Bacilli demonstrated in sputum.

14. Anne M. aet. 23. Pulmonary tuberculosis, both upper lobes, duration doubtful, as also had a cardiac lesion. Reaction medium, 4-15 hours. Clear 3rd day. Bacilli demonstrated in sputum.

15. Fanny H. aet. 33. Acute pulmonary tuberculosis occurring after 2 years of symptoms. Good reaction, 4-15 hours. Clear 3rd day. Bacilli demonstrated in sputum.

16. George W. aet. 40. Pulmonary tuberculosis, both lungs, vomica right upper lobe, duration 5 years. Good reaction, 3-12 hours. Clear 4th day. Bacilli demonstrated in sputum.

17. Dennis F. aet. 27. Pulmonary tuberculosis, early signs in right upper lobe, confirmed with X ray appearance. Bacilli demonstrated in sputum. Duration 6 months. No reaction after two applications of test.

18. May R. aet. 30. Pulmonary tuberculosis, both lungs, duration 3½ years. Medium reaction, 3-12 hours. Clear 4th day. Bacilli demonstrated in sputum.

19. Susan L. aet. 26. Pulmonary tuberculosis, both lungs, duration 3 years. No reaction after test was applied twice at intervals of a week, third application produced a reaction, 4-15 hours. Clear 3rd day.

20. Morris W. aet. 33. Pulmonary tuberculosis, both lungs, vomica L. upper lobe, duration 3½ years. Good reaction, 5-15 hours. Clear 3rd day.

21. John S. aet. 19. Pulmonary tuberculosis, early signs left apex. Good reaction, 4-15 hours. Clear 3rd day. Reaction lit up by diagnostic injection of Koch's old tuberculin. Lit up twice when patient had a cold, once in one eye and once in both eyes, several weeks after the first instillation.

22. Jane R. aet. 62. Pulmonary tuberculosis, vomicae both lungs. Post mortem confirmed the condition of lungs. Duration several years. Reaction good, 4-15 hours. Clear 3rd day.

23. Charles J. aet. 29. Pulmonary tuberculosis right lung, duration 9 months. Reaction good, 3-12 hours, persisted to 5th day.

24. Wm. H. aet. 21. Pulmonary tuberculosis left upper lobe. Reaction good, 4-15 hours. Clear 2nd day. Duration of disease 3 months.

25. James H. aet. 60. Pulmonary tuberculosis, old vomica right upper lobe. Patient was unaware of any pulmonary disease; duration doubtful. No reaction obtained. Patient was being treated for chronic interstitial hephritis; vomica was discovered in ordinary routine of examination. The other pulmonary regions gave no physical signs.

26. Lucy M. aet. 22. Pulmonary tuberculosis, early signs at left upper lobe. First test produced a negative result, second test positive. This patient had experienced very slight haemoptysis, otherwise felt well. Duration 3 weeks. Reaction good, 4-15 hours. Clear 3rd day.

27. Thomas B. aet. 29. Pulmonary tuberculosis R. lung, duration 6 months. Medium reaction, 3-12 hours. Clear end of 2nd day.

28. Nellie T. aet. 24. Pulmonary tuberculosis R. upper lobe, duration 2 months. Test was applied 3 times; all gave good reactions in about 5-20 hours on an average. 1st cleared by 3rd day, second two persisted to 4th day.

29. Wm. P. aet. 47. Pulmonary tuberculosis, both lungs, apparently thickened pleura at both bases, duration 3-4 years. Good reaction,

appeared 5th hour, maximum at about 17th hour. Clear at beginning of 4th day.

30. Clara N. aet. 20. Pulmonary tuberculosis, duration 18 months, scar in neck resulting from removal of glands as a child. Reaction good 9-14 hours. Clear 4th day.

31. Edward R. aet. 35. Pulmonary tuberculosis, left upper lobe, duration 7 months. No reaction. Signs in chest perfectly definite and conclusive.

32. Lawrence S. aet. 32. Pulmonary tuberculosis, both lungs, right lung fibrotic, heart pulled over. Reaction good, 4-11 hours. Clear 3rd day. Duration of disease 7 years.

33. Amy W. aet. 29. Pulmonary tuberculosis, both lungs, duration 4 years. Good reaction, 4-20 hours. Clear on 4th day.

34. Edward P. aet. 17. Acute miliary tuberculosis, duration about 4 weeks. Good reaction 4-7 hours. Clear 3rd day.

35. Alice K. aet. 27. Pulmonary tuberculosis, both upper lobes, duration 20 months. Mild reaction, 5-10 hours. Clear end of 2nd day.

36. Isaac M. aet. 15. Pulmonary tuberculosis, left upper lobe, duration 2 months. Good reaction,

4-15 hours. Clear 3rd day.

37. Samuel K. aet. 18. Pulmonary tuberculosis, middle lobe right lung. Haemoptysis (half a pint) 4 days before was the first symptom. Signs were early. Good reaction, 4-12 hours. Clear 4th day. Came up three months later, another haemoptysis, physical signs more numerous and more extensive.

38. Wm. C. aet. 21. Pulmonary tuberculosis, R. upper lobe. Came as had slight haemoptysis, otherwise well. Duration 2 weeks. Good reaction 4-20 hours. Clear on 3rd day.

39. Charlotte D. aet. 31. Pulmonary tuberculosis both upper lobes. Mild reaction, 8-24 hours. Clear on 4th day. Duration of disease doubtful.

40. Harold S. aet. 18. Pulmonary tuberculosis, early signs left apex. Good reaction, 4-16 hours. Clear 4th day.

41. Violet B. aet. 12. Pulmonary tuberculosis, left lung, duration 16 months. Good reaction, 4-15 hours. Clear 4th day.

42. John C. aet. 17. Pulmonary tuberculosis, both upper lobes. Good reaction, 6-18 hours. Clear 3rd day. Duration of disease 2½ years.

43. Wm. S. aet. 32. Pulmonary tuberculosis R. lung, L. lower lobe, duration 5 years. Medium reaction, 7-21 hours. Clear 4th day.

44. Samuel W. aet. 23. Pulmonary tuberculosis, L. upper lobe, duration 5 weeks. Reaction good, 4-15 hours. Clear 4th day.

45. Jane G. aet. 25. Pulmonary tuberculosis R. lung, duration 18 months. Medium reaction, 18-24 hours. Clear 3rd day.

46. Frank J. aet. 39. Pulmonary tuberculosis, both lungs, duration 3 years. Mild reaction, 4-20 hours. Clear 3rd day.

47. Beatrice A. aet. 35. Pulmonary tuberculosis, both upper lobes, duration 2 years. Good reaction, 5-17 hours. Clear 4th day.

48. Fanny R. aet. 26. Pulmonary tuberculosis L. upper lobe. No reaction to 2 applications of test. Bacilli demonstrated in sputum. X ray showed mottled condition of L. upper lobe.

49. Wm. S. aet. 23. Pulmonary tuberculosis L. upper lobe, duration 7 months. Bacilli demonstrated in sputum, definite early signs. No reaction obtained.

50. John S. aet. 31. Pulmonary tuberculosis both lungs, larynx involved, duration 3 years.

Good reaction 4-20 hours. Clear 3rd day.

51. James N. aet. 11. Tubercular peritonitis, duration 3 months. Good reaction 3-15 hours. Clear 4th day.

Cases 52-91 unfortunately had not details kept. They were all definite cases of pulmonary tuberculosis. All except 4 reacted.

92. Fanny E. aet. 25. Doubtful case, anaemic, no physical signs, loss of weight, both apices mottled, as shown by X rays. No reaction obtained. Duration 4 months.

93. Wm. R. aet. 27. Doubtful case, occasional crepitations at left apex, percussion unimpaired, no other signs. No reaction. Duration 3 weeks.

94. Alfred M. aet.17. Doubtful case, occasional crepitations at right apex, no other signs. Not feeling well. Duration a few weeks. No reaction.

95. Jane C. aet.32. Mitral disease, crepitations both apices, duration several years, moist sounds limited to apices. No reaction.

96. Wm. C. aet. 15. Left pleural effusion, aspirated, no physical signs remained, right lung healthy,

duration 2 weeks. Good reaction, 5-15 hours. Clear 4th day.

97. Fred L. aet. 54. Doubtful case, dulness and feeble breath sounds L. base, duration 3-4 years. No reaction.

98. Michael S. aet. 27. Doubtful case, slight haemoptysis, no physical signs. Injection of Koch's old tuberculin on 3 occasions with increasing doses gave no result. No reaction.

99. Herbert W. aet. 39. Doubtful case, signs of apparently a thick pleura at left base, duration 2 or 3 years. No reaction.

100. Emily W. aet. 17. Right pleural effusion, followed by left effusion. Good reaction.

101. Mary S. aet. 28. Doubtful case, suspicious signs left upper lobe. Good reaction, 4-12 hours. Clear 3rd day. Reaction reappeared when had a cold 2 or 3 months later. Same occurred each time she had a cold. Occasional attacks of bronchitis. Well 2 years afterwards.

102. John M. aet. 25. Healthy, not under treatment. Good reaction, 4-20 hours. Clear 3rd day.

103. Wm. N. aet. 25. Healthy, not under treatment. Good reaction, 4-15 hours. Clear 2nd day.

104. Anne K. aet. 7. Bronchitis, duration a few days,

cleared up leaving healthy lungs. No reaction.

105. Ch. F. aet. 61. Arterio sclerosis, duration doubtful, X ray examination of chest negative. No reaction. No physical signs in chest. No sputum.

106. Robert T. aet. 30. No physical signs. No reaction.

107. James B. aet. 54. Chronic bronchitis and emphysema. Duration several years. No reaction.

108. Margaret W. aet. 32. Mitral disease, several years' duration. No reaction.

109. Wm. R. aet. 12. Bronchitis, duration a few days. No reaction.

110. Edw. L. aet. 55. Chronic bronchitis and emphysema, several years' duration. No reaction.

111. Wm. H. aet. 34. Influenza, no signs in chest. No reaction.

112. Fred. J. aet. 56. Emphysema. No reaction.

113. James S. aet. 54. Chronic bronchitis. No reaction.

114. Ellen H. aet. 65. Chronic interstitial nephritis, dilated heart. No reaction.

115. Jane K. aet. 45. Diabetes mellitus, bronchitis which cleared up, leaving healthy lungs. No reaction.

116. Rose J. aet. 48. Aortic disease, chronic bronchitis. No reaction.

117. Mary H. aet. 37. Mitral disease. No reaction.

118. Mildred G. aet. 26. No physical signs. Test applied twice, once in each eye. No reaction.

119. John B. aet. 10. Bronchiectasis. No reaction.

120. Herbert I. aet. 14. Bronchitis, cleared up leaving no physical signs. No reaction.

121. Hen. P. aet. 52. Chronic bronchitis. No reaction.

122. Th. M. aet. 23. No physical signs. Test applied 3 times. No reaction.

123. Leonard A. aet. 18. Bronchitis, suspicious signs at left apex disappeared entirely. No reaction.

124. Jane S. aet. 34. Dyspepsia, no signs chest. No reaction.

125. Mary N. aet. 21. Chlorosis, no pulmonary signs, X ray of chest negative. No reaction.

126. Joseph S. aet. 36. Sarcoma of lung. No reaction.

127. Alexander C. aet. 11. Bronchiectasis, injection of Koch's old tuberculin with increasing doses on 3 occasions negative. No reaction.

128. Amy R. aet. 23. Gastric ulcer, haematemesis. No reaction.

129. Wm. B. aet. 43. Aortic disease. No reaction.

130. Constance N. aet. 24. Acute Pneumonia, no bacilli of tubercle in sputum. No reaction.

131. Abraham M. aet. 17. Acute Pneumonia, gangrene of lung, no bacilli in sputum. No reaction.

132. Wm. O. aet. 19. No physical signs. Good reaction. Injection of Koch's old tuberculin 3 times with increasing doses gave a reaction after 3rd injection.

133. Hen. D. aet. 15. Bronchitis, cleared up leaving no signs. Good reaction, 4-16 hours. Clear on 4th day.

134. Fred C. aet. 34. Empyema, thick creamy pus. No reaction.

135. Winifred A. aet. 27. No physical signs. No reaction.

136. Charles J. aet. 24. No physical signs. No reaction.

137. Jane T. aet. 23. Bronchitis, cleared up. Good reaction.

138. Amy W. aet. 37. Neurosis, no pulmonary signs. No reaction.

139. Joseph B. aet. 48. Chronic bronchitis and emphysema. No reaction.

140. Wm. H. aet. 31. No physical signs. No reaction.

141. Adam J. aet. 56. Chronic bronchitis. No reaction.

142. Beatrice M. aet. 47. Neurosis. No reaction.

143. James C. aet. 43. Mitral disease; good reaction, 4-15 hours. Clear on 3rd day.

144. Geo. W. aet. 35. Mitral disease. No reaction.

Cases 145 to 203 where other details, unfortunately, were not kept. They were all cases clinically free from tuberculosis. Two of them gave positive reactions.

CASES OF THE CUTANEOUS TEST.

Unless specially mentioned, it may be concluded that the control exhibited no activity.

1. Alb. P. aet. 20. Hodgkin's disease, 24 hours redness round the test, 30½ hours redness more marked, slight broad raising, 48 hours about the same, 96 hours flatter; 5th day, red, flat, scaly; 11th day about the same; good reaction.

2. Harold H. aet. 12. Mitral disease, subacute rheumatism, 24 hours, almost disappeared, no erythema, no raising; 4th day, nothing. No reaction.

3. Horace W. aet. 10. Tubercular peritonitis, improving 16 hours; erythema, raising, 24 hours, red papule, broad, flat top measures 1 2 c.m. in diameter; 31 hours paler but still raised; 48 hours, larger, marked erythematous ring, edge of papule paler than centre; 72 hours same. 4th day, beginning to subside; gradual subsidence; 3rd week pigment only. Good reaction.

4. Arth. C. aet. 20. Subacute Nephritis. 30 hours slight erythema, no raising; 48 hours erythema,

much more marked, no raising; 72 hours slight elevation, very red; 5th day, same, erythema very irregular at margin; 6th day, onset of subsidence; 7th day, scaling; 3rd week pigmentation. Good reaction.

5. Wm. H. aet. 27. Subacute rheumatism. 23 hours slight redness; control area is slightly red, but less so than the other; 30 hours, same, control shows nothing; 48 hours raised slightly, especially at edges, very red; 6th day, flatter, but still red; 10th day, still slightly raised, redness still marked; 12th day, scaling; 3rd week pigmentation.

6. Harry L. aet. 40. Pernicious anaemia. No reaction.

7. Wm. D. aet. 25. Mitral disease. No reaction.

8. Fred V. aet 19. Subacute rheumatism, convalescent. 18 hours, distinctly raised, red; 29½ hours same; 72 hours subsiding; 120 hours flat, scaly; 9th day, pigmentation only. Medium reaction.

9. John W. aet. 23. Subacute rheumatism. 29½ hours red, raised 1¾ c.m. diameter, slight erythema round it. 72 hours edge of papule composed of small papules; 6th day, subsiding; 8th day,

scaling; end of 2nd week pigmentation. Good reaction.

10. Hen. W. aet. 53. Chronic Interstitial nephritis, uraemia. No reaction.

11. Walter O. aet. 44. Abductor paralysis of cords ? ? tubercular disease of larynx. 18 hours red, raised, 22½ hours good papule 1¾ c.m. diameter; 29½ hours, same with more marked red margin, edges of papule paler than the rest, dimpled centre; 96 hours, beginning to fade; 6th day flatter, scaling; 7th day, flat, red, scaling; 8th day, red and scaling, but became slightly raised again; 11th day, about same, but flat; 3rd week, pigmentation. Good reaction.

12. Thomas C. aet. 8 ? Tubercular disease of larynx. 21 hours, slight redness, no raising; 26 hours, raised, red papule, erythematous ring; 48 hours, edge of papule composed of irregular small papules; 120 hours, redness very marked, otherwise the same, beginning to subside; 6th day flat, scaling and red; end of 3rd week, pigmentation. Good reaction.

13. Wm. Bradley, aet. 7. Tubercular arthritis knees. 21 hours slightly raised, faint erythema ring, slight erythema round the control; 26 hours,

same; 48 hours, erythema almost disappeared; 72 hours, same, erythema much more marked, still raised; 96 hours, red and flat; 11th day, scaling; 3rd week pigmentation. Medium reaction.

14. Fred C. aet. 15. Purpura haemorrhagica. No reaction.

15. Arthur C. aet. 49. Plumbism. No reaction.

16. Wm. J. aet. 32. Appendicitis. 21 hours, quiescent; 26 hours, much of it has disappeared; 48 hours, same, no raising; 96 hours, ring of small papules surrounding a depression, centre of depression shows no activity, erythematous ring; 6th day, subsiding; 10th day, still slightly raised, red; 11th day, scaling; 3rd week, pigment good, but late reaction.

17. James A. aet. 22. Tonsilitis. No reaction.

18. Joseph H. aet. 16. Pneumonia, convalescing. 20 hours, slight erythema, raised papule, 1 c.m. diameter; 26 hours slightly less raised, otherwise same; 48 hours, papule still less; 168 hours, reddish, flat; 8th day, scaling slightly; 10th day, pigment only. Weak reaction.

19. Humphry S. aet. 28. Sciatica. No reaction.

20. Walter B. aet. 22. Subacute rheumatism. 18 hours, no raising, slight erythema; 21 hours, slight elevation; control also slightly elevated; 48 hours, control subsided, raised, red papule, good erythematous ring, edge of papule composed of small papules; 120 hours, beginning to fade; 6th day, red, flat; 8th day, scaling; 3rd week, pigment only. Good reaction.

21. Jack K. aet. 21. Mitral disease. No reaction.

22. Alfred H. aet. 36. Pleural effusion. 18 hours slight erythematous ring; 21 hours, same, no raising; 48 hours, marked erythema, no raising; 72 hours, same; 96 hours, same; 120 hours, same; 7th day, redness is less; decreased daily leaving pigmentation at 3rd week. Feeble reaction.

23. Charles M. aet. 11. Tubercular hip. 16 hours slight erythema ring, slight elevation; 24 hours, same; 4th day, beginning to subside; 10th day, flat, red, scaling; 3rd week, pigmentation, still red.

24. George G. aet. 19. Injury to finger. Healthy. No reaction.

25. John F. aet 16. Tubercular peritonitis. No reaction.

26. Frank C. aet. 46. Tubercular Knee. 18 hours marked erythema, red papule, not seen again.

27. Wm. R. aet. 21. Tubercular Knee. No reaction.

28. Thomas Walker, aet. 5. Pulmonary tuberculosis. 24 hours slightly raised papule, red, no erythematous ring. Not seen again.

29. Eliz. Watts, aet. 49. Pleural effusion. 24 hours, red, no elevation; 48 hours, slight elevation, erythematous ring; 72 hours, same; 5th day, subsiding; 10th day, red, flat, scaling; 21st day, still red.

30. Alice F. aet 38. Mitral disease. 16 hours, erythematous ring; 24 hours, red, raised papule; 48 hours, edges of papule white, surrounded by an oedematous swollen area measuring 5 x 8½ c.m., painful (fomented) red line 1 c.m. broad extending up to axilla; 72 hours, all disappeared, except well formed papule with papulation of edges, erythematous ring; 120 hours, subsiding; 144 hours, flatter; 7th day, red, flat; 10th day, scaling; 4th week, still red; 5th week, pigment. Severe reaction

31. Anne M. aet. 20. Subacute rheumatism. 18 hours slight redness and erythematous ring; 24 hours, red and raised slightly; 48 hours, edges split up into papules; 120 hours, small haemorrhages into edges of papule; 144 hours, same; 168 hours, still red and raised, papules at edge flatter; 8th day, still raised; 12th day, haemorrhages gone, red, flat; 14th day, scaling. Still red in 4th week. Good reaction.

32. Mary C. aet. 26. Subacute rheumatism. 18 hours slight raising, red, erythema ring; 24 hours, good papule, with whitish edge; 48 hours, same; 120 hours, papule has increased in size, narrow erythematous ring; 144 hours, small haemorrhages in the edge of the papule; papule still good with edge composed of smaller papules; 7th day, redness has gone, papule still good; 8th day, subsiding; 10th day, scaling, flat; 16th day, pigmentation. Good reaction.

33. Beatrice B. aet. 11. Subacute rheumatism. No reaction.

34. May Y. aet. 23. Pleurisy (dry). No reaction.

35. Daisy Worton aet. 19. Subacute rheumatism.

36. Sarah M. aet. 43. Carcinoma of pylorus. 24 hours, small papule, red, slight erythematous ring; 5th day, subsiding; 6th day, reddish, flat; 8th day, almost disappeared; 2nd week, pigmentation. Feeble reaction.

37. Fanny S. aet. 16. Enteric. No reaction.

38. Evelyn M. aet. 15. Neurosis. No reaction.

39. Selina McD. aet. 47. Morbus Cordis. No reaction.

40. Ellen P. aet. 22. Subacute rheumatism. 19 hours slight erythematous ring; 24 hours, papule, with red margin; 48 hours, edge of papule composed of smaller papules, erythema more marked; 5th day, subsiding; 7th day, still slightly raised; 8th day, flat reddish, scaling; 3rd week; pigmentation, still rather red. Good reaction.

41. Mary H. aet. 19. Hysteria. No reaction.

42. Emma W. aet. 24. Rheumatism. 18 hours, slight redness and ring of erythema; 24 hours, raised papule, ring and redness more pronounced; 7th day, still raised and red; 9th day, same; 10th day, subsiding; 11th day, flat, scaling; 25th day, pigmentation. Feeble reaction.

43. Florrie B. aet. 19. Neurosis. No reaction.

44. Nellie E. aet. 22. Subacute nephritis. 24 hours, slight redness and injection around; 48 hours, same; 72 hours, nil; 6th day, red, raised, slight erythematous margin; 8th day, same; 10th day, subsiding; 11th day, reddish, scaling; 4th week, pigmentation. Delayed reaction.

45. Edith G. aet. 10. Chorea. No reaction.

46. Lizzie T. aet. 11. Morbus Cordis. No reaction.

47. Nora H. aet. 10. Lupus vulgaris. 16 hours, redness, ring of erythema; 22 hours, red, raised papule; 48 hours, edges of papule composed of smaller papules, almost no erythematous ring now present; 72 hours, subsiding; 6th day, flat, red; 7th day, same; 8th day, flat, no redness, scaling. Good reaction. Test was repeated 14 days later, the papule being rather broader, and the ring of erythema very marked. Good reaction.

48. Mary N. aet. 18. Neurosis. 18 hours reddish; 24 hours, raised papule, with whitish edge, erythematous ring well developed; 48 hours, edge of papule irregularly split up into rather badly formed small papules; 5th day, subsiding; 7th day, flat, reddish, scaling;

3rd week, pigmentation. Good reaction.

49. Mary P. aet. 24. Neurosis. 24 hours, red papule, slight erythematous ring; 48 hours, edge composed of very numerous, well formed small papules, encircling a depression; 144 hours same; 7th day, beginning to subside; 8th day, flatter; 9th day, flat; 10th day, scaling; 4th week, pigmentation.

50. Hetty S. aet. 13. Subacute rheumatism. No reaction.

51. Henry R. aet. 30. Tubercular ankle. No reaction.

52. Mary J. aet. 5. Tubercular hip. 18 hours, red, erythematous ring; 24 hours, same with some elevation; 60 hours, same; 90 hours, erythema very marked, small haemorrhages at edge of papule; 5th day, reddish, subsiding; 10th day, flat, still red; 13th day, pigment. Good reaction.

53. Alice E. aet. 5. Tubercular hip. 24 hours, raised, red, erythema ring; 48 hours, erythema very marked; 6th day, subsiding; 8th day, scaling; 3rd week, pigment.

54. Florrie N. aet. 4. Tubercular hip. 18 hours, some redness and ring of injection; 48 hours,

slight elevation; 7th day, same; 8th day, subsiding; 10th day, flat, scaling; 3rd week, pigment. Medium reaction.

55. Cyril H. aet. 9. Diphtheria. No reaction.

56. Harry M. aet. 18. Tubercular appendix. No reaction.

57. John F. aet. 24. Pyogenic abscess neck. 24 hours, raised, red, no ring; 48 hours, same; 6th day, red, raised, ring of erythema now present; 7th day, fading; 9th day, flat and scaling. Feeble reaction.

58. Geo. P. aet. 42. Septic hand. 24 hours, nil; 48 hours, slight elevation, slight erythema ring; 3rd day, subsiding; 2nd week, pigment. Feeble reaction.

59. Minnie B. aet. 14. Abscess face. No reaction.

60. Esther B. aet. 25. Pelvic abscess from gonorrhoeal salpingitis. 24 hours, nil; 48hours, slight raising, erythematous ring; 4th day, subsiding; 6th day, flat and scaling; 2nd week, pigment. Feeble reaction.

61. Emily B. aet. 31. Plumbism. No reaction.

62. Arthur Murray aet. 25. Pulmonary Tuberculosis right upper lobe duration 1 year. No reaction.

63. Wm. G. aet. 7. No physical signs. No reaction.

64. Mary B. aet. 32. Neurosis. No reaction.

65. Wm. C. aet. 16. Tubercular peritonitis. 16 hours, slightredness; 24 hours, slight elevation, no erythema ring; 48 hours, subsided; 5th day, almost disappeared; 2nd week, pigmentation. Very feeble reaction.

66. Harriet B. aet. 63. Epithelioma foot. 24 hours, slight raising, red; 72 hours, same, with slight papulation of edge; not seen again. Medium reaction.

67. Kate O'C. aet. 16. Rheumatism. No reaction.

68. Nellie C. aet. 6. Chorea. No reaction.

69. Agnes F. aet 8. Tubercular glands, neck. 18 hours, red, raised; 36 hours, good papule, with irregular erythematous ring; 48 hours, same; 4th day, flat, slightly red; 7th day, scaling; 3rd week, pigment. Good reaction.

70. Charles W. aet. 19. Pulmonary tuberculosis. 48 hours, red, slight raising, slight erythema ring; 60 hours, erythema more marked; 6th day, subsiding; 8th day, reddish, flat, scaling; 20th day, pigment. Feeble reaction.

71. Ethel W. aet. 16. Mitral disease. No reaction.

72. Albert. E. aet. 20. Pulmonary tuberculosis. No reaction.

73. George W. aet. 42. Pulmonary tuberculosis, duration 3 years, plural effusion. No reaction.

74. Elsie A. aet. 11. No physical signs. No reaction, also no reaction to 3 injections of increasing doses of Koch's old tuberculin, but reacted to the percutaneous test (a late reaction.

Second cutaneous test made 3 days later gave a good reaction.

75. Isabella F. aet. 8. Chorea. 14 hours, slight raising, reddish; 24 hours, nil. No reaction.

76. Martha E. aet. 34. Subacute nephoritis. No reaction.

77. John A. aet. 45. No physical signs. No reaction.

78. Martha H. aet. 11. Tubercular hip. No reaction.

79. Gladys H. aet. 12. Tubercular hip. 15 hours, slight erythematous ring, no raising, no redness; 24 hours, raised; 36 hours, white papule with slight erythema ring; 7th day, beginning to subside; 8th day, red, flat; 10th day, scaling; 4th week, pigmentation only. Good reaction.

80. Elsie V. aet. 7. Tubercular necrosis tibia.

15 hours red, no raising, irregular erythema; 24 hours, raised, slight irregularity of edge of papule; 36 hours, good, white papule, with faint erythema ring; 120 hours, same, but redness more marked; 7th day, beginning to subside; 8th day, slight raised, redness much less; 9th day, reddish, flat, scaling; 3rd week, pigmentation only. Good reaction.

81. Ronald B. aet. 4. Tubercular empyema. 3 hours reddish, slightly raised; 6 hours, redness less raised; 24 hours, very red, slight raising, faint erythema ring; 48 hours, same, with very irregular erythema round it; 96 hours, red, slightly raised, not a very good papule; 5th day, flatter; 7th day, red, flat, scaling; 3rd week, pigmentation. Medium reaction.

82. Annie W. aet. 21. Morbus Cordis. No reaction.

83. Fred B. aet. 34. Doubtful pulmonary tuberculosis No reaction.

84. Emily L. aet. 23. Syphilis (tertiary). No reaction.

85. Ethel J. aet. 24. Morbus Cordis. No reaction.

86. Harold H. aet. 18. Tubercular ? laryngitis. No reaction.

87. Cyril B. aet. 1½. Glands in neck enlarged. 17

hours, slight raising, reddish; 42 hours, red papule, with edges composed of smaller papules, faint erythema ring. Not seen again. Good reaction.

88. Isaac R. aet. 22. Tertiary syphilis. No reaction.

89. Kate H. aet. 19. Pulmonary tuberculosis; 36 hours, slight, red, raising; 42 hours, good papule, with good erythematous ring; 70 hours, subsiding; 4th day, very little remains. Good reaction.

90. Edw. M. aet. 55. Pulmonary tubercolisis, duration several years. No reaction.

91. Arthur C. aet. 19. Pneumonia. 19 hours, slight, red, and raised; 48 hours, same; 3rd day, subsiding; 5th day, disappeared. Slight evanescent reaction.

92. George H. aet. 42. Rheumatism. No reaction.

93. George N. aet. 40. Chronic Interstitial nephritis. No reaction. Injection of first dose of Koch's old tuberculin caused temperature to rise to 100.4 F.

94. John R. aet. 51. Cirrhosis of Liver. 18 hours, very red, marked erythema ring, slight raising; 28 hours, same; 4th day, subsiding;

5th day, flatter, redness and erythema less; 6th day, reddish, flat, scaling; 13th day, same; 3rd week, pigment. Medium reaction.

95. Sarah S. aet. 28. Pulmonary tuberculosis. L. upper lobe, duration 7 months. No reaction.

96. Jessie M. aet. 30. No physical signs. Not under treatment; 16 hours, red, erythematous ring; 18 hours, slightly raised; 43 hours, good papule with slight division of edge; about one inch proximal to the papule are a few petechial haemorrhages, good erythematous ring; 7th day, beginning to subside; 10th day, flat, scaling; 17th day, still red; 4th week, pigmentation. Good reaction.

97. Ethel W. aet. 15. Morbus Cordis. 2nd Test. 18 hours, red, raised, erythema ring; 48 hours, more marked; 5th day, subsiding; 7th day, red, flat; 8th day, scaling; 3rd week pigmentation. Good reaction.

98. Nora H. aet. 10. Lupus. See No. 47.

99. Nellie C. aet. 9. Tubercular glands abdomen. No reaction.

100. Jane K. aet. 25. No physical signs. No reaction.

101. Fanny M. aet. 27. No physical signs, not under treatment. 20 hours broad erythema ring; 36 hours, red, raised papule; 5th day, beginning to subside; 8th day, flat, scaling. Good reaction.

102. John Q. aet. 29. No physical signs, not under treatment. Good reaction.

103. Leo S. aet. 29. Pulmonary tuberculosis, left upper lobe, duration 3 months; 24 hours, red, raised, faint erythema ring; 48 hours, reddish, slightly raised, altogether less marked; 3rd day, flat, reddish; 5th day, slight, scaling; 2rd week, pigmented. Feeble reaction.

104. Isaiah W. Conjenital syphilis. No reaction.

105. Mariah S. aet. 27. Plumbism. No reaction.

106. Henry B. aet. 31. Enteric. No reaction.

107. Wm. R. aet. 19. Pneumonia. No reaction.

108. Rose B. aet. 36. Constipation; 20 hours, reddish, slight raising, slight ring of erythema; 40 hours, good red papule, edges composed of smaller papules, erythema marked; 4th day, slightly less; 7th day, red, flat; 10th day, reddish, scaling; 3rd week, pigmentation. Good reaction.

109. Emma W. aet. 21. Peptic Ulcer. 16 hours, slight, redness; 20 hours, slight elevation; 60 hours, very red, good papule, no erythematous ring; 80 hours, same; 5th day, subsiding, still red; 6th day, paler; 8th day, almost flat; 10th day, scaling. No erythematous ring appeared at all. Good reaction.

110. May S. aet. 14. Subacute nephritis. 20 hours, reddish, slight erythema ring, no elevation; 40 hours, same; 60 hours, cluster of half dozen irregular papules forming an irregular ring; 80 hours, redness more marked; 5th day, slightly less and paler; 7th day, reddish, almost flat; 9th day, redness much less; 11th day, scaling; 3rd week, pigmentation. Good reaction.

111. Florence L. aet. 11. Pneumonia. No reaction.

112. Daisy G. aet. 9. Chorea. No reaction.

113. Minnie B. aet. 18. Pneumonia. 20 hours, red, raised; 36 hours, same; 40 hours, subsiding; 4th day, flat, red; 6th day, scaling. Short but definite reaction.

114. James R. aet. 67. Myotarditis. No reaction.

115. Lily M~~agness~~, aet. 25 ? Tubercular larynx. 19 hours, red, no raising; 48 hours, redness

more marked, erythema ring, small irregular papules (4 in number); 4th day, same; 5th day, subsiding; 7th day, flat. Good reaction.

116. Elizabeth N. aet. 38. Enteric. No reaction.

117. Nellie R. aet. 8. Enteric. No reaction.

118. Lily C. aet. 9. Enteric. No reaction.

119. Charlotte B. aet. 29. Enteric. No reaction.

120. Arthur M. aet. 14. Sclerosis cord. 19 hours, redness, no raising; 43 hours, same; 72 hours, subsiding; 96 hours, flat. Feeble reaction.

121. Annie S. aet. 21. Gastric ulcer. 24 hours, nil; 40 hours, raised papule; ring of erythema; 48 hours, papule with white edge split up into smaller papules, good erythematous ring; 4th day, beginning to subside; 7th day, almost flat; still redness; 9th day, scaling; 3rd week, pigmentation. Good reaction.

122. Thomas T. aet. 32. Renal Calculus, X Ray confirmed it; 60 hours, reddish, irregular erythematous margin, no raising; 96 hours, slight elevation, large, irregular area of erythema; 120 hours, same; 6th day, crimson, irregular, flat area resembling a naevus; some small haemorrhages scattered over this

area which measures 4 x 2½ c.m.; 8th day, redness less, haemorrhages more obvious; 12th day, haemorrhages absorbed; 14th day, scaling; 4th week, pigmentation only. Good reaction.

123. May E. aet. 38. Pulmonary tuberculosis. No reaction.

124. George L. aet. 42. Pulmonary tuberculosis, No reaction.

125. Margaret W. aet. 35. Pulmonary tuberculosis. No reaction.

126. Samuel B. aet. 37. Pulmonary tuberculosis. No reaction.

127. John O. aet. 9. Purpura. 48 hours, redness, ring of erythema, no raising; same up to 4th day; gradually faded in the succeeding few days. Feeble reaction.

128. Mary P. aet. 34. Pulmonary tuberculosis, duration 18 months. No reaction.

129. Horace M. aet. 23. Tubercular Kidney (operation). No reaction.

130. Joseph A. aet. 32. Sarcoma iliac bone. No reaction.

131. Wm. Cliff. aet. 52. Pulmonary tuberculosis. 5 years. No reaction.

132. George K. aet. 11. Tubercular peritonitis. 20 hours, slight redness; 48 hours, redness, raised with marked elevation of edge of papule; 5th day, subsiding; 7th day, flat, scaling; 3rd week, pigmentation. Medium reaction.

133. Wm. Ward aet. 16. Pneumonia. No reaction.

134. Joseph B. aet. 21. Pneumonia. No reaction.

135. Wm. H. aet. 12. Morbus Cordis. 7 hours, reddish, quite raised, faint erythema ring. Control slightly red; 24 hours, more marked, control subsided; 5th day, subsiding; 7th day, scaly. Feeble reaction, early.

136. Benj. C. aet. 12. Enteric. 14 hours redness, slight erythema ring, slight elevation; 48 hours, same; 60 hours, erythema more pronounced; 4th day, subsiding, redness less; 6th day slight desquamation; 3rd week, pigmentation only. Feeble reaction.

137. Nellie J. aet. 25 ? Psoas abscess. No reaction.

138. Nellie C. aet. 15. Enteric. No reaction.

139. Gladys R. aet. 12. Enteric. No reaction.

140. Fred B. aet. 23. Indicanuria. No reaction.

141. John N. aet. 35. Enteric. No reaction.

142. Wm. B. aet. 25. Psoas abscess. 16 hours,

slight erythema ring, slight redness; 28 hours, slight elevation; 7th day, erythema still present, scaling. Feeble reaction.

143. Alfred N. aet. 9. Tubercular sinus. No reaction.

144. Roy M. aet. 11. Tubercular hip. 18 hours, very red, irregular, erythematous ring, very slight elevation; 21 hours, same, but erythema more pronounced; 7th day, same; 8th day, beginning to subside; 10th day, flat, still very red, scaling; 3rd week, still red; 5th week, pigmentation. Good reaction.

145. Fred W. aet. 10. Tubercular hip. 15 hours, slight elevation, erythema ring; 48 hours, same, not seen again. Medium reaction.

146. Reginald B. aet. 7. Tubercular disease tibia. 18 hours, nil; 21 hours, slightly red; 48 hours same, moderate erythema ring; 7th day, still good erythema, scaling; 3rd week, pigment. Feeble reaction.

147. Winifred W. aet. 28. Psoas abscess. No reaction.

148. Hilda W. aet. 21. Tubercular salpingitis. No. reaction.

149. Ada Meddick aet. 34. Pyonephrosis. No reaction.

150. May R. aet 11. Tubercular hip. No reaction.

151. Mildred C. aet. 6. Pulmonary tuberculosis. Good reaction.

152. Norah R. aet. 24. Tubercular abscess, abdominal wall. No reaction.

153. Charles W. aet. 23. Pulmonary tuberculosis. No reaction.

154. Jesse A. aet. 35. Tubercular femur. No reaction.

155. Alice F. aet. 32. Tubercular nephritis. No reaction.

156. John B. aet. 26, Pulmonary tuberculosis. No. reaction.

157. Arthur G. aet. 29. Chronic Bronchitis. No reaction.

158. Joseph G. aet. 45. Pulmonary tuberculosis. No reaction.

159. Percy W. aet. 23. Pulmonary tuberculosis, left upper lobe, duration 1 year; 24 hours, red, slight ring of erythema, no raising; 48 hours, same; 5th day, very slight redness, no ring; 6th day, scaling; 2rd week, pigmentation. Feeble reaction.

160. Leonard R. aet. 45. Pulmonary tuberculosis. 18 hours, reddish; 24 hours, slight elevation,

no erythema ring; 5th day, same; 6th day, scaling, redness almost gone. Feeble reaction.

The case had involvement of both lungs.

161. Samuel R. aet. 49. Pulmonary tuberculosis, duration 4-5 years, both lungs involved; 24 hours, nil; 48 hours, slight white elevation, nothing else; persisted for 3 days then disappeared, no scaling; 2nd week, slight pigmentation. Feeble reaction.

162. Charles C. aet. 27. Pulmonary tuberculosis. No reaction.

163. Edward B. aet. 27. Pulmonary tuberculosis. No reaction.

164. John F. aet. 35. Pulmonary tuberculosis. No reaction.

165. Wm. B. aet. 32. Pulmonary tuberculosis. No reaction.

166. Wm. R~~ogers~~ aet. 44. Pulmonary tuberculosis. No reaction.

167. Henry C. aet. 64. Pulmonary tuberculosis, both lungs extensively involved, duration several years; 24 hours, reddish, slight ring of erythema; 48 hours, raised papule, reddish, with ring of erythema; 4th day,

same; 5th day, beginning to subside; 7th day, flat; 9th day, scaling; 3rd week, pigmentation. Medium reaction.

168. Samuel H. aet. 47. Pulmonary tuberculosis, advanced. 7 years. No reaction.

169. Arthur B. aet. 52. Advanced Pulmonary tuberculosis. 5 years duration. No reaction.

170. Charles W. aet. 52. Advanced Pulmonary tuberculosis. 5 years duration. No reaction.

171. Geo. S. aet. 40. Pulmonary tuberculosis, both lungs. No reaction.

172. Wm. ~~Packer~~, aet. 54, Pulmonary tuberculosis, both lungs. 4 years. No reaction.

173. Thomas H. aet. 66. Pulmonary tuberculosis (advanced). 10 years. No reaction.

174. John ~~Allen~~ aet 51. Pulmonary tuberculosis (advanced). 7 years. No reaction.

175. John Q. aet. 55. Pulmonary tuberculosis, both lungs. 8 years. No reaction.

176. Joseph S. aet. 63. Pulmonary tuberculosis, both lungs. Not very active, 8 years. No reaction.

177. Louie C. aet. 14. Pulmonary tuberculosis. 16 hours, reddish, no elevation; 24 hours, erythematous ring; 40 hours, slight elevation

at edge, red, no erythematous ring; 3rd day, fading; 5th day, flat, scaling. Feeble reaction.

178. Mabel C. aet. 19. Pulmonary tuberculosis, both upper lobes, duration 2 years; 14 hours, marked ring of erythema; 16 hours, slight elevation; 40 hours, flat and red, erythema still marked; 5th day, flat, still erythema; 6th day, fading; 10th day, scaling; 3rd week, pigmentation. Feeble reaction.

179. Agnes B. aet. 49. Pulmonary tuberculosis, vomica both upper lobes, duration 18 months; 14 hours, slight ring of erythema; 16 hours, raised; 40 hours, raised, ring of erythema, edge of papule elevated; 3rd day, subsiding; 5th day, almost gone. Medium evanescent reaction.

180. Winnie L. aet. 16. Pulmonary tuberculosis. Both upper lobes, 18 months duration. 16 hours, red, with ring developed; 40 hours, same; 4th day, same; 5th day, fading; 7th day, scaling; 3rd week pigment. Feeble reaction.

181. Mildred C. aet. 6. Pulmonary tuberculosis, duration doubtful, left apex involved.

14 hours faint broad erythema; 16 hours ring more marked, breadth ¼ inch, good deal of swelling, 1 inch in diameter, centre surmounted by small well-formed vesicles; 40 hours more marked, vesicles dried up in about 12 hours; 4th day subsiding; 5th day flat, erythema still present; 7th day almost gone; 9th day, scaling; 3rd week pigmentation. Good reaction.

182. Nellie F. aet. 8. Pulmonary tuberculosis, left upper lobe, duration doubtful; 16 hours reddish, slight erythema ring, slight elevation; 40 hours more marked; 5th day edges of papule raised and white, 2 small haemorrhages present; 7th day subsiding; 10th day flat, scaling; 3rd week pigmentation. Good reaction.

183. Ada F. aet. 22. Pulmonary tuberculosis, both upper lobes, 3 years duration; 16 hours red, slight erythema ring; 24 hours slight elevation, 40 hours same, but erythema is pronounced and broad; 5th day same; 6th day subsiding; 8th day flat, red, scaling; 4th week pigmentation. Medium reaction.

184. Emma H. aet. 34. Pulmonary tuberculosis. Both upper lobes, duration 10 months.

16 hours, faint, narrow erythematous ring; 24 hours, papule present; 40 hours, edge of papule elevated and white, centre red; 4th day, subsiding; 6th day, flat, reddish, still faint ring; 8th day, scaling; 4th week, pigment. Good reaction.

185. Mary C. aet. 30. Pulmonary tuberculosis. Duration 3 years. No reaction.

186. Emma B. aet. 29. Pulmonary tuberculosis. Both upper lobes. Duration 10 years. 16 hours, red, ring of erythema; 24 hours, papule; 40 hours, edge of papule composed of small papules, ring more marked; 4th day, subsiding; 5th day, flat, erythema very marked; 7th day, scaling, still red; 3rd week, pigmentation. Good reaction.

187. Ruth A. aet. 62. Pulmonary tuberculosis. Both lungs, duration 5 years. No reaction.

188. Lottie B. aet. 24. Pulmonary tuberculosis. Left upper lobe, duration 16 months; 24 hours, erythematous ring; 36 hours, elevated; 3rd day, subsiding; 2nd week, pigmentation. Feeble reaction.

189. Florence B. aet. 16. Pulmonary tuberculosis, left apex, 2 months duration; 16 hours, slight, red, no erythematous ring; 24 hours, ring developed; 36 hours, marked ring, redness, no elevation; 3rd day, subsiding; 5th day, flat, scaling; 10th day, pigmentation. Feeble reaction.

190. Laura T. aet. 34. Pulmonary tuberculosis. Both lungs, 18 months duration; 14 hours, ring of erythema, redness; 16 hours, ring marked, moderate elevation; 40 hours, broad erythema ring, good papule; 5th day, same; 7th day, beginning to subside; 10th day, flat, scaling; 3rd week, pigmentation; good reaction.

191. Jennie B. aet. 13, Pulmonary tuberculosis. Left lung, 4 months duration. 14 hours, redness, ring of erythema; 16 hours, both more pronounced; 40 hours, ring very broad, good papule; 5th day, flat, erythema still present; 9th day, scaling; 4th week, pigmentation. Good reaction.

192. Mary T. aet. 42. Pulmonary tuberculosis. Both upper lobes, duration 18 months. 12 hours, slight erythema ring, redness; 16 hours, some elevation; 40 hours, same; 5th day, subsiding;

7th day, flat; 3rd week, pigmentation.
Medium reaction.

193. Wm. B. aet. 33. Pulmonary tuberculosis. Duration 3 years, both lungs. No reaction.

194. Eliza F. aet 20. Pulmonary tuberculosis. Good reaction.

195. James W. aet 32. Tubercular Knee. No reaction.

CASES OF PERCUTANEOUS TEST.

1. Elizabeth W. aet. 49. Pleural effusion. No reaction. Gave V.P. positive.
2. Alice F. aet. 38. Morbus cordis; 36 hours 6 papules, 48 hours pustules, 72 hours subsiding, 7th day disappeared; pigmentation; good reaction; gave V.P. positive.
3. Anne M. aet. 20. Subacute rheumatism; 48 hours one papule, 96 hours fading; 7th day gone. Feeble reaction, gave V.P. positive.
4. Mary C. aet. 36. Subacute rheumatism; 24 hours 3 papules, 144 hours fading; 8th day scaling. Feeble reaction, gave V.P. positive.
5. Beatrice B. aet. 11. Subacute rheumatism; no reaction. Gave V.P. negative.
6. Mary Y. aet. 23. Pleurisy (dry). No reaction. Gave V.P. negative.
7. Daisy W. aet. 19. Subacute rheumatism. No reaction, gave V.P. negative.
8. Sarah M. aet. 43. Carcinoma of pylorus. No reaction. Gave V.P. positive.
9. Fanny S. aet. 16. Enteric. No reaction. Gave V.P. negative.
10. Evelyn M. aet. 15. Neurosis. No reaction. Gave V.P. negative.

11. Selina McD. aet. 47. Morbus cordis. No reaction. Gave V.P. negative.

12. Ellen P. aet. 22. Subacute rheumatism. No reaction. Gave V.P. positive.

13. Mary H. aet. 19. Hysteria. No reaction. Gave V.P. negative.

14. Emma W. aet. 24. Rheumatism. No reaction. Gave V.P. positive.

15. Florrie B. aet. 19. Neurosis; 96 hours crop of very small papules, 6th day subsiding, 8th day scaling. Late feeble reaction. Gave VP negative.

16. Nellie E. aet. 22. Subacute nephritis. No reaction. Gave V.P. positive.

17. Edith G. aet. 10. Chorea. No reaction. Gave V.P. negative.

18. Lizzie T. aet. 11. Morbus cordis. No reaction. Gave V.P. negative.

19. Nora H. aet. 10. Lupus vulgaris. 16 hours crop of papules, 18 hours vesicles, 24 hours pustules, 4th day subsiding, 7th day flat, scaling. Good reaction. Gave V.P. positive.

20. Mary N. aet. 18. Neurosis. No reaction. Gave V.P. positive.

21. Mary P. aet. 42. Neurosis. No reaction. Gave V.P. positive.

22. Hetty S. aet. 13. Subacute rheumatism. No reaction. Gave V.P. negative.

23. Albert P. aet. 20. Hodgkins disease. 24 hours two papules, 48 hours same, 72 hours few small papules, 4th day fading, 7th day flat. Feeble reaction. Gave V.P. positive.

24. Harold H. aet. 12. Morbus cordis. No reaction; gave V.P. negative.

25. Horace W. aet. 10. Tubercular peritonitis. No reaction. Gave V.P. positive.

26. Arthur C. aet. 20. Subacute nephritis. No reaction. Gave V.P. positive.

27. Wm. H. aet. 27. Subacute rheumatism. No reaction. Gave V.P. positive.

28. Harry L. aet. 40. Pernicious anaemia. No reaction. Gave V.P. negative.

29. Wm. D. aet. 25. Morbus cordis. No reaction. Gave V.P. negative.

30. Fred. V. aet. 19. Rheumatism. No reaction. Gave V.P. positive.

31. John W. aet. 23. Subacute rheumatism. No reaction. Gave V.P. positive.

32. Henry W. aet. 53. Chronic Interstitial nephritis, uraemia, no reaction. Gave V.P. negative.

33. Walter O. aet. 44? Tubercular laryngitis. 18

hours four very red papules, erythematous areas round them, 36 hours pustular, 6th day increased in size, 10th day subsiding, 14th day flat, scaly. Feeble reaction. Gave V.P. positive.

34. Thomas C. aet. 8? Tubercular laryngitis. 16 hours crop of papules, 20 hours larger, 24 hours vesicular, 36 hours pustular, 6th day subsiding, 7th day scaling, 8th day flat, 20th day remains still present. Good reaction. Gave V.P. positive.

35. Wm. B. aet. 7. Tubercular arthritis knees. No reaction. Gave V.P. positive.

36. Fred C. aet. 15. Purpura haemorrhagica. No reaction. Gave V.P. negative.

37. Arthur C. aet. 49. Plumbism. No reaction. Gave V.P. negative.

38. Wm. J. aet. 32. Appendicitis. No reaction. Gave V.P. positive.

39. James A. aet. 22. Tonsilitis. No reaction. Gave V.P. negative.

40. Joseph H. aet. 16. Pneumonia. No reaction. Gave V.P. positive.

41. Humphry S. aet. 28. Sciatica. No reaction. Gave V.P. negative.

42. Walter B. aet. 22. Rheumatism. 24 hours crop of papules, 48 hours pustular, 6th day still good crop, 7th day same. Good reaction. Gave V.P. positive.

43. Jack K. aet. 21. Morbus Cordis. No reaction. Gave V.P. negative.

44. Alfred H. aet. 36. Pleural effusion. No reaction. Gave V.P. positive.

45. Amy H. aet. 24. Healthy. No reaction. Gave V.P. positive.

46. Harry R. aet. 30. Tubercular ankle. No reaction.

47. Agnes F. aet. 8. Tubercular hip. 24 hours few small papules, 3rd day same, 4th day fading, 6th day scaling. Feeble reaction.

48. Mary J. aet. 5. Tubercular hip. No reaction. Gave V.P. negative.

49. Alice E. aet. 5. Tubercular ankle. 20 hours crop of papules (small), 48 hours fading, 3rd day flat. Feeble reaction. Gave V.P. positive.

50. Florrie N. aet. 4. Tubercular hip. No reaction. Gave V.P. positive.

51. Charles M. aet. 11. Tubercular hip. No reaction. Gave V.P. positive.

52. Harold S. aet. 2. Empyema. No reaction.

53. Nellie T. aet. 7. No physical signs. No reaction.

54. Richard B. aet. 4. Pneumonia. 6th day few small papules appeared, 7th day same, 8th day fading. Feeble late reaction.

55. Dennis W. aet. 5. Infantile paralysis. No reaction.

56. Leslie B. aet. 5. Congenital cardiac disease. No reaction.

57. Fanny C. aet. 2. Subacute nephritis. No reaction.

58. Wm. J. aet. 2. No physical signs. No reaction.

59. Cyril T. aet. 4. No physical signs. No reaction.

60. Alice P. aet. 3. Infantile paralysis. No reaction.

61. Edith K. aet. 1. No physical signs. No reaction.

62. Wm. J. aet. 2. Fract. femur. No reaction.

63. Percy K. aet. 3. No physical signs. No reaction.

64. Oliver W. aet. 2. Tubercular abscess neck. Nothing until 7th day, when large crop of papules appeared, 9th day fading, 11th day absent. Late reaction.

65. Cyril H. aet. 9. Diphtheria. No reaction. Gave V.P. negative.

66. Ronald R. aet. 4. Pneumonia. No reaction.

67. Harry M. aet. 18. Tubercular appendix. No reaction. Gave V.P. negative.

68. George P. aet. 42. Septic hand. No reaction. Gave V.P. positive.

69. Wm. V. aet. 2. Burns. No reaction.

70. Minnie B. aet. 14. Abscess face. No reaction. Gave V.P. negative.

71. Esther B. aet. 25. Petric[lv] abscess. No reaction. Gave V.P. positive.

72. Emily B. aet. 31. Plumbism. No reaction. Gave V.P. negative.

73. Dennis B. aet. 5. Diphtheria. No reaction.

74. John T. aet. 5. Diphtheria. No reaction.

75. Arthur M. aet. 25. Pulmonary tuberculosis, right upper lobe, duration 9 months. No reaction. Gave V.P. negative.

76. Wm. G. aet. 7. No physical signs. No reaction. Gave V.P. negative.

77. Wm. C. aet. 16. Tubercular peritonitis. No reaction. Gave V.P. positive.

78. Lilian C. aet. 25. Enteric. No reaction.

79. Sarah P. aet. 11. Tubercular glands neck. No reaction.

80. Agnes S. aet. $1\frac{5}{12}$. Diphtheria. No reaction.

81. Hilda J. aet. 7. Tubercular glands neck. 36 hours crop of papules, 48 hours some converted into pustules, 5th day beginning to subside, 7th day scaling. Good reaction.

82. Mary W. aet. 7. Hare lip. 72 hours small crop of papules, well maintained to 7th day, no pustules, 8th day subsiding, 11th day scaling. Good reaction.

83. Charles W. aet. 19. Pulmonary tuberculosis, 18 months, left upper lobe. No reaction. Gave V.P. positive.

84. Ethel W. aet. 16. Mitral disease. No reaction. Gave V.P. negative.

85. Albert E. aet. 20. Pulmonary tuberculosis, right upper lobe, 2 years. No reaction. Gave V.P. negative.

86. George W. aet. 43. Pulmonary tuberculosis, duration 3 years. Pleural effusion. No reaction. Gave V.P. negative.

87. Alfred B. aet. 1. Bronchopneumonia. 20 hours crop of papules, 42 hours close crop of papules and pustules, marked erythema of intervening skin, blotchy; 48 hours erythema much less, 4th day subsiding, 11th day flat, scaling; good reaction.

88. Elsie A. aet. 11. No physical signs. 44 hours few papules, 68 hours much more numerous, 5th day subsiding, 9th day flat, pigment, no scaling. This case failed to react to 3 injections of Koch's old tuberculin in increasing doses. Gave V.P. negative.

89. Isabella F. aet. 8. Chorea. No reaction. Gave V.P. negative.

90. Martha E. aet. 34. Subacute nephritis. No reaction. Gave V.P. negative.

91. John A. aet. 45. No physical signs. No reaction. Gave V.P. negative.

92. Mary H. aet. 11. Tubercular hip. No reaction. Gave V.P. negative.

93. Gladys H. aet. 12. Tubercular hip. 20 hours crop of very small papules, 36 hours some pustules, very small in size, 7th day subsiding, 10th day flat. Good reaction. Gave V.P. positive.

94. Elsie V. aet. 7. Tubercular tibia. 20 hours crop of very small papules, four of ordinary size, 9th day beginning to fade, 11th day flat, scaling. Good reaction. Gave V.P. positive.

95. Nellie C. aet. 6. Chorea. No reaction.

96. Ethel L. aet. 8. No physical signs. 24 hours

few petechial haemorrhages, 96 hours fading, 5th day absorbed, 8th day a few papules appeared, 9th day same, not seen again. A typical reaction ~~also~~ delayed.

97. Harriet B. aet. 54. Epithelioma foot. No reaction. Gave V.P. positive.

98. Annie W. aet. 21. Morbus cordis. No reaction. Gave V.P. negative.

99. Fred B. aet. 33? Pulmonary tuberculosis. No reaction. Gave V.P. negative.

100. Olive B. aet. 5. Bronchitis; 18 hours large crop of papules, 24 hours pustular and vesicular, 72 hours marked erythema of skin, 8th day subsiding, 9th day scaling. Good reaction.

101. James B. aet. 2. Pneumonia. No reaction.

102. Emily L. aet. 23. Tertiary syphilis. No reaction. Gave V.P. negative.

103. James T. aet. 28. Morbus cordis. No reaction.

104. Horace H. aet. 16. Tubercular laryngitis. 48 hours a few haemorrhages, no papules, 4th day absorbed. A typical reaction.

105. Minnie S. aet. 3. Tubercular glands neck. 20 hours few petechial haemorrhages, no papules, 36 hours a few papules present, 2nd day haemorrhages disappeared, papules began to

fade on 7th day. A typical reaction.

106. Sarah S. aet. 12. Pulmonary tuberculosis left upper lobe. No reaction.

107. Horace W. aet. 2. Burns. No reaction.

108. Arthur W. aet. 6. Bronchopneumonia. No reaction.

109. Alice M. aet. 2. Mastoid abscess. No reaction.

110. Cyril B. aet. 1½. No physical signs. No reaction. Gave V.P. positive.

111. Isaac R. aet. 22. Tertiary syphilis. No reaction. Gave V.P. negative.

112. Kate H. aet. 19. Pulmonary tuberculosis. No reaction. Gave V.P. positive.

113. Edward M. aet. 55. Pulmonary tuberculosis. No reaction. Gave V.P. negative.

114. George H. aet. 3. Rachitis. No reaction.

115. Arthur C. aet. 19. Pneumonia. No reaction. Gave V.P. positive.

116. George H. aet. 42. Rheumatism. No reaction. Gave V.P. negative.

117. Mary G. aet. 1. Empyema. No reaction.

118. Gladys W. aet. 4 ? Pulmonary tuberculosis. 5th day crop of papules, 7th day fading. Late reaction.

119. John R. aet. 46. Cirrhosis of liver. No reaction.

Gave V.P. positive.

120. George N. aet. 40. Chronic nephritis. No reaction. Gave V.P. negative.

121. Albert B. aet 6 ? Pulmonary tuberculosis. No reaction.

122. Ellen M. aet.52. Furunculosis. No reaction.

123. John L. aet. 8. Otitis media. No reaction.

124. Minnie B. aet. 18. Pneumonia. No reaction.

125. Thomas T. aet. 32 ? No reaction.

126. Albert C. aet. 30. Bright's disease. No reaction.

127. Rudolf N. aet. 3. No physical signs. No reaction.

128. John S. aet. 1½. No physical signs. No reaction.

129. Leo S. aet. 29. Pulmonary tuberculosis. No reaction. Gave V.P. positive.

130. Eliza W. aet. 37. Pulmonary tuberculosis, 4 years' duration. No reaction.

131. Leonard M. aet. 5. Bronchitis. No reaction.

132. John T. aet. 4. No physical signs. No reaction.

133. Violet C. aet. 2. Abscess groin. No reaction.

134. Wm. H. aet. 11. Abscess leg. No reaction.

135. Phyllis C. aet. 4. Popliteal abscess. No reaction.

136. Isaiah W. aet. 52. Congenital syphilis. No reaction. Gave V.P. negative.

137. Mariah S. aet. 27. Plumbism. No reaction. Gave V.P. negative.

138. James L. aet. 8. Abscess groin. No reaction.

139. John H. aet. 5. Bronchitis. Good reaction (no details).

140. Gertrude R. aet. 24. Pulmonary tuberculosis, left upper lobe, 2 years duration.

141. Annie N. aet. 37. Pulmonary tuberculosis, 4 years duration. No reaction.

142. Joseph M. aet. 5 ? Pulmonary tuberculosis. No reaction.

143. George G. aet. 2. No physical signs. No reaction.

144. Bernard H. aet. 7 ? Pulmonary tuberculosis. No reaction.

145. Samuel O'B. aet. 42. Tertiary syphilis. No reaction.

146. Wm. R. aet. 9. Pneumonia. No reaction.

147. Daisy G. aet. 8. Chorea. No reaction.

148. Fred L. aet. 10. Abscess leg. No reaction.

149. Benj. C. aet. 40. Enteric. No reaction. Gave V.P. positive.

150. Charlotte B. aet. 29. Enteric. No reaction.

Gave V.P. negative.

151. Hen. B. aet. 29. Enteric. No reaction.

152. Florence L. aet. 11. Pneumonia. No reaction.

153. Henry P. aet. $1\frac{9}{12}$ Acute osteomyelitis. No reaction.

154. James R. aet. 67. Myocarditis. No reaction. Gave V.P. negative.

155. Emma W. aet. 21. Peptic ulcer. No reaction. Gave V.P. positive.

156. Lily M. aet. 25. Tubercular laryngitis. No reaction. Gave V.P. positive.

157. Rose B. aet. 36. Plumbism. No reaction. Gave V.P. positive.

158. Annie S. aet. 21. Gastric ulcer. No reaction.

159. Edwin B. aet. 38. Tubercular meningitis(conformed at autopsy). No reaction.

160. Arthur M. aet. 14. Sclerosis cord. No reaction. Gave V.P. positive.

161. May S. aet. 14. Subacute nephritis. No reaction. Gave V.P. positive.

162. May E. aet. 38. Pulmonary tuberculosis. No reaction.

163. George L. aet. 42. Pulmonary tuberculosis, both lungs, duration 4 years. No reaction. Gave V.P. negative.

164. Margaret W. aet. 32. Pulmonary tuberculosis, vomica L. upper lobe. No reaction. Gave V.P. negative.

165. Samuel B. Pulmonary tuberculosis. No reaction. Gave V.P. positive.

166. John O. aet. 9. Purpura. 79 hours few papules just appearing, 4th day more numerous, 5th day fading. Medium reaction. Gave V.P. positive.

167. Winifred M. aet. 4 ? Pulmonary tuberculosis. 18 hours several small papules, 24 hours pustular, 48 hours numerous papules and pustules, 4th day fading, 8th day flat, scaling. Good reaction.

168. Wm. C. aet. 1. Tubercular peritonitis. No reaction.

169. Eliza N. aet. 38. Enteric. No reaction. Gave V.P. negative.

170. Nellie R. aet. 9. Enteric. No reaction. Gave V.P. negative.

171. Lily C. aet. 9. Enteric. No reaction. Gave V.P. negative.

172. Charlotte B. aet. 29. Enteric. No reaction. Gave V.P. negative.

173. Mary P. aet. 34. Pulmonary tuberculosis. No reaction. Gave V.P. negative.

174. Vincent L. aet. 16 months. Tubercular glands neck (operation). 16 hours crop of papules, 24 hours pustular, 72 hours fading, 6th day flat, scaling. Good reaction.

175. Evelyn M. aet. 6. Tubercular peritonitis. No reaction.

176. Horace M. aet. 23. Tubercular kidney (confirmed at operation). No reaction. Gave V.P. negative.

177. Wm. H. aet. 8. Abscess leg. No reaction.

178. George K. aet 11. Tubercular peritonitis. No reaction. Gave V.P. positive.

179. Wm. C. aet. 52. Pulmonary tuberculosis, several years duration. No reaction. Gave V.P. negative.

180. Joseph A. Sarcoma ileum. No reaction. Gave V.P. negative.

181. Albert B. aet. 7. Pleurisy witheffusion. No reaction.

182. Kate C. aet. 7. Enteric. No reaction.

183. John C. aet. 12. Enteric. No reaction.

184. Alice P. aet. 8. Pleurisy c effusion. No reaction.

185. Kate R. aet. 39. Furunculosis. No reaction.

186. Susan T. aet. 1. Acute osteomyelitis. 24 hours crop of papules, 72 hours subsiding, no pustules, 6th day flat. Good reaction.

187. John O. aet. 9. Purpura. No reaction.

188. Gladys R. aet. 12. Enteric. No reaction. Gave V.P. negative.

189. Joseph B. aet. 21. Pneumonia. No reaction. Gave V.P. positive.

190. Bernard S. aet. 1. Bronchopneumonia. No reaction.

191. Wm. H. aet. 12. Morbus cordis. No reaction. Gave V.P. positive.

192. Jane C. aet. 3. Enteric. No reaction.

193. Wm. W. aet. 16. Pneumonia. No reaction. Gave V.P. negative.

194. Nellie J. aet. 25. No physical signs. No reaction.

195. Dorothy R. aet. 5. Tubercular peritonitis. 24 hours crop of small ill developed papules, 48 hours subsiding, 3rd day flat. Feeble reaction.

196. Peter S. aet. 2. Intussusception, enlarged mesenteric glands. 22 hours few small papules, 48 hours more numerous, 3rd day

beginning to subside, 4th day flat; good reaction.

197. Horace T. aet. 2. Intussusception. No reaction.

198. John N. aet. 35. Enteric. No reaction. Gave V.P. negative.

199. Fred B. aet 23. Indicanuria. No reaction. Gave V.P. negative.

200. Theodore F. aet. 7. Enlarged glands neck. No reaction.

201. Wm. B. aet. 25. Psoas abscess. No reaction. Gave V.P. positive.

202. Alfred N. aet. 9. Tubercular sinus. No reaction.

203. Roy M. aet. 11. Tubercular hip. 18 hours crop of small papules, 21 hours a few are pustular, good deal of erythema of skin, 4th day fading. Good reaction.

204. Fred W. aet. 10. Tubercular hip. 18 hours erythema only, 21 hours small papules, 48 hours moderate crop, 4th day subsiding, 6th day flat. Good reaction. Gave V.P. negative.

205. Reginald B. aet. 7. Odeomyelitis (tubercular). No reaction.

206. Winifred W. aet. 28. Psoas abscess. No reaction.

Gave V.P. negative.

207. Hilda W. aet. 21. Tubercular salpingitis. No reaction. Gave V.P. negative.

208. Ada M. aet. 34. Pyonephrosis. No reaction. Gave V.P. negative.

209. Wm. S. aet. 2. Tubercular glands. No reaction.

210. Mary R. aet. 11. Tubercular hip. No reaction. Gave V.P. negative.

211. Mary C. aet. 31. Pulmonary tuberculosis, duration 3 years. No reaction. Gave V.P. negative.

212. Annie G. aet. 20. Pulmonary tuberculosis, duration 2 years. 48 hours few small papules, 72 hours same, 4th day subsiding, 6th day flat. Feeble reaction.

213. Ada F. aet. 22. Pulmonary tuberculosis. Both lungs, duration 3 years. 48 hours few papules, 96 hours fading, 7th day flat, scaling. Medium reaction. Gave V.P. positive.

214. Emma H. aet. 34. Pulmonary tuberculosis, both upper lobes, 10 months' duration. 24 hours scanty crop of papules, 96 hours fading, no pustules appeared, 6th day flat, 7th day scaling. Medium reaction.

215. Blanche L. aet. 24. Pulmonary tuberculosis,

left upper lobe, duration 7 months. No reaction.

216. Lily W. aet. 49. Pulmonary tuberculosis, both lungs, duration 3-4 years. No reaction.

217. Jane C. aet. 53. Pulmonary tuberculosis, both upper lobes, duration 7 years. No reaction.

218. Agnes B. aet. 49. Pulmonary tuberculosis, vomica both upper lobes, duration 18 months. No reaction. Gave V.P. negative.

219. Winnie L. aet. 16. Pulmonary tuberculosis, both upper lobes, duration 1½ years. 24 hours scanty crop of papules, 4th day fading, no pustules developed, 6th day flat and scaling. Medium reaction. Gave V.P. positive.

220. Jennie B. aet. 16. Pulmonary tuberculosis, both lungs, 4 months duration. 36 hours crop of papules, 48 hours pustular, 96 hours beginning to subside, 6th day flat, 7th day scaling. Good reaction. Gave V.P. positive.

221. Mary T. aet. 42. Pulmonary tuberculosis, both upper lobes, 1½ years. No reaction. Gave V.P. positive.

222. Laura T. aet. 34. Pulmonary tuberculosis, both lungs, duration 1½ years. No reaction. Gave V.P. positive.

223. Florence B. aet. 16. Pulmonary tuberculosis, early signs at right apex. 48 hours few papules, 72 hours papules and pustules scanty, 96 hours more numerous, beginning to fade, 8th day flat, scaling. Good reaction. Gave V.P. positive.

224. Mildred C. aet. 6. Pulmonary tuberculosis. 24 hours few large papules, 34 hours pustules, 48 hours large papules and pustules, irregular areas of erythematous skin, 72 hours still very marked, 4th day fading, erythema disappeared, 7th day flat, 8th day scaling. Good reaction.

225. Nellie F. aet. 7. Pulmonary tuberculosis. 18 hours scanty crop of papules, 24 hours more marked, 48 hours papules and pustules, 4th day fading, 7th day flat, scaly. Good reaction. Gave V.P. positive.

226. Lottie B. aet. 20. Pulmonary tuberculosis, both lungs, 2 years duration. No reaction. Gave V.P. positive.

227. Mabel Cox. aet. 19. Pulmonary tuberculosis both lungs, 2 years duration. No reaction. Gave V.P. positive.

228. Emma B. aet. 21. Pulmonary tuberculosis. 18

hours a few papules, 24 hours more marked, 48 hours moderate crop of very small papules, 96 hours fading, 7th day flat scaling. Good reaction. Gave V.P. positive.

229. Lizzie F. aet. 20. Pulmonary tuberculosis, right upper lobe, 3-4 months duration. No reaction. Gave V.P. negative.

230. Ruth A. aet. 62. Pulmonary tuberculosis, both lungs ? 5 years duration. No reaction. Gave V.P. negative.

231. Charles W. aet. 23. Pulmonary tuberculosis, both lungs, 4 years duration. No reaction. Gave V.P. negative.

232. Jesse A. aet. 35. Tubercular femur No reaction. Gave V.P. negative.

233. Alice Frances, aet. 32. Tubercular nephritis. No reaction. Gave V.P. negative.

234. John B. aet. 26. Pulmonary tuberculosis. No reaction. Gave V.P. negative.

235. Agnes K. aet. 12. Pulmonary tuberculosis, both upper lobes, 2 years duration. No reaction.

236. Priscilla B. aet. 32. Pulmonary tuberculosis, both upper lobes, 5 years duration. No reaction.

237. Eliza N. aet. 50. Pulmonary tuberculosis, both

lungs, 6 years duration. No reaction.

238. Henry B. aet. 13. Tubercular hip. 24 hours crop of very small papules, 48 hours vesicular, 72 hours same, did not become pustular, 5th day fading, 6th day flat. Medium reaction.

239. George S. aet. 6. Tubercular hip, waxy liver. 36 hours crop of papules, 42 hours vesicular, no pustules developed, 4th day fading, 5th day flat, scaling. Medium reaction.

240. George C. aet. 13. Tubercular hip. 18 hours few papules, 22 hours much more numerous, 40 hours many of them pustular, 96 hours fading, 6th day flat, 7th day scaling. Good reaction.

241. Joseph B. aet. 20. Leg amputated for tubercular disease. 20 hours few small papules, 3rd day no further development, 4th day flat. Feeble reaction.

242. Charles O'B. aet. 40. Tubercular tibia. No reaction.

243. Rose M. aet. 5. Pulmonary tuberculosis, vomica right upper lobe. No reaction.

244. George C. aet. 24. Tubercular rib. No reaction.

245. Grace B. aet. 5. Tubercular hip, duration 3 months; 16 hours scattered small papules, 24 hours pustular, 4th day fading, 7th day

flat. Good reaction.

246. May D. aet. 10. Tubercular hip. 16 hours widely scattered papules, 20 hours pustular, eruption extends well beyond the area tested, 5th day subsiding, 7th day flat and scaly. Good reaction.

247. Mary J. aet. 7. Tubercular knee. 16 hours scanty papules at margin only, central part markedly erythematous, 30 hours some pustules and vesicles, 4th day subsiding, 7th day flat. Good reaction.

248. Minnie B. aet. 7. Tubercular spine. 16 hours scattered papules, 20 hours vesicular, 4th day same, 5th day fading, 7th day flat. Good reaction.

249. Annie T. aet. 19. Tubercular knee. No reaction.

250. Alice G. aet. 9. Tubercular hip. 18 hours small papules, 26 hours larger and more numerous, 4th day fading, 6th day flat. Medium reaction.

251. Mary A. aet. 11. Tubercular hip. No reaction.

252. James H. aet. 24. Tubercular spine. No reaction.

253. Edith H. aet. 1½. No physical signs. 40 hours few papules, 3rd day fading, 5th day flat. Feeble reaction.

254. Rose J. aet. 7. Subacute nephritis. 24 hours some erythema and one papule, 40 hours scattered papules, 3rd day few pustules, 4th day fading, 5th day flat. Medium reaction.

255. Lily S. aet. 4. No physical signs. 18 hours scattered papules, 24 hours more numerous, 40 hours more numerous and pustular, 4th day subsiding, 7th day flat, scaling. Good reaction.

256. Annie B. aet. 5. No physical signs. 40 hours few small papules, 3rd day subsiding, 4th day flat. Feeble reaction.

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