parallel, which might be taken as proof that extreme cold weather is not a predisposing cause. I am of the opinion, however, that the excess in per cent. of cases, and also in per cent. of mortality in the Southern States is due to the large percentage of negroes in that section, who, from poor hygienic surroundings and lack of intelligent care, are easy victims to the disease.

My contention then is that the germ or germs that are the specific cause of the disease are fruitful in proper soil at any season of the year and in any latitude. Having then an inflammation due to a specific cause, the modern trend of therapeutics will lead us to look hopefully for a specific treatment; and, indeed, results have been already attained by investigators like Washbourn¹, Pane², Rienzi³, and others that sustain this view. As far as I am informed, however, we are not at the present time in a condition to avail ourselves of a specific so well established as to warrant its general use, and are compelled to follow a line of expectant treatment. As a result of this treatment Drs. Townshend and Coolidge, who worked up the records of the Massachusetts General Hospital from 1822 to 1889, and who characterized the treatment before 1850 as heroic, from 1850 to 1860 as transitional, and since that time as expectant, rather hopelessly conclude that neither the duration of the disease nor its convalescence is affected by the treatment. This, let me say, parenthetically, is in line with that therapeutic nihilism that has been for the last twenty years so prevalent. Of the dietary of the disease I have only to say, it should be no different from that of other acute diseases. Of the hygienic surroundings the same may be said. I would, however, lay special stress on the importance of pure air, i. e., air free from infectious germs. Beverly Robinson⁴ recommends that some disinfectant vaporized by boiling water be provided, both for the benefit of the patient and the protection of the attendants. How valuable such a measure may be I shall leave the bacteriologists to decide. Antiseptic mouth washes and gargles, or better, sprays, are important. Regular forcible inspiration, I consider extremely useful at such intervals and during such time as each individual case will admit. Local applications while supported by staggering statistical tables have not in my experience proved of especial value. A recent article by Prof. May⁵ especially commends a liberal use of ice, topically, while Kolipinski⁶ advises hot water bags to maintain a temperature of 110 F. My own experience with these methods is so limited as to render an opinion worthless. The agents that have proved most useful in my hands have been acetanilid, some derivative of opium, strychnin, nitroglycerin, alcohol, oxygen and digitalis: The acetanilid in the initial stage where nervous disturbance and pain are present has seemed to me an excellent agent; the opiate for pain not amenable to acetanilid, and for the relief of a distressing cough; for the former sulphate of morphin, for the latter codein or, what is probably better, heroin; the strychnin for the sudden failure of heart power that so often proves fatal, and in this connection let me say that 1-20 gr. is none too much for a crisis, to be repeated in from two to four hours as indicated; the nitroglycerin for its well-known effects on arterial tension; the alcohol as an aid to strychnin—champagne preferably; the oxygen, when deficient oxygenation is evident, and the digitalis from the time a diagnosis is made until convalescence is established. Some years since Petresco⁷ urged on the profession the use of this drug in massive doses and supported his contention with favorable

statistics, but the treatment did not stand the test of experience, mainly for two reasons: in the dose recommended the drug in many cases interfered with nutrition by upsetting the stomach, and its slow action made it uncertain whether its full physiologic effect could be obtained in time to ward off disaster. To those who have made a special study of the physiologic action of digitalis, and especially to those who have noted the actual increase in cardiac tissue resulting from its use, a result very strikingly brought out by some experiments by Prof. Hare⁸, it will not seem extravagant to say that we need from two to three days to establish a full physiologic action. While we may expect a marked increase in the force of systole, a rise in arterial tension, and a lengthened interval between diastole and systole in from twelve to twenty-four hours, we can not expect marked trophic changes so soon. While theoretically we might look for an initial change in this direction early in the use of the drug, an appreciable effect is probably not obtained under two or three days. I hope soon to see a series of experiments demonstrating this point. However, the theory that digitalis will increase cardiac tissue is too well established to admit of successful controversy.

My method of administering the drug is to give small doses at frequent intervals, being guided in amount largely by the tolerance of the stomach. A pill or tablet is less likely to disturb digestion than a liquid preparation.

To summarize: While the other agents mentioned are to be used as symptoms indicate and are of undoubted value, I am firmly convinced that the routine use of digitalis as I have suggested will not only greatly lessen the mortality of the disease, but will render the use of most of the other agents mentioned unnecessary in a majority of cases.

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* And I can well believe that "jam satis" will be the mental if not the verbal greeting such a title will invoke.

VALUE OF THE TUBERCULIN TEST IN THE DIAGNOSIS OF TUBERCULOSIS.*

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So long as the tuberculin test has many strong opponents as well as ardent advocates, future evidence from the experience of those who are using it is of value in deciding its position as a method of diagnosis. Those who oppose its use for this purpose, take the ground that it is dangerous, either by rendering more active already existing disease which is in a more or less quiescent state, or by infecting the general system, or in both of these ways; or, on the other hand, that it is unreliable by giving reactions in other diseases, notably syphilis, and by not reacting in certain cases of tuberculosis, cases demonstrated to be such by other methods of diagnosis.

Its chief value, and I believe it is valuable, though not infallible, is in the assistance it renders us in detecting early and doubtful cases impossible of detection by

* Presented to the Section on Practice of Medicine, at the Fiftieth Annual Meeting of the American Medical Association, held at Columbus, Ohio, June 6-9, 1899.

other diagnostic methods. It is superfluous when the diagnosis can be established by the ordinary means.

The X-ray examination, in the hands of an expert, seems to be a more accurate and delicate test of early lung disease than even tuberculin, and without the fear of possible injury as with the latter, but the required technic and experience, and the expensive apparatus limits its use to the few. The tuberculin test can be used by anyone. The importance of the earliest possible diagnosis of pulmonary tuberculosis in reference to prognosis and treatment is of incalculable importance. Both auscultation and percussion and the sputum examination fail to do this in many cases, more, perhaps, than we are aware. If we wait until tubercle bacilli are found in the sputum, the case, in the writer's opinion, is one or more steps beyond the earliest stage. It is unsafe and in some cases entails a fatal delay to wait for this proof. Before a definite diagnosis is made, one is naturally disinclined, and lacks the requisite authority, to institute a vigorous plan of treatment in a mere suspect. Certainty of facts renders one resolute and energetic in action.

The problem before us then is, how far will tuberculin aid us in reaching this much desired goal of early diagnosis? Will it, in the large majority of cases, give a recognizable reaction when tuberculosis is present, and fail to do so when the disease does not exist? In doing this will it injure the patient, or in any way lessen his chances for recovery? Further, what is the amount to be used in order to accomplish the one object and avoid the other?

Some at least of the opponents, I fancy, have been prejudiced by the dire results following the use of enormous doses of tuberculin at the time of its discovery, and their adverse opinion seems rather to be due to this vivid and unfortunate experience, than to investigations with the small doses now used. At all events, the advocates of the test seem more generally to have produced their evidence. The question of injurious results from the test is a difficult, if not an impossible, one to finally and fully answer. Take, for instance, a case, which by the usual methods of examination gives no evidence of tubercular infection: it reacts to tuberculin, and soon after the evidence of active tubercular trouble is manifest. Did this activity exist, undiscovered, before the test, or was it accelerated by it? The almost, if not quite, universal conclusion of the many patient users of the tuberculin test is that they have not encountered injurious results, when used in small doses, and my own experience accords therewith. Such evidence comes from Krause, Gaffie, von Jaksch, Grasset, and Wedel, Springthorpe, M. Beck, and many others in Europe; and from Trudeau, Whittaker, White, F. H. Williams, Klebs, R. C. Cabot, and others in this country. Assuming then, as the weight of evidence seems to prove, that when used in small doses, generally not over ten milligrams, there is no permanent injurious effect, we come to the second half of the question: Can we depend on the results? In the large majority of cases I believe we can, but not in every case. If we shall in the future be able to determine some method of more exact dosage, proportioning, perhaps, the dose to the weight of the individual, or discovering some other constant ratio between the dose and the individual, we may find the test to be true in every case.

In common with others, I have had cases of proved pulmonary tuberculosis which did not react, at least so far as the general reaction was concerned, and, on the contrary, it has happened to me to obtain a more or less

complete general reaction when I felt rather sure that no tuberculosis existed. It seems to be not unlikely that beyond a certain dose maximum to the individual in question, a general reaction may occur in a healthy person, which means that he is simply poisoned by the toxins of the tuberculin. I have also obtained reactions in syphilis.

That well-established pulmonary tuberculosis, where tubercle bacilli exist in the sputum, sometimes fails to react, at least in the general reaction, as has happened more than once in my experience, is probably either due to the insufficiency of the dose in those particular cases, or to the fact that White points out: that the general reaction is slight and the local reaction marked in advanced cases, and I overlooked or did not seek for the local reaction. However, the tuberculin test is not needed for well-marked cases; they are readily and absolutely detected otherwise. It is in the early cases, as I have said, that tuberculin has its great value, and where I believe the test is the most delicate, and the results elicited by it can be depended on.

My observations have extended over 111 cases, originally undertaken in an ambulatory clinic to see if I could arrive at an approximate conclusion as to the proportion of cases of cervical adenitis which were tuberculous. While making these investigations, I also embraced the opportunity to test all cases which came to the clinic, which, for any reason, suggested tuberculosis, as well as several cases of syphilis and other general cases which gave no evidence, clinical or otherwise, of tuberculosis. My observations of last year were published in the *Medical News* of July 9, 1898; the tables of results as there given, as well as those of this year, I append to this communication. In the total number of 56 cases of cervical adenitis taken without selection, there were 33 reactions, 6 slight reactions, and 2 doubtful ones. Throwing out the slight and doubtful ones, we have 58.8 per cent.; including them 73.2 per cent.; or an average of 66 per cent., so that this would indicate the proportion of cases of cervical adenitis that were tuberculous so far as an inference can be drawn from this number of cases (55), and dependence can be placed on the tuberculin test, but a larger number of cases, and other methods of investigation must corroborate or disprove these deductions. It seems not unlikely, however, that this is not far from the truth, for Volland, from his investigations, makes the proportion 68 per cent., and Dr. R. C. Moore¹, out of 28 cases of chronic enlargement of the glands, mostly of the neck, which had to be operated on for various reasons, found that 73 per cent. were tuberculous. In 8 cases of syphilis and 1 doubtful one, there were four reactions. One of these cases was injected for cervical adenitis and reacted moderately after 5 mg., and markedly after 10 mg. A few days later she developed evidence of secondary syphilis. Another case was injected for a chronic enlargement of the metacarpal bones of the first and second fingers of the left hand, of three months' duration. The clinical diagnosis made was either tuberculosis or syphilis; 5 mg. gave a marked reaction, leaving the diagnosis, however, still in doubt, as either disease may have given the reaction.

There does not appear to be any doubt then that a certain proportion of syphilitic cases react. This fact, however, would rarely interfere with the test in its most useful, nay principal, application in suspected early cases of tuberculosis. In seven cases of more or less advanced pulmonary tuberculosis containing tubercle bacilli in the sputum, three gave no general reaction

¹ London Lancet, Sept. 17, 1898, p. 734.

after 10 to 12 mg., and one none after 5 mg. Unfortunately the local conditions after the test were not noted.

The only deduction that can be drawn from these few cases is that pulmonary tuberculosis, when more or less advanced, will not always give a general reaction from 5, 10 or 12 mg. of tuberculin; but here again let me repeat that the test is the most useful in the early cases where it is the most sure, the general reaction being marked, and the local slight. In the other general cases the results corroborated the clinical diagnosis in a majority of instances. Whether any reactions occurred without the existence of tuberculosis, one can only conjecture, but it is rather surprising that an enlarged thyroid gland or atrophic rhinitis and pharyngitis sicca should give a reaction without other evidence of tuberculosis.

In no case did I have any serious event as the immediate result of the injection or as a later consequence. The clinic being an ambulatory one, the statement of the patient as to his sensations was principally relied on as to whether or not a reaction had occurred, that is, the general reaction was depended on. If, from six to twenty-four hours after the injection, the patients complained of excessive weakness, sensations of heat and cold, nausea, anorexia, pain in the back and limbs, severe headache, sweating, sleeplessness, summed up by them as feeling "very sick," "awful bad," or "miserable," and they appeared at the clinic the next morning with coated tongue, rather a rapid, weak pulse, more or less rise of temperature—if the other symptoms were marked, not much reliance was placed on the temperature at that time—looking as if they had just arisen from a serious illness, a reaction was considered to have occurred. The cases were generally afebrile at the time of the injection.

Objection may be urged as to the accuracy of these tests when the patient could not be kept constantly under observation, as in a hospital ward, but anyone who has listened to the graphic recital of the reaction symptoms, and seen the striking evidence of weakness and depression exhibited by the patient, would be convinced, I am sure, that a general reaction had occurred. Moreover, since making my first set of tests a year ago, Dr. R. C. Cabot, at the out-patient department of the Massachusetts General Hospital, has followed a similar plan in tuberculin and other injection tests, and has also satisfied himself that accuracy in results can be attained in an out-patient clinic*.

As a matter of convenience I gave the injection in the forearm or upper arm, generally subcutaneously. The site of injection was almost invariably swollen and tender and painful for a few days, but I never had an abscess. I would by all means advise deep injections in the muscles, either of the back or limbs, preferably the former. Asepsis was practiced in the procedure, and a common glass or metal subcutaneous syringe was used. Either Koch's original tuberculin, or that made in the Adirondack Cottage Sanatorium Laboratory, kindly furnished by Dr. Trudeau, was used. As the latter seemed, in my experience, to be less concentrated than the former, judging from results, I finally confined myself to Koch's, previous experience with which had taught me what to expect from certain doses. One is likely to be misled, I think, if he indiscriminately uses tuberculin of different strengths, and, therefore, he can judge of his results better if he sticks to one preparation which does not vary in strength. I diluted the Koch's tuberculin to a 1 per cent. solution, using for the purpose either

distilled water or a normal salt solution. By adding a few drops of carbolic acid I was enabled to keep the solution clear much longer than without it. With a pipette graduated into tenths and one-hundredths of a c.c., milligrams could be easily measured.

There is much diversity of opinion as to the dose, among authorities. Some assert that they obtain satisfactory results with very small doses, as for instance, Grasset with .2 to .5 mg. for an adult, and Gaffie, .05 mg. for infants. The majority, however, use larger doses, from .5 to 10 mg., and occasionally 20 mg. A. C. Klebs regards 20 mg. as the "maximum dose which can be injected safely," but he would not begin the test with this dose. It is not unlikely that this difference of opinion as to the dose is largely due to the difference in the preparations. I have never used over 12 mg. of Koch's tuberculin, generally from 5 to 10 mg. for an adult, and from .5 to 3 mg. for children.

I would summarize my conclusions as follows:

1. The tuberculin test indicates early tuberculosis, by a general reaction before it can be detected by other methods, except the X-ray, in the large majority of cases, with a dose of from 5 to 10 mg. of Koch's original tuberculin.
2. No injurious results occur from the use of tuberculin in these doses.
3. Proved tuberculosis in a more or less advanced stage may fail to give a general reaction from doses of from 10 to 12 mg.
4. Syphilis gives a reaction in an undetermined proportion of cases.
5. There is a dose, undetermined, at which a non-tuberculous person may react or simulate a reaction.
6. The reaction may be deferred from six to twenty-four hours.

As rules to be observed in making the test:

1. Always use the same tuberculin and of a standard strength.
2. Use aseptic precautions in giving the injection.
3. Make the injection deep into the muscles of the back, arm, or leg.
4. Keep a two, three, or four-hourly chart of the temperature if possible, beginning twenty-four hours before the injection.
5. Allow several days to elapse before repeating the test.
6. In early cases depend on the general reaction; in late cases, if the general reaction fails, carefully look for the local.

Local Treatment of Rheumatic Joints.

The swelling of the synovial membranes and ligaments in retarded convalescence or chronic cases taxes the patience of both the sick and the physician. Vesicatories, kept on for half an hour, and frequently repeated; the wet bandage or pack snugly applied, so as to compress gently; compression by bandages or collodion; gentle massage; the galvanic current daily applied, find their indications in many and various cases. Iodin will come in for its share of usefulness. Besides the internal administration of the iodids—potassium or sodium, or both combined, in doses of 5 to 20 grains daily—the external application will be found beneficial. The official ointment will act through the gentle handling and kneading necessitated by its use. Solutions of potassium iodid in glycerin will act better, but are inferior to the lanolin ointment. Superior to all, however, is the application, twice daily, of one part of iodoform in from 8 to 15 of collodion or flexible collodion. It is brushed over the swollen part copiously and allowed to dry while the limb is kept absolutely at rest for ten minutes. Only such scales as get detached spontaneously may be removed; otherwise the next application is made on top of the preceding ones. Very old cases, with chronic effusion into the joint, require aspiration and washing out.—*Jacobi, in "Therapeutics of Infancy and Childhood."*

* Cabot, R. C.: Substitutes for Tuberculin in Diagnoses. Jour. Boston Soc. of Med. Sci., January, 1899.