monia and *tuberculosis* have also been studied, without great success so far as is generally known. In *diphtheria* certainly, probably in *cholera*, and possibly in *tetanus* are to be found the main results that justify us in hoping for further advances in this direction so far as the application to man is concerned. Very possibly, too, results that may be immediately forthcoming will show that we are much nearer to a solution of the problem of the streptococcus antitoxin than at present seems to me to be the case.

THE FALLACY OF ANTITOXIN TREATMENT AS A CURE FOR DIPHTHERIA.

Read in the Section on Diseases of Children, at the Forty-seventh Annual Meeting of the American Medical Association, at Atlanta, Ga., May 5-8, 1896.

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Early in my medical career, and at the time that Pasteur declared he had discovered a certain remedy for hydrophobia, it seemed a pity to me that the profound effort could not have been directed to the cure of diphtheria. Hydrophobia is such a rare disease, occurring not oftener than one to the million per annum, whereas diphtheria is universally prevalent, is the reason why regret was felt at the time of his publication. What it was hoped he might have done, is alleged to have been done by other investigators. Pasteur claimed in 1884, that a product made from the culture of the brain of an animal which had been inoculated with the disease of hydrophobia, was able, when injected beneath the skin of the human being, to cure rabies. This prophetic utterance emanated from a man who seemed to me, during this period of medical adolescence, to be utterly irrefutable. The scientific position which was accorded him, made his declaration appear to the world at that time, and to me with almost the same awe inspiring force, as if it had been an inspiration which had directed his mind and his hand. Hundreds and thousands of human beings have turned their faces toward the Pasteur Laboratory since 1884, supposing that they were mortally wounded by the teeth and the virus of mad dogs. There have been many who have presented themselves at his gate who were bitten, but not by a mad dog; hundreds of others who were bitten through the protecting folds of the clothing; many, indeed, who were simply licked by the tongue of a dog, not bitten at all. Still others have submitted to the inoculation through curiosity, having had no injury whatsoever. So great is the influence of the modern press that a scientific proposition, while still in the germinative state, is heralded throughout the civilized world, and is quickly transformed into a perfected science by writers of the press. There were a few who were able to doubt the truth of the allegation as to the curative influence of the Pasteur lymph. Long before cool and scientific inquiry could be made by physicians away from this center of discovery, the die had been cast that hydrophobia was curable by Pasteur lymph. At this present moment there are unmistakable proofs that error in judgment and in practice is the largest element in the hydrophobia cure. During the first few years of the experimental inoculations for rabies, many deaths occurred among the patients; so many, in fact, that Pasteur himself became alarmed at his own work. During a later period the death rate from

hydrophobia, as stated at the Pasteur institute, became less. The lowered death rate was proclaimed to be the result of the natural improvement in the process, and at the time, was accepted by nearly all. In the last few years of the hydrophobia cure the death rate has been materially lessened and is attributed to still further advancement in the understanding of the treatment. Right here is where the point, which is to be drawn from the foregoing statements, appears.

Whatever may be the view of persons who have not personally investigated the treatment of hydrophobia by Pasteur lymph, the real explanation of the reduced mortality since the declaration of the treatment in 1884, is directly due to the dilution of the curative lymph. In so far as the reduction of the virility of the laboratory product is concerned, just so far has there been advancement in the progress; perhaps, if the lymph was indefinitely attenuated, the mortality would be still less. This recital is introduced to show the error which may exist in one of the greatest therapeutic faiths close to the end of the nineteenth century.

Bacteriologic investigators, in Berlin and Paris, sent word to the United States recently, that diphtheria is curable by a specific medicine. This specific cure is produced as follows: A culture of the germs of diphtheria is injected, day after day, in increasing doses for a long time, into a horse, until it is able to withstand the poison of 250 cubic centimeters of the diphtheria virus, whereas one-tenth of a cubic centimeter of the same virus would be fatal to a guinea pig. After a certain period has elapsed a quantity of blood is drawn from the jugular vein of the horse, and the serum, after being further treated in the laboratory, is ready to be injected beneath the skin as a cure for diphtheria.

Ever since the discovery by Tyndall that the atmosphere, as well as the soil and the water, is inhabited by life in invisible form, there has been a prolific series of theories concerning germ organisms. It is generally accepted that a constant state of antagonism exists between minute organic life, and it is supposed that preservation as well as destruction of life, is attributable to these germs which are warring with each other. First came the discovery of germ life in nature, followed in due time by the declaration that all diseases are due to the influence of pathogenic germs. The next step consisted of a conception that pathogenic germs must be antagonized by other germs in the preservation of life and the treatment of disease. The next step in the process is that pathogenic germs, or their ptomaines, are able to be counteracted in their influence upon the life of the human body, by either the same germ or its own ptomaine. It is believed that during the period of inoculation of a horse with the diphtheria culture, a process is going on which is generating a fluid in the animal, that is antagonistic to the disease which it is assumed is caused by the original germ, namely, diphtheria.

Let us now consider diphtheria from a clinical standpoint. There are two varieties of diphtheria which exist to-day, but, one of which did not exist yesterday. One is true clinical diphtheria, the gross symptoms of which are entirely sufficient for practical diagnosis. The other form is the diphtheria of the bacteriologic laboratory. One is diagnosed by the clinician, while the other is discovered by the bacteriologist. These two varieties are made necessary by reason of the claims of bacteriology, by which

discoveries practical medicine has been both aided and retarded. Aided, by helping to a clearer understanding of the pathogenic and bacteriologic changes during the process of disease, and hindered, for the time being, by throwing a cloud across the pathway of natural and practical therapeutics.

Diphtheria is a systemic disease with both general and local manifestations. The local manifestations are located principally in the throat and larynx. By some observers the local symptomatology is considered paramount. It is taught by bacteriology that local microbes develop toxins upon the mucous membrane of the throat, and from this source the entire system is infected, whereas the true explanation regards the pathologic changes in the throat as but local exhibitions of general systemic poisoning. The laboratory declaration that a Klebs-Löffler bacillus found in the secretions of the throat establishes *prima facie* evidence that a disease is diphtheria, need not confuse our judgment and interfere with the conclusion previously stated in the foregoing sentence. It is undoubtedly true, that suitable nourishment for the growth of germs is found in the throats of children whose general system is impaired with diphtheritic sepsis. The so-called specific germ is found upon the tonsil both in health as well as in disease. Is it, therefore, a reliable means of determining the diagnosis of diphtheria?

Is the explanation of the false membrane which forms upon the throat, thus interfering with respiration, to be found by bacteriologic inquiry? When the system is impaired, and a determination of the weakened vital forces results in an inflammation of the fauces, there is thrown out upon the mucous membrane a thick, tenacious, glairy fluid, which dries and thickens into a membrane. The inflammatory state of the mucous membrane keeps adding fresh serous discharges, thus augmenting the deposit and ultimately filling the free space of the throat. In this serum the colonies of a variety of germs find normal food for nourishment and growth. Owing to the occlusion of the breathing space, insufficient air enters the lungs and further embarrassment of the health of the child quickly ensues. Examinations of the blood show an altered relationship among the component parts. Capillary circulation is diminished and congestions arise, both in the structures of the throat and neck, and in other tissues which are adjacent. The physical economy of the vital organs is imperiled and their functions are imperfectly performed. Retention of morbid matter rapidly accumulates throughout the entire system, especially in the capillary and lymphatic vessels. Great efforts are made by the resisting vitality to unload its burden and repair the damage.

At this time of the pathologic processes there are two therapeutic measures which are imperatively demanded: first, the supply of new force to the tissues by fresh nutrition; and secondly, aid to the impaired efforts of the organism to remove the morbid and retained matters. Nature is doing all that it can to carry the effete material produced by the disease, out of the system through the excretory organs. At this moment what is accomplished by forcing into the circulation a substance which has no natural relationship to the structure of a single element composing the entire body? The system is laboring and panting for life, under the oppression of toxins which it is trying to eliminate. At the very crisis of the greatest strain

upon vital resources, a serum which does not belong in the human economy, is strangely added to the fearful load, which is in some cases the last straw that breaks the camel's back. Its use is therefore unphysiologic and absolutely contraindicated. The bacteriologist affirms to the contrary; observe which is the better able to judge, practical clinicians or the ultra-scientist in the laboratory?

The claims that are seductively held out that cases treated early by antitoxin would recover have utterly failed. The claim subsequently that cases treated by antitoxin recover more quickly than those not so treated has utterly failed to be true. The claim that the death rate would be lessened has proved to be a disappointment. The claim that antitoxin was harmless has been proven to the contrary by many fatal terminations. Judging from the facts concerning the use of antitoxin in practice, does there stand on record to-day one single valid reason, from a clinical standpoint, to encourage the hope of better results in the future than have been attained in the past by other methods of treatment? It is not the purpose to impute insincerity, or lack of intelligent industry, on the part of the profession, concerned in experimenting with antitoxin, but the promises of better results through its use have unfortunately failed to be substantiated.

The human system, when laboring under morbid influences, needs rather those elements which can add strength and vigor to the vital resistance. By what law or principle in physiology can augmented vital resistance be maintained by the introduction of antitoxin into the system? Has the explanation of the action of antitoxin been satisfactorily given by those who are its sponsors? It is to be conceded that there are cases of diphtheria which, when treated by antitoxin, have seemingly progressed favorably, while there are other cases which have quickly terminated fatally. The influence of the antitoxin virus is directly dependent upon the condition of the patient at the time of its introduction. If the powers are well maintained, as during the first few days of the disease, naturally the system is stronger and its efforts more effective toward elimination, both of the antitoxin introduced and of the autogenerated toxin. Here is the explanation of the advantage claimed by the early use of antitoxin. It follows, when the system is further impaired its phagocytic action is also impaired, and the chances for recovery by reason of the further introduction of extraneous matter are lessened. What physiologic problem could be more simple? The point is this, that the blood does not need to be further polluted in order to expel the autogenerated products which it already contains. Can any one explain the reaction which takes place in the human living organism when antitoxin is added? There is a reaction, but that the reaction is a curative, influence is open to discussion.

A small amount of morbid matter adjacent to living cell structures is dissolved away by the leucocytes and forced out of the body through the escapes provided by nature. This takes place regularly when the cell is aided by forces which contribute to its vigor. If the vitality is diminished by extensive morbid processes, extraneous matter added to the system only further weakens the reconstructive agencies which are at work. The theory that sepsis of any kind, already in the system, is able to be neutralized by the addition of manufactured toxins from without, though freely taught, is utterly inconsistent and

unreasonable. Can the chemic reactions of the laboratory be successfully repeated in the laboratory of the human body?

Has horse serum, plus disease, any natural place in the human blood? And the red corpuscles are dissolved by its presence. No material success has ever been achieved by the transfusion of healthy animal blood into the human body for the cure of disease. Transfusion of salt water accomplishes all that is claimed for the process. Now then, how much the less is likely to be accomplished when an infected animal serum is injected for the cure of diphtheria?

The blood has lost some of its component elementary conditions. It is thereby altered in character, and when acting through inflamed mucous membranes morbid symptoms are produced, such as are seen in diphtheria. The fluid which patrols the entire body should be strengthened rather than further decomposed and disorganized by the addition of extraneous and poisonous matter.

The records of the cases treated in the Willard Parker Hospital of New York City prove that antitoxin is dangerous and even fatal. The statistics of that hospital establish that the further use of antitoxin is unjustifiable. Extreme interest and effort to know the truth has guided the staff of the Willard Parker Hospital. Dr. Joseph E. Winters of New York has sought diligently to establish the value of antitoxin, but the clinical experiences have forced him unwillingly to condemn its use. Is it safe to neglect the warning of such an experienced clinician and medical teacher? Professor Lennox Browne of London, patiently and earnestly sought for clinical reasons to further the interests of antitoxin. His conclusions are emphatic and pronounced against it. Dr. Weeks of Philadelphia also deprecates the use of antitoxin, basing the conclusions upon an extensive experience in the Municipal Hospital of that city.

Health department statistics of New York are cited in Chicago to the advantage of antitoxin, and Chicago statistics are published in the interest of antitoxin in New York. Health department methods of collecting information must be taken with allowance for accuracy. Previous to leaving Chicago a culture was made of the tongue of the office boy and the tube left at the city health office. The answer received stated that the case was one of true diphtheria. In fact, the boy was not ill at all. Provisions were immediately made by the department to fumigate and otherwise annoy the family at the boy's home. Is it not easy to be seen that the enthusiasm and overzealous interest of the medical corps in the employ of cities may bring to the notice of the health departments cases similar to the one cited? Such reports go on the records and contribute toward the statistics which are sent broadcast. The statistics very quickly become confused and their power for usefulness is absolutely *nil*. Unquestionably large numbers of cases which have been reported to be diphtheria and cured by an injection of antitoxin have been of the bacteriologic class.

It was recently stated to me, upon good authority, that the sales were falling off rapidly and an early termination of the demand for antitoxin was not far off; also that offers to purchase antitoxin upon most advantageous figures had been declined because of the fear of pecuniary loss. Thus the straws point the way the wind blows.

103 State Street.

SOME PRACTICAL POINTS ON THE COMBINED EFFECTS OF ANTITOXIN AND INTUBATION,

WITH SPECIAL REFERENCE TO INFANT FEEDING IN MALIGNANT DIPHThERIA.

Read in the Section on Diseases of Children at the Forty-seventh Annual Meeting of the American Medical Association at Atlanta, Ga., May 5-8, 1896.

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Certain factors appeal to us in a severe case of laryngeal diphtheria. The main point to be considered, however, is to afford instantaneous mechanical relief and prevent asphyxia. This, to my mind, is of more importance than the consideration of what the real therapeutics shall be.

If therefore, a child has recovered from the exhaustion following this mechanical relief by intubation, then it is necessary to commence with the real therapeutic management of the case.

If a history of diphtheria exists, and we are positive of the diagnosis, then we should without delay inject our case with either 5 c.cm. of antitoxin of the strength of 500 normal units, and if no relief is afforded in twenty-four hours, then we repeat the injection of the same dose of antitoxin. The choice as to the location of the injection depends on the practitioner. My own preference has been, that seen by me in Berlin with Professor Baginsky, in the interscapular space. It is not the purpose of this paper to detail the technique of intubation, for every one of us, no doubt, knows when and how to place a tube.

The same might be said for the injections of antitoxin. They have become so universally used that the technique is very well understood. It is an important point to lay stress on what I consider of vital importance, especially so, when we hear of sudden deaths occurring within a minute or two after an injection of antitoxin has been given. Any one familiar with the danger of injecting air into a vein will at once recognize the great importance of selecting that part of the body which is least likely to have large veins, and where we would be least apt to puncture them. A thrombus forming in a vein can easily produce death, and we all know that were the barrel of the syringe filled with plain water or milk or with any other ingredient, that death would occur just as quickly if air is injected into a vein, as it does or has done when antitoxin is injected.

We then have reached the two main indications demanded by science of to-day in the treatment of an obstinate case of laryngeal diphtheria: 1. We have satisfied nature's demand for the relief of the stenosis by intubation, and probably avoided asphyxia. 2. We have aimed, by injecting the antitoxin, at the destruction of septic elements or toxins introduced in the system through the agency of the Klebs-Löffler bacilli. The most important part of the treatment of a severe laryngeal diphtheria consists in the after treatment. I insist in every case of laryngeal diphtheria, with a tube in the throat, on feeding per rectum. By this means we can guard against that most dangerous complication, namely, Schluck-pneumonie. This latter is caused by the suction or flowing into the trachea, bronchi and capillaries of liquids, intended for swallowing, and causing pneumonia.