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THE CAUSATION OF DIPHTHERIA.

BY PROF. FREDERICK G. NOVY, SC. D., M. D., ANN ARBOR.

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We can profitably begin the discussion of the causation of diphtheria with the discovery of the germ. First of all we can say that about thirteen years ago Klebs, while examining a number of cases of diphtheria, found a peculiar rod or bacillus present in a certain number of the cases. There is no doubt today but that the germ discovered by Klebs was the diphtheria bacillus which we recognize as the cause of diphtheria. Klebs, however, brought forward no proof as to the relation of the germ. He merely demonstrated that a peculiar germ was present in the false membrane of diphtheria. In the following year Loeffler carried out his classical work on the causation of diphtheria. He went further than Klebs; he not only demonstrated the presence of this germ in about one-half of the twenty-seven cases that he examined, but he also succeeded in growing the germs artifically. With these pure cultures, free from all other

germs, free from all impurities, he inoculated animals and was able to produce results which resembled diphtheria to a marked extent. Animals inoculated with such pure cultures would die in from two days to a week, depending upon the amount and virulence, as we call it today, of the germ. At the point of inoculation, whether under the skin or in the trachea, a false membrane was observed. In his study at that time Loeffler established that the germ was not carried throughout the body. In an animal inoculated with the Loeffler bacillus the bacillus was not distributed throughout the body, but was found only at the point of inoculation, in the immediate neighborhood of where it was originally planted. This fact was at variance with the views then held as to how germs produced disease, and Loeffler was obliged to have recourse to an explantion that was entirely new. He supposed that this germ acted by producing a poison which was absorbed and distributed throughout the body, although the germ itself was growing only at a given spot. The demonstration of this theory was not effected until 1888. In that year the French investigators, Roux and Yersin, and also Loeffler, showed that if the cultures of the diphtheria bacillus, after they have fully developed, are deprived of the germ by filtering through porcelain the germ-free filtrate, will produce the same results in animals that are observed with the germ. The infectious character of the disease in such cases is absent owing to the absence of the living cause—the bacillus. This work of Roux and Yersin in 1888 is the foundation on which the antitoxin treatment of today rests. In every one of the fifteen cases examined they found the germ present. They obtained, like Loeffler, pure cultures of this germ, and with these pure cultures they produced the same results that Loeffler had produced. Further, they found that pure cultures deprived of the germ by filtration, that is to say, the soluble products produced by the germ, were able to cause paralysis, as well as the other characteristic symptoms following inoculation with the germ. The result, therefore, was the same, whether the germ or whether the toxin was used. Yesterday I had occasion to bring before you a couple of guinea-pigs that were in the condition of diphtheria paralysis consequent upon the injection, a week before, of a few drops of the diphtheria poison or filtrate. They did not receive a single germ, only the soluble products of the germ, and yet the result was the same as if a living germ had been introduced. The living germ, although growing on a small area in the body, in the false membrane of the throat, produces an intensely poisonous product which when absorbed affects the entire body. The guinea-pigs died about nine or ten o'clock last night.

So much for our knowledge of the distribution of the germ in the disease. The question comes up now as to whether this germ is present in all cases of diphtheria. Is it present in every case? It is hardly necessary, here and at this time, to enter into any discussion as to what diphtheria is, to show that it is not a single disease, clinically speaking, but that it is really a group of diseases due to different organisms. There was a time when that had to be brought up and carefully demonstrated. I will simply summarize as briefly as I can. If you will examine a number of cases of diphtheria you will find that where, clinically, all the symptoms are present that after all you are dealing with several different causes, and yet you will probably discover that two-thirds or three-fourths are due to one organism. That is to say, one germ is present.

I have placed here on the blackboard a table which I have compiled from returns up to 1895.

	No. of cases examined.	No. of times Loeffler bacillus found.	Per cent.
European	2,846	2,344	82.4
American	5,340	3,599	67.5
Total	8,186	5,943	72.6

The European investigators up to 1895 reported 2,846 cases. The Loeffler bacillus was found in 2,344 or about 82 per cent. of the cases. The American investigators, largely on account of the efficient service of the New York Board of Health, examined 5,340 cases. The germ was found in 35, — or in 67.5 per cent. If we combine these two we shall have 8,186 cases in which the germ was found 5,943 times, or in about 73 per cent. In other words, about 73 per cent. of the cases of clinical diphtheria, as commonly met with in this country and abroad, will be found to contain the Loeffler bacillus. Now this percentage may be increased if care is taken, we will say, in the diagnosis. This, however, is a matter that it is difficult to do, but in the hospitals of some of the larger cities of the continent progress has been made in this direction. With improved methods of diagnosis, eliminating many of the so-called suspicious cases, and with skilled men as clinicians and bacteriologists, it is possible to show that the per cent. of the cases containing Loeffler bacillus is much greater. For instance, during 1894, the reports of a number of German investigators show that in 972 cases the Loeffler bacillus was found 945 times, or a percentage of 97. As a matter of fact, the percentage of cases where the Loeffler bacillus is present is likely to be very low owing to the unavoidable introduction of all suspicious cases. Thus a report of the bacteriologists of Buffalo for the last year shows that in about 1,500 cases or examinations made the Loeffler bacillus was found in less than one-third. To summarize, we can say that about 75 per cent. of cases of clinical diphtheria are due, or rather, let us say for the present, are accompanied by the Loeffler bacillus. Now if this germ is present in 75 per cent. of the cases, what is present in the other 25 per cent.? If we examine the various germs present in this group of cases we will find that they differ considerably. Usually spherical germs, micrococci as we call them, are present. These may present several forms or types. Thus, there is present in a considerable number of such cases small diplococci, little round bodies arranged in pairs. I will have occasion to speak of these again. Then again we may have a row of cocci which we call streptococci, presenting an appearance not unlike that of the beads on a rosary. Specimens of these we will have under the microscope for you to examine. Again, we may have these spherical germs arranged in little masses like bunches of grapes. This form is known as staphylococcus. We can say, therefore, that most of the 25 per cent. of cases left will have cocci present. A few may have different forms of rods present. Now in the

following table I have endeavored to show, from the records of the French workers, the relative frequency of these two groups in anginas and in croups. The cases in which the Loeffler bacillus is present are designated as diphtheria, and those where it is absent as non-diphtheria:

	No. of cases.	Diphtheric.	Non-diphtheria.	Per cent. of latter.
Anginas	211	139	72	34.1
Croups	187	153	34	18.2

It will be seen that 34 per cent. of the anginas are non-diphtheria, that is, are not due to the Loeffler bacillus, whereas only 18 per cent. of the croups are non-diphtheric. In other words, croup is more often due to the Loeffler bacillus than are anginas.

You are no doubt familiar with the designation of true and false diphtheria. True diphtheria is a term restricted to that form where the Loeffler bacillus is present. False diphtheria where the other germs are present unaccompanied by the Loeffler bacillus. Now what proof have we really that the Loeffler bacillus is the cause of diphtheria? I have mentioned incidentally in the sketch of the history of the subject some of the reasons. The germ is present as we have seen in a large percentage of the cases. This frequency clearly points to some relation to the disease. The next thing necessary is to grow this germ artificially, thus purifying it from all other germs and products. Thirdly, with these pure cultures results in animals can be produced which will duplicate those seen in the actual disease. This chain of evidence and proof clearly demonstrates that we have in the Loeffler bacillus the case of diphtheria.

Now there is one other line of demonstration that I want to bring before you, and that is from the records of mortality of these different forms of diphtheria. In the accompanying table, compiled from the work of Roux and his colaborers, the number of cases where the Loeffler bacillus is present is 353, the number of deaths in that group is 185, a percentage of 52.

Average.	No. of cases with Loeffler bacillus.	Deaths.	Per cent.	No. of cases without Loeffler bacillus.	Deaths.	Per cent.
	353	185	52.4	117	11	9.4
Treated with antitoxin	300	78	26.0	128	11	8.6

Up to 1894 the average annual death rate in the Children's Hospital in Paris was 50 per cent. In 117 cases where the Loeffler bacillus was not present only 11 died. That represents a mortality of 9.4. That is to say, the mortality was 52 per cent. when the Loeffler bacillus was present, and only 9 per cent. when other germs replaced the Loeffler bacillus. It might be well, incidentally, to call your attention to the results obtained two years ago by Roux at the time of the introduction of antitoxin. I have not attempted to bring together recent results. This work was

done in the same hospitals where the mortality for years exceeded 50 per cent. The comparison, therefore, is perfectly legitimate. With the serum 300 infants were treated and gave a mortality of 78. This is 26 per cent. as against 52 per cent. without the antitoxic serum treatment. In 128 cases where the Loeffler bacillus was not present, other germs being present, 11 died, representing a mortality of 86 per cent. The mortality therefore was the same with or without serum treatment in those cases where the Loeffler bacillus was absent. In the other case it was lowered one-half. That shows us, then, that we have in antitoxin another proof of the relation of the Loeffler bacillus to diphtheria.

It is to be noticed that the diphtheria antitoxin is good only for diphtheria, and then only against the Loeffler bacillus diphtheria. It does nothing in the other forms of diphtheria. The diphtheria serum is of use only against that germ or its products which gave rise to it to begin with. Diphtheria is prepared by means of the Loeffler bacillus poison, and therefore it can protect only against a disease produced by this germ.

Of course foreign germs are not infrequently present in diphtheria and consequently complicate the disease. It is a well recognized fact that there are germs which favor the growth of a given germ. On the other hand there are germs that can antagonize or even prevent the growth of another organism. We can take a disease germ that is so weak that it will scarcely produce any effect in an animal. We can combine it with another germ and they together will work and produce a malignant form of the disease. One germ in this case favors the other. That is true very often in the case of lock-jaw. The germ by itself will have little effect if perfectly pure, but if you blend with that germ foreign bacteria that create lactic acid or some acid that favors the growth of the tetanus germ, lock-jaw will develop. And so in diphtheria there are germs which favor the growth of the Loeffler bacillus. There are other germs which are unfavorable to that germ, which tend to drive it out, neutralize its effects. It is evident, therefore, that the kind of bacteria accompanying the Loeffler bacillus can influence for good or bad the outcome of the disease. Where the germ present favors the Loeffler bacillus you are going to have a greater mortality. In the other case the mortality will be less.

What are actual laboratory facts on this point? The following table, like the preceding one, is constructed from the memoirs of Roux and his pupils:

Anginas.	Cases.	Deaths.	Per cent.	Per cent. both anginas and croups.
Pure diphtheria	96	38	40	
Diphtheria with coccus	14	1	7	
Diphtheria with streptococci	29	26	90	
Croups.				
Pure diphtheria	67	44	66	50.3
Diphtheria with coccus	19	5	26	18.2
Diphtheria with streptococci	25	19	76	83.3

In 98 cases of pure diphtheria where the predominating germ is the Loeffler bacillus the number of deaths was 38—a mortality of forty per cent., that is to say, where the Loeffler bacillus is almost pure, or no other germ is present, the mortality is about 40 per cent. On the other hand, in 14 cases of diphtheria where the Loeffler bacillus was accompanied by the diplococcus already mentioned only 1 death resulted, giving a mortality of 7 per cent. This diplococcus, therefore, antagonizes the Loeffler bacillus and renders the outcome more favorable. In striking contrast to this we have the behavior of the streptococci, which clearly favors the growth of the Loeffler bacillus. Out of 29 cases, with such associations, 26 died, giving a mortality of 90 per cent. In other words, 90 per cent of those cases where the Loeffler bacillus is associated with streptococci died, against 40 per cent. where only the Loeffler bacillus is present.

Let us examine croup. Exactly the same condition is shown. In 67 cases where the Loeffler bacillus is present alone or almost alone 44 died, giving a mortality of 66 per cent. The mortality is much greater in the case of pure diphtheric croup than in the same type of angina. In 19 cases of croup associated with the diplococcus 5 died, yielding a mortality of 26 per cent. The difference between 26 and 66 per cent. is certainly striking. In 25 cases of croup where the Loeffler bacillus was associated with streptococci 19 died, or 76 per cent. Combining the two, anginas and croup, we will have a mortality of 50 per cent. where only the Loeffler bacillus is present; a mortality of 18 per cent. where it is associated with diplococci, and a mortality of 83 per cent. where it is associated with streptococci.

The use of antitoxin is beneficial without any question. The mortality drops down one-half or more if the case is taken at the proper time. We can demonstrate in the laboratory with perfect precision that antitoxin will neutralize the action of the germ if the animal receives the injection at the proper moment. The animals exhibited yesterday could not have been saved last night with antitoxin, but if antitoxin had been given three days ago the animals would have recovered and been well today. Thus pure diphtheria cases therefore are markedly benefited by antitoxin. In those cases, however, where the Loeffler bacillus is associated with streptococci, where the mortality is about 80 per cent. ,we will find that the antitoxin is less favorable.

Now to summarize: (1.) We are justified in saying that 75 per cent. of the cases of diphtheria contains the Loeffler bacillus. This bacillus is present in that number of cases clinical of the disease. (2.) By proper cultivation we can isolate the germ in a pure culture. (3.) By the use of its poisonous products or with the pure germ we can bring out the typical symptoms of the disease. (4.) Where Loeffler bacillus is present the mortality is higher than in those cases where it is not present. (5.) By the use of antitoxin we can stay the disease. All these facts demonstrate beyond question that we have in the Loeffler bacillus the cause of diphtheria.

THE CAUSATION OF DITHTHERIA.

DISCUSSION LED BY PROF. DELOS FALL, MEMBER STATE BOARD OF HEALTH, ALBION.

It seems to me that we ought to have something better than these stools to sit on, but, while that is true, I want to say another thing, and that is that there are very great advantages in our meeting in this room over the room below or any of the other comfortable lecture rooms on this campus, because we laymen, doctors, and health officers must become inspired by the surroundings, by the fact that here in this untidy looking room, with its stained floor and apparatus, the valuable experiments have been made which enable Dr. Vaughan and Dr. Novy to talk with so much emphasis and confidence upon matters that are interesting us during our two days' session. When all understand that sanitary science is a matter that is to be the possession of and carried out by the common people of the State of Michigan and of the world, that this science is not a doctor's science, to be thought of and worked over and carried out by them alone, we will be making great strides forward. It is the business of every layman to inform himself on the facts of sanitary science, the facts of bacteriology, and become impressed with their practical value. I am sure that all are impressed with the very confident tone with which Dr. Novy and Dr. Vaughan speak of the real, the true relations, which certain little micro-organisms stand to this dreaded disease. We must learn to have confidence in their work and to believe them. It has been the experience of State Boards of Health that in almost every convention that we have held we find certain men who pretend to know all about these matters who yet shake their heads in doubt about the utterances of bacteriologists with reference to this question of germ disease. It would seem as though this question is settled, and yet there are those who shake their heads and don't believe in it. I do not believe that there is anyone in this audience who is not convinced that the truth concerning communicable diseases has been given to us this morning. I am glad to hear the proper pronunciation of certain technical terms. We laymen do not always get the accent on the syllables just right, but here are men who know, who know that they know, and they are willing to communicate their knowledge to us, that our knowledge may be certain and our confidence may be great, and we may enter thereby into the practical work of carrying out the details for the prevention of diphtheria and other diseases. We have a notion that a great deal of this work is theoretical, but all of it has some practical application which has to do with the welfare of the people of the State, and our lives will be better preserved in the future because of the work that these experts are doing. That is about all I wanted to say. I want my own confidence strengthened in the truth of the facts of bacteriology as they are brought out from time to time, and I agree to enter heartily into the practical carrying out of that which shall be for the saving of lives of the inhabitants of Michigan.

Before I sit down I want to utter two words of caution. One is against the practice of too soon lifting the quarantine from cases of diphtheria. Now in most cases health officers feel that they have a right to lift the

quarantine and allow the patient to go about among other people as soon as the specific conditions which gave rise to the disease and manifest the course of the disease in the system have disappeared, but it won't do in those cases, as I understand it, to allow the person to go among other people as soon as the febrile and other conditions marking the course of diphtheria have disappeared. The researches of Loeffler and others, some of which have been mentioned here, reveal the fact that the bacillus of diphtheria has been found in the throat of patients several days, two or three weeks, after all the conditions incident to the run of this disease had disappeared, and it therefore seems to be the height of wisdom in the practical management of this disease, on the part of health officers, that they shall be very careful to delay the time of lifting the quarantine in cases of diphtheria. I presume you are all familiar with this fact, and yet it seems to me it ought to be emphasized. The State Board of Health have emphasized this thing in their leaflet on diphtheria.

Another word of caution, and that is that in our enthusiasm for and belief in the efficacy of the antitoxin treatment of diphtheria, we should never lose sight of the fact that it will always be just as necessary that we shall continue the old methods of restriction by isolation and disinfection as before. I am afraid that our confidence in the power of the doctor to stay the course of the disease and to destroy it in the system of the patient will cause us to become lax and loose in our isolation of the patient, and in our disinfection of the infectious material that comes from the disease. Does it not seem quite as necessary that we shall still pursue the old policy of isolation and disinfection? It seems so to me that the two combined will bring grand results—the result being that in the near future we may destroy this scourge from off the face of the earth. It will be by the combined effort of those who cure and those who prevent, and I hope the health officers who have this thing in mind will continue to be vigilant, and that the doctors shall assist with their curative methods, and that together we shall reach the result that I have suggested.

Dr. Baker—Mr. President, I would like to ask Dr. Novy why he does not himself start some great movement for the treatment of diphtheria, having in mind the figures on the blackboard which seem to show that when the diplococcus is present with the Loeffler bacillus the mortality is slightly less than it is where the serum treatment has been used. I would like to have him explain why he does not enter upon the recommendation of the use of the diplococcus instead of the serum?

Dr. Novy—I suppose I could do it. But in order to reach the results shown on the blackboard we would have to blend the diphtheria germ and the diplococcus together from the start.

Dr. Wilbur—Before Prof. Novy sits down I would like to ask him what percentage of croup is caused by the Klebs-Loeffler bacillus?

Dr. Novy—The majority of croups, about 75 to 80 per cent., are caused by the Loeffler bacillus.

Dr. Wilbur—Then croup is practically diphtheria, so far as the Loeffler bacillus is concerned?

Dr. Novy—Yes.

Dr. Wilbur—It is becoming almost the universal practice among vital statisticians to compile diphtheria and croup together. Now I had sup-

posed that that was the proper thing to do from the light that bacteriology throws on the causation of the two diseases, but in making a statistical study of croup and diphtheria as returned in Michigan during the past 25 years, I was very much impressed to find that there was a marked distinction.

Dr. Hurd—I would like to ask Dr. Novy if these two reports here where the serum was used and where it was not, were in the same year?

Dr. Novy—All during the period of twelve months.

Dr. Hurd—I readily recall a statement made in the Interstate Medical Society. A physician said that for three successive years there were epidemics of scarlet fever in different parts of the country surrounding Kalamazoo. The first year the mortality was about 20 per cent. The second year it was about 40 per cent., and the third year it was over 75 per cent., and that might be true of diphtheria, might it not?

Dr. Novy—Yes, sir. Different epidemics in different years have different percentages of mortality. I will say with reference to that, to emphasize the correctness of that table, that in the hospital referred to where the mortality of 52 per cent. was found, that for the period of ten years before that the annual mortality was about 50 per cent. It has not at any time during the period of ten years varied more than 6 or 8 per cent. from 46 to 52.

Dr. Hurd—I bring this up for another reason. I read an article by Dr. Lenox Brown, who takes the Paris hospitals and argues that diphtheria serum has produced an additional mortality. That the mortality has increased.

Dr. Calkins—Mr. President, the gentleman who opened the discussion sounded a couple of words of warning, one was that quarantine should not be opened too soon. I would like to inquire whether the burning of sulphur is all that there is necessary for disinfection?

Dr. Novy—Yes, sir.

Dr. Baker—The State Board of Health recommends "not less than three pounds," per thousand cubic feet of space.

Dr. Calkins—That will kill the bacillus, will it?

Dr. Novy—Yes, sir.

Dr. Hochstein, of Kalamazoo, was then called upon to read a paper on the "Practical Restriction of Diphtheria in Cities." Dr. Hochstein being absent, Dr. Vaughan arose and moved that Dr. Hagadorn be called upon both to read a paper and support the discussion.

Dr. A. D. Hagadorn—Mr. President, Ladies and Gentlemen: The subject of the practical restriction of diphtheria in cities and localities to me, as a health officer and as a physician, is interesting and of vital importance, and I had thought of emphasizing some few things, but Prof. Fall has brought them out in a manner more emphatic than I could possibly bring them out. In the practical restriction of diphtheria in cities the most important fact is to early recognize the disease, and after recognizing it to isolate the patient at once and officially quarantine the house. Now it requires but little courage on the part of the physician who is in attendance and also on the part of the health officer to quarantine and isolate a malignant or severe type of the disease, but when they have to deal with mild or doubtful cases it requires more courage to isolate and quarantine such patients and families. This has been my observation. This, the mild type of the disease, has been the center from

which more cases have sprung; also from such cases a malignant type of the disease has spread in the locality.

I wish to emphasize this point that all cases, however mild and doubtful, should be dealt with as promptly and as rigidly as the most malignant type of the disease, and that if the patient has been isolated and the family of the household quarantined there is not so much danger to be apprehended from its spreading. I fully agree with Prof. Fall that the quarantine is raised long too soon. Oftentimes a sufficient use of the proper germicides and antiseptics have not been made to destroy the germs in the throat, and sufficient care has not been taken to disinfect the patient otherwise, also the disinfection of the room is oftentimes not done carefully; neglect of these things favor the spread of the disease in a locality. I have in mind a number of cases where I am certain the disease has been transmitted to others because quarantine has been raised too soon, and the patient permitted to go at large before the germs are destroyed in the throat; also where the cause of the spread of the disease was in a lack of proper disinfection of the room and the patient's clothing. I know of another case where the disease was communicated to several families because of insufficient disinfection after a death from diphtheria. Now I do not believe that the burning of sulphur in rooms where there has been a malignant form of diphtheria, where a lack of care and cleanliness on the part of the attendants is sufficient to destroy all germs in the room. I think in addition to the use of sulphur the thorough washing and wiping of all the contents of the room with a certain strength of bichloride of mercury is necessary. I believe this is just as important as the use of the sulphur. After the patient has become well the carpets, bedstead and woodwork of the house should be thoroughly washed with the bichloride solution. I have observed, too, carelessness on the part of physicians. Not long since I was called in consultation with a physician to see a child, the last in a family where the mother and two children had died from malignant diphtheria, and this child was about to die, all had occupied the same bed. During our conference or stay in the room the doctor sat upon this bed, beside the sick child. Such carelessness, no doubt, favors the spread of diphtheria in localities.

I do not think proper care is taken by the physician in the sick room. Oftentimes I do not think that it is necessary for the physician to come in contact with the bed or patient's clothing nor sit down in the sick room where there is a contagious disease, and when visiting diphtheritic patients he should be provided with an antiseptic solution and a sponge and carefully disinfect his person before going elsewhere. I think care on the part of the physician and attendants, a thorough disinfection with sulphur and the bichloride solution and keeping the patient in quarantine a sufficient length of time are the most efficient methods of protecting others, and preventing the spread of the disease in localities.

Dr. Rosenberry—I would like to make a suggestion. In the city of Milwaukee they have a ruling of the health department that says that no placard will be removed from the house that contains a case of scarlet fever until six weeks has elapsed, and that in case of diphtheria the placard shall not be removed until four weeks has elapsed. Now that sometimes works a hardship upon both the doctor and the patient, but I

believe it is justified. In the six weeks the patient who has scarlet fever has ample time to peel off and get rid of the germ. If the doctor has made a mistake in his diagnosis, it is pretty hard on the doctor, but I believe the rule is a good one.

L. M. Connor—I would like to ask the value of bichloride of mercury.

Dr. Novy—Bichloride of mercury is an excellent germicide, especially where there are no spores. In the case of the diphtheria germ we have no spores, and, consequently, mercuric chloride could be used as a disinfectant. It has to be used with a great deal of caution, inasmuch as it is exceedingly poisonous.

I would like to make one or two remarks, especially upon the subject brought up by Prof. Fall. We must not expect everything of antitoxin, so far as the prevention of diphtheria is concerned. Antitoxin is useful, but on no account should it displace entirely the means heretofore in the hands of the physican. The usual methods of local treatment that have been practiced in the past are as good now as then. Every procedure possible should be resorted to to prevent the spread of the disease, and when it comes to the restriction of the disease, I believe it is the duty of the physician to see that cleanliness, in the bacteriological sense, which is next to Godliness, should be enforced. Every article that leaves the room should be sterilized, and isolation should be rigidly maintained until all danger of the spread of the disease has passed away.

Now about placarding. Of course that is a measure introduced long before anything was known regarding the causal germ. It is now a well known fact that the Loeffler germs may persist in the throat for days and weeks, and even in rare cases for months after the child has recovered. That, however, does not necessarily mean that we have to placard a house and keep it placarded for months in every case. Where it is possible to do so a bacteriological examination of the throat should be made. As long as the child harbors in its mouth these germs, and goes to school and uses the same cup and slate pencil, that child is a source of danger, and the only safe way is to see that the patient is bacteriologically free from the disease.

Dr. Mills—You say that 25 per cent. of the cases of so-called diphtheria do not contain the Loeffler bacillus. Are we justified in placarding that 25 per cent. of other cases that do not contain the Loeffler bacillus?

Dr. Novy—They are infectious to a certain extent, and while the same rigorousness in preventive methods is not necessary, at the same time until they disappear, I should believe in restricting the disease if possible.

Prof. Vaughan—Something has been said here about placarding houses. I hope that we will all regard the placarding of houses as a temporary expedient that we are compelled to resort to, and that we will try and place ourselves under conditions where the placarding of houses will not be necessary. This is simply a step in the development of sanitary matters. It is not the most desirable way of preventing the spread of infectious diseases. Every health officer must endeavor to have his city, as soon as possible, establish a small hospital for infectious diseases, and then when a case of diphtheria occurs in a house, the child is to be taken to the hospital and the house is to be disinfected at once, and

there is no necessity of placarding the house. Placarding houses is like the old method of quarantine. For fifty or more years the United States government tried to keep yellow fever out of New Orleans by quarantine. They compelled incoming ships to lay for forty days at the mouth of the Mississippi, and after laying there forty days they came up, disembarked their cargo, and yellow fever always came. We must ultimately recognize the fact that a special hospital for infectious diseases is desirable in every town of any size, and there are other obvious advantages. We have our trained nurses at the hospitals. Physicians are in attendance at all times, day and night, appliances are ready for performing any necessary operations or examinations. In places where such hospitals exist people soon come to recognize the great good that they do. I know, for instance, from personal observation that in Birmingham, England, there is no man, no matter how rich he is, who would think of keeping his child at home with a case of diphtheria. For nearly fifteen years they have had an infectious-disease hospital, and they know when the child is taken with diphtheria that that is the place for him. The mother may go, too, but if she goes she must remain with him. I look forward to the time when we shall have these hospitals in the smaller towns, and it would certainly pay our cities to have such hospitals.

Prof. Fall—Prof. Vaughan's answer or suggestion was spurred by Dr. Mills' question. I quite fully agree with the desirability of bringing about such a condition as that, but that is in the future, and my answer to Dr. Mills' question would be this, that we relax no means now that will in any way contribute to the restriction of this disease, that the placarding of houses in this 25 per cent. of cases, while it may be that there is a mistake, still there is an element of danger in it, it is communicable, and we ought to be on the safe side in our method of procedure. Just as an illustration, we were very indefatigable in our efforts during the World's Fair year to keep out a disease which never got into the country, and which did not menace us to a very great degree. Nine-tenths of the work done there was thrown away, but it did contribute in lessening in a great measure a great many other diseases. Let us go to the extreme and do all we can.

Dr. Crane—As I understand the subject, the 25 per cent. of cases where the diphtheria bacilli are not present are not diphtheria. If the germ is absent there is no danger of infection. But if all of these houses are going to be placarded anyway, how do the bacteriological examinations help the health officer?

Dr. Baker—In one of Dr. Novy's tables, on the blackboard, I see the "number of cases without Loeffler bacillus 117, the deaths 11, mortality 9.4." That settles the question, it seems to me. The law provides that the isolation and disinfection and efforts for prevention shall apply to small-pox, diphtheria and scarlet fever, and "other dangerous communicable diseases." Now the mortality there is 9 per cent., very much the same as in typhoid fever. The State Board of Health recommends that typhoid fever shall be placarded. I understand that this form of the disease heretofore known as diphtheria is caused not by the Loeffler bacillus but by other micro-organisms which are communicable, from person to person. In other words, the disease is a communicable disease. The table shows it to be a dangerous communicable disease,

and it seems to me that caution should be taken to restrict it. What difference does it make if the house is labeled diphtheria or scarlet fever? The fact that the name may not be just exactly the right one does not matter, but it is important that the placard should be on the house that the people may keep away from there, that steps may be taken for the restriction of the disease, just the same as if it were Loeffler diphtheria.

Dr. Rosenberry—Is it diphtheria at all if the Loeffler bacillus is not found there? Is it not some other disease, and should it not be tabulated under some other name?

Dr. Novy—Give it any name you please. Call it false diphtheria. So far as our knowledge today is concerned we are justified in restricting the word diphtheria to that group which is due to the Loeffler bacillus. So far as the clinical side is concerned we are dealing with a group of diseases. Of these various causes the Loeffler bacillus is the most destructive. The other diseases are due to germs. They are infectious, and yet I should not carry out the same treatment, since antitoxin is useful in one case, the Loeffler diphtheria, and useless in the other cases where the Loeffler bacillus is absent.

A careful bacteriological examination will tell whether it will or will not be serviceable. Where it is impracticable to have a bacteriological examination made, antitoxin should be resorted to as early as possible. While it does no good in those cases where the Loeffler bacillus is absent, yet it does no harm.

Dr. Crane—The other germs are present I presume in almost every throat in this room, and it is certainly doubtful whether such a sore throat is contagious. The New York City Board of Health has a ruling on that point, and the experience of the New York City Board of Health is greater than that of any other board of health in this country or in the world perhaps. Its ruling is that the Boards of Health are not justified in putting a diphtheria sign on any house where the diphtheria is due to these other germs, that they are not proved to be contagious nor specific. There is not any one germ that causes it, and so far as there is any precedence in the matter, the precedence is in favor of not placarding those houses where the Loeffler germ is not found.

Dr. Baker—I would like to suggest this fact—that New York City may be advanced in a great number of things, but I remember very well when they did not placard for the other diphtheria, now known as the Loeffler diphtheria, until after a certain man was elected President of the Board of Health. It seems to me that we are not to follow New York in everything. They have followed Michigan with reference to the restriction of diphtheria of the other kind, they may yet follow us in something else, and when you have to deal with a dangerous communicable disease that has been known to the people of this State for years as diphtheria, and the physicians have as yet no other name for it, I see no reason why the diphtheria sign is not applicable, until the physicians have another name for the other, perhaps milder, form of the disease. This particular sore throat is known to a large portion of the profession as streptococcus diphtheria. I think some of those experts in New York recognize it as the streptococcus diphtheria. Until the medical profession get some other name for the disease than streptococcus diphtheria, I believe that the health officers of Michigan ought to placard the houses as "Diphtheria," and to restrict it.

Dr. Kapp—I have heard but very little of your discussion, but it would seem to me that instead of calling one diphtheria and another scarlet fever, when there is slight doubt, why not have a placard "Dangerous Disease." That will cover everything, in my opinion. It is immaterial what the disease is. If it is shown to be dangerous, people will keep away from it. It is immaterial whether we are run over by the locomotive or a freight car or the Flying Dutchman.

Dr. Crane—Pardon me for rising again, but it is a serious thing when a man's house is placarded for diphtheria. Everybody is kept in the house and they are tabooed by the neighborhood. If that 25 per cent of cases where the Loeffler germ is not present should be placarded, the people would have a right to protest.

Dr. Calkins—I would like to ask Prof. Novy whether that 25 per cent of cases have ever communicated or originated another case of diphtheria where the Loeffler bacillus was present. If that were true it would show that this 25 per cent. of cases should be quarantined just as thoroughly as the other.

Dr. Novy—It is impossible for the Loeffler bacillus to be formed from a micrococccus. The cases of false diphtheria due to micrococci may change to true Loeffler diphtheria if they are exposed to the latter disease.

Mr. McAlvay—Mr. President, as layman, I am not acquainted with this vast Coxie's (cocci) army that you are telling about; also facing the fact that as a layman my tongue is somewhat tied in the proper pronunciation of this terminology, yet I think my scientific brethren will recognize this fact, that a number of cases come up every day in cities and towns where the physician has little or no opportunity to immediately examine in such a way as to decide at once whether this germ is present or not. I think the physician should placard the building until he determines by such examination as may be necessary. I think the public interest demands that the placard should be used, and that the private individual interest should take second place for the time being. The interests of the public health are paramount.

Dr. Mills—In placarding a house previous to knowing exactly what the trouble is, it becomes a little embarrassing perhaps to take down a placard a day or two later. In such a case as that I think it would be well, as Dr. Kapp remarked a moment ago, that we could have a placard that was simply put up for temporary use, until it was definitely decided what was the trouble. It seems to me that something of that kind might be adopted which should relieve physicians, and give the warning desired.

Dr. Crane—Mr. Chairman, I ask Dr. Novy or Dr. Vaughan or both whether the other diseases caused by the cocci are dangerous communicable diseases; whether they can be so classified?

Dr. Vaughan—I will answer that question to the best of my knowledge and ability. As a practical physician I say there is very little danger in the spread of these other diseases that are due to the cocci. As a rule they do not go through families, and they are very seldom transmitted from one person to another. That is my observation. That there is a possibility of their transmission there can be no question at all, but as Dr. Crane has very properly stated, these cocci are present in great numbers abundantly all about us, and the fact that a child has the steptococcus diphtheria is probably due to some local irritation of the throat

which enables it to grow there more vigorously than it ordinarily does. These germs are to be found in the throat and nose very frequently, and I agree with Dr. Crane that practically the placarding of houses from the streptococcus diphtheria would not be necessary. However, this is a matter that I do not think of very great importance, because there are only a few places in Michigan where the physician can determine whether it is a streptococcus diphtheria or Loeffler's diphtheria. In Kalamazoo, I believe, which is a progressive town and ahead of most of us, they have a microscopical examination made in a few hours to determine whether it is true diphtheria or false diphtheria. Where that is done I do not think any long or continued placarding of the house is desirable or necessary, and I agree with Dr. Crane that that is one of the objects of having such bacteriological examinations so the long-continued isolation and confinement of the members of the household will not be necessary. In New York city streptococcus diphtheria is not isolated.

Dr. French—Speaking of the subject of placarding, I am sure we have pretty good facilities for finding the germs. Some time in the month of April I was called upon to attend a case of sore throat. It was analyzed and the germ found to be the round germ. I did not take down the placard. I think there is danger in removing the placards.

Prof. Fall—Apparently there are two sides to this question. Both sides have been very vigorously but quite confidently defended, and we are coming to the agreement that where we know absolutely that the case is not a case of the Loeffler bacillus less precaution need be taken. We ought to crystallize the exact fact that we wish to go out to the public or health officers that are here. Some one ought to write it out that it shall not be understood that we are at odds here over the question. I feel like asking Dr. Vaughan to write out clearly the statement that he made the last time, in the form of a resolution to present to this body for passage so that the publication of the fact will be secured.

President Wells—I think that will be entirely satisfactory to the conference. If Dr. Vaughan will do so we will now continue the program.

[Dr. Vaughan did not do so, no opportunity occurred for a full discussion, and the extent of the danger in streptococcus diphtheria seems not yet definitely established, therefore the safe way seems to be to follow the directions of the State Board of Health, in its pamphlet on the restriction of diphtheria, which read as follows: "No health officer should fail to act for the restriction of diphtheria in any case of sore throat in which there is doubt, certainly not until bacteriological tests have proved the absence of the Loeffler bacillus (now known to be the specific cause of true diphtheria) and of the streptococci; streptococcus diphtheria also being a dangerous disease." H. B. B., Sec. S. B. of H.]