The Otological Society of the United Kingdom will hold its annual dinner at the Café Monico, Shaftesbury Avenue, London, on December 3, at 7 for 7.30 p.m.

"Under the will of the late Mr. Richard Smith, the Metropolitan Ear, Nose, and Throat Hospital, Grafton Street, Fitzroy Square, W., will benefit to the extent of the residue of his estate after certain specific legacies, life interests, and annuities have been paid. The total which will eventually fall to the hospital will be about £30,000."—*Times*, October 26, 1900.

BRITISH MEDICAL ASSOCIATION.

ANNUAL MEETING, IPSWICH, JULY 31, AUGUST 1, 2, 3, 1900.

SECTION OF PATHOLOGY.

E. KLEIN, M.D., F.R.S., President.

A DISCUSSION ON

THE PATHOLOGICAL DISTRIBUTION OF THE DIPHTHERIA BACILLUS AND THE BACTERIOLOGICAL DIAGNOSIS OF DIPHTHERIA.

THE discussion was opened by F. W. ANDREWES, M.A., M.D., F.R.C.P., Pathologist and Lecturer on Pathology at St. Bartholomew's Hospital. Dr. ANDREWES said:

Most pathologists will admit that Bretonneau's definition of diphtheria requires modification in the light of modern bacteriological knowledge. It requires in one direction limitation, for there are grounds for supposing that not every membranous sore throat or laryngitis is due to infection by the Klebs-Loeffler bacillus; while in another direction it requires extension, for it is clear that many mild and non-membranous sore throats do depend upon infection by this organism. It is the presence or absence of the specific bacillus which is now held to decide whether or not a given case is to be regarded as one of diphtheria.

This being so, a consideration of what is and what is not to be regarded as the diphtheria bacillus becomes an essential preliminary to the discussion of the subject. There exists a fairly definite group of bacteria, often spoken of as "diphtheroid organisms," which has with propriety been systematized as a definite genus under the name "Coryne-bacterium." Its members are

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characterized by a tendency towards a "clubbed" form, and by an irregularity in the staining properties of their protoplasm, due to the presence of granules which are commonly metachromatic, and may even admit of differential staining. Spore formation is not known in the group; its species are devoid of flagella and are non-motile; they stain by Gram's method, and do not liquefy gelatine; in certain cases true branching has been demonstrated.

It has been shown, beyond the possibility of doubt, that diphtheria depends upon the pathogenic action of a bacillus possessing the above characters. It seems also certain that there are allied bacilli which are non-pathogenic, or are at least not concerned in the production of diphtheria. It is thus of the first importance to find criteria by which we can distinguish between the true diphtheria bacillus and its non-pathogenic allies. Unfortunately, the genuine organism varies considerably in its morphological characters. A large well-clubbed form, a much smaller peg-shaped form, or any gradation between these types, may be met with in clinically typical diphtheria. The toxin produced by these different forms is practically identical, and their inoculation into susceptible animals gives the same result. Considerable variation in size and form may sometimes be found, even amongst the individuals composing a single colony. Some of the smaller types of the true bacillus bear so close an outward resemblance to allied species—for example, to the xerosis bacillus—that they may be morphologically indistinguishable. Less commonly harmless species are found to mimic the large form of the diphtheria bacillus.

It follows that morphological characters alone are an unsafe guide for absolute diagnosis. There is, indeed, a structural character for which some diagnostic value has been claimed—namely, the differential staining of the granules present in the protoplasm by Neisser's method or its modifications. Young cultures of the true bacillus on serum or serum agar commonly show the granules well, while in corresponding cultures of other diphtheroid organisms they are usually feeble or absent. I have employed the test regularly for some time, and my experience is that while it is a useful confirmatory test, often helpful, it is not one upon which absolute reliance can be placed.

Much the same criticism applies to a common chemical test, namely, the production of acid in glucose broth during the first twenty-four or forty-eight hours. It is a test of very great value, but it is not an absolute criterion. Individual strains of true diphtheria bacilli vary in their degree of acid production, and

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although the majority of allied organisms fail to produce acid, there are said to be some that do so.

A test of much higher value is furnished by animal experiment, and it is upon this that ultimate reliance must be placed. If a guinea-pig, inoculated with a suitable dose of the suspected bacillus, die with the characteristic lesions, the bacillus is pronounced to be the genuine diphtheria bacillus. If, on the other hand, no pathogenic effect whatever is produced, the bacillus is held to be some other species, however closely its remaining characters may approach those of the diphtheria bacillus. Short of a fatal result, the production of pathogenic effects, such as illness and local tumour, in the inoculated animal is consonant with the belief that the bacillus is an attenuated form of the true diphtheria bacillus.

Such are the opinions commonly accepted; but there are certain points as to the absolute reliability even of animal experiment which are open to argument. Is it, for instance, quite certain that if the guinea-pig dies the suspected bacillus is necessarily the diphtheria bacillus? Or, in other words, may there not be other diptheroid organisms pathogenic to the guinea-pig, yet unconnected with diphtheria? It is claimed that there are such organisms, and that hence absolute proof can only be attained by showing that known diphtheria antitoxin immunizes a control animal against an otherwise fatal dose of the suspected microbe. Again, is it absolutely certain that absence of pathogenic power proves that the suspected organism is not the diphtheria bacillus? It is certain that under such circumstances no one can affirm that it is that organism; but that is a different thing to affirming that it cannot be. What we know of loss of virulence in artificial cultures may well make us hesitate to deny that such non-pathogenic forms may be lineal descendants of pathogenic bacilli.

It may be that, in searching for absolute criteria, we are striving after the unattainable. No evolutionist need marvel that, amongst the lowliest forms of life, specific distinctions are vaguer and more elusive than higher in the organic scale. After all, it is only in very exceptional cases that a skilled observer, who is at pains to apply all the known tests, is left in serious doubt as to the nature of a given diphtheroid organism.

The practical application of the foregoing remarks leads to questions of the highest importance. The diagnosis of the diphtheria bacillus is required under two distinct conditions. It is justly demanded of the man who puts forward new facts about the bacillus, as, for example, about its pathological distribution, that he should neglect no attainable proof as to its identity. The

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demonstration of this needs several days, perhaps a week or even longer; but scientific work demands it imperatively. Far more frequently, however, the bacteriologist is confronted with the problem of clinical diagnosis. He knows that the tests for absolute diagnosis require several days, a delay which the physician cannot tolerate. For the physician is aware that every day's delay in the administration of antitoxin means an added risk to his patient, and he is responsible for questions of isolation and disinfection. He naturally asks prompt assistance from the bacteriologist, for it is of little service to him unless it is prompt. He wants an answer by telegram in twenty-four hours. The bacteriologist does his best to comply with the request. The physician gets his report, and, if we may judge from the increasing demand for such reports, finds it of assistance in diagnosis. But it is of great importance that practitioners generally should apprehend the precise nature and limitations of such a report. It can only represent a pious opinion on the part of the bacteriologist, based on the somewhat uncertain foundation of morphological, tinctorial, and cultural characters. In the hands of a competent and experienced observer the probability that such a report is correct may be very high, and more than enough to justify the practitioner in taking decisive action. It is therefore of obvious utility, but the practitioner must take it only for what it is worth; it has not the value of certainty too often attributed to it; and the report should, in my opinion, be more cautiously worded than is frequently the case. Every bacteriologist who has done much work of this kind has probably at one time or another placed himself in a false position by too hasty an assumption as to the nature of the bacilli he has found; for, as a rule, he knows little or nothing of the source of the material sent him, which may be from a suspicious sore throat, but may equally come from a healthy nose, or even from some non-human source. Malicious tricks have been played on bacteriologists often enough.

It may be urged that the practitioner wants an authoritative answer upon which final diagnosis may be based. If so, the sooner he is educated out of that expectation the better. There is a growing tendency to place the responsibility of diagnosis in diphtheria upon the shoulders of the bacteriologist, without furnishing him with any clinical details, or allowing him time for necessary tests. This is partly the fault of bacteriologists themselves, for they have loudly proclaimed that they alone can tell what is diphtheria and what is not. It is true that, given the requisite time for experiment, they can assert the presence or absence of pathogenic diphtheria bacilli; but ultimate diagnosis must always

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rest with the physician, who knows all about the case, and not with the bacteriologist, who may know little or nothing. Virulent bacilli may be present in the throats of healthy persons who have been in contact with diphtheria cases, and it is obvious that this does not constitute diphtheria. Bacilli closely resembling diphtheria bacilli may be abundant in the healthy nose. In every case the ultimate responsibility of diagnosis must rest with the physician and not with the bacteriologist, though the help which the latter can give is of the highest value and importance. In one small branch of practice it is my good fortune to combine the two functions, for I am at once Pathologist to St. Bartholomew's Hospital and medical attendant to the nursing staff, amongst whom sore throat is common. For the diagnosis of such cases the combination is ideal, and I can bear emphatic testimony to the fact that it is from a combination of all points of view that a just and sane diagnosis is most readily attainable. At the same time it is fair to say that the bacteriologist is less liable to error than the physician—indeed, very much less liable to error if he is at pains to control his results by animal experiment. Five years ago I carried out, with the late Professor Kanthack, an investigation of some seventy consecutive cases of sore throats of all kinds amongst nurses—clinical and bacteriological—controlled by animal experiment. We found that, on clinical grounds, I should have made an erroneous diagnosis in one out of every nine cases of apparently simple sore throat.

In my opinion, it would be a reasonable thing that the bacteriologist should always be furnished with clinical details concerning the material submitted to him. Much erroneous diagnosis is caused by his working in the dark. The practitioner seems to fancy that he gets a more unbiassed opinion if he withholds clinical facts, but I am sure this is a mistake. Within the last few months I have been concerned with a private school in which cases of diphtheria had occurred. The boys were sent home while disinfection was carried out, and no boy was allowed to return until cultivations from the throat and nose had shown the absence of diphtheria bacilli. Between fifty and sixty boys were thus examined: in no case were any suspicious bacilli found in the throat, but in about ten cases reports came from different bacteriologists that diphtheria bacilli (or the more cautious report, "bacilli morphologically indistinguishable from diphtheria bacilli") were present in the nose. These boys were all in perfect health, but the bacteriologists were not told that the material came from healthy noses, and they fell into the pit. But in no single case were the

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bacilli found to have any pathogenic effect upon guinea-pigs, when more careful tests were applied. Eight out of the ten were submitted to me, and I found only Hoffmann's bacillus or some allied harmless species; the other two were tested elsewhere with similar result. Had the bacteriologists known the facts, the parents of the boys would have been spared a serious panic.

Another point worthy of consideration is the weight to be attached to negative bacteriological reports, especially in cases clinically regarded as diphtheria. It must occasionally have happened to most bacteriologists to find diphtheria bacilli at the second or third attempt when previous results had been negative. It has happened to me to fail in demonstrating the bacilli during life in a case of undoubted clinical diphtheria, in which tracheotomy did not avert a fatal issue, in spite of repeated and elaborate endeavours, and even after death to fail, except in a cultivation from the ventricle of the larynx, in which the bacillus was demonstrable. Such instances make one hesitate to accept as final the cases of fatal membranous laryngitis which have been asserted to be non-diphtherial in nature. It must in any case be conceded that negative results are much less conclusive than positive ones.

I have felt it my duty, in opening the discussion on this very important subject, to deal with general principles rather than with details. I have no new or striking facts to bring forward as to the pathological distribution of the bacillus. It is generally admitted that it commonly remains limited to the original seat of infection; that by direct extension it may spread down the air-passages or along the mucous membranes which are in continuity with the throat (so that it is commonly to be found in the lung in fatal cases); and, lastly, that in cases of severe type it may be found after death in other parts of the body, such as the spleen, usually in scanty numbers, and probably only as a terminal infection.

It is to be regretted that much of the work which has been done upon the distribution of the diphtheria bacillus—as, for instance, upon its occurrence in healthy throats—is vitiated by the absence of convincing proof as to the identity of the bacilli found. The question of the persistence of the bacilli in the throat after diphtheria is also of singular interest and importance. I have myself found bacilli present abundantly and in full virulence three months after the primary attack, and I believe that similar facts are on record. Another matter well worthy of discussion is the relation of the diphtheria bacillus to scarlatinal and post-scarlatinal diphtheria, a subject upon which, unfortunately, I have no personal observations to offer.

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The opinions that I have ventured to express are the result of my own personal experience, and represent my sincere convictions. But I do not doubt that, in a subject which bristles with so many difficulties and fallacies, there must be many present who will disagree with them, a circumstance which, I trust, may lead to an animated discussion.

Dr. Thomas David Lister (London) said: The bacterioscopic test which Dr. Andrewes described is sufficiently accurate for clinical purposes—that is to say, so far as the diagnosis of the presence of the Klebs-Loeffler bacillus is concerned—and is naturally the only one usually adopted for clinical purposes; in the exigencies of practice, inoculation is not widely applicable. Cases in which organisms are found presenting the morphological characteristics described by Dr. Andrewes should be isolated and treated antiseptically, whether they present symptoms of true diphtheria or not. At the Royal Medical and Chirurgical Society on October 25, 1898, I mentioned, in a discussion on a paper by Dr. Lambert Lack on Membranous Rhinitis, the frequency with which such bacilli are found in cases of chronic nasal discharge in infants and young children. I gave statistics of 125 examinations, in some of which a post-mortem examination confirmed the views expressed by Dr. Lack as to the relation of the Klebs-Loeffler bacillus to membranous rhinitis. Since then I have been able to trace three cases of true diphtheria following upon the presence of what I am accustomed to call Klebs-Loeffler bacilli in apparently merely chronic nasal discharges. These may of course have been infections by a different bacillus presenting similar morphological characteristics, but they may also have been due to the development of virulence in the organisms found in the nose, though what the factor is which may determine such virulence it is impossible to suggest.

Dr. Crowfoot said: I entirely concur with what Dr. Andrewes has said as to the necessity for the diagnosis of diphtheria being, in a large measure, dependent upon clinical as distinguished from bacteriological data. As an illustration of this statement I may mention a case which came under my notice. It was that of an individual who suffered from sore throat; a swab was taken from the throat and examined bacteriologically, with a negative result. Nevertheless, several other members of the same family contracted the same disease, and I have no hesitation in saying that the cases, whatever they may have been bacteriologically, were clinically diphtheria.

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Professor Muir (Glasgow) said that Dr. Andrewes had treated the matter from the common-sense point of view, and he agreed in the main with what had been stated. He thought that the question had a twofold aspect—the strictly scientific and the practical. With regard to the former, the question was what determined species was involved, and that was a question in biology—moreover, a question which at present could scarcely be properly answered. An organism might give all the cultural and microscopic characters of the diphtheria bacillus and also produce the characteristic lesions on inoculation; with regard to it no doubt would arise, but another might be like it in all respects except that it was non-virulent to a guinea-pig and yet might produce small quantities of diphtheria toxin; this also would be called an attenuated diphtheria bacillus. But supposing that no toxin could be detected (the other characters being present), could it be said that it was not the diphtheria bacillus? From the biological point of view he thought not. With regard to clinical diagnosis, he thought that the proper course was for the bacteriologist to state the results of his investigations, and for the clinician to use these in association with the results of his own observation; it was only in this way that the best use could be made of the knowledge obtained in the two departments; the clinician ought at least to understand the bacteriology of the disease. It was a great mistake to divorce the two fields of investigation, as was sometimes done.

Dr. Lazarus-Barlow (London) said: I think there is nothing more certain than the fact that it is absolutely impossible to give a strictly scientific and certain diagnosis in a suspected case of diphtheria in twenty-four hours, and as the result of microscopic examination alone. The only thing that the physician has a right to expect is an opinion of a greater or less degree of probability. As a matter of fact, I decline to give an opinion unless I have been able to learn something of the clinical aspects of the case. Where experimental evidence is obtainable the probability of accurate diagnosis is, of course, enormously increased, so that while the rapid diagnosis must be more or less unsatisfactory, cases in which time is a somewhat less urgent factor can still derive the full benefit from a bacteriological examination. Cases of this description are to be found in the so-called mild cases in which throat symptoms are slight and fugitive. From the point of public health no less than from the point of the proper convalescence of the patient, definite knowledge as to whether the case has been one of true diphtheria or not is of the greatest importance; that is to say, the class of case in which bacteriological examinations are of value are

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of a somewhat different order than those for which we are commonly asked our opinion.

The PRESIDENT said: The opinions expressed by Dr. Andrewes and Dr. Muir are those which commend themselves to all scientific bacteriologists, namely, that the bacteriologist cannot at present do all that the clinician expects. I am of the opinion that the sooner and the more forcibly this is placed before the physician the better for the physician, and particularly for the bacteriologist. After all, the bacteriologist cannot go beyond what his methods and the particular state of his science allow. For example, diphtheria bacilli or bacilli conforming to all tests we are familiar with as characteristic of diphtheria bacilli occurred in milk, and yet the farm, its personnel, and the consumers of the milk, negatived the conclusion that the bacilli were those that cause diphtheria.

THIRTEENTH INTERNATIONAL MEDICAL CONGRESS, PARIS.

August 2-9, 1900.

SECTION OF LARYNGOLOGY AND RHINOLOGY.

Summary of communications translated and abstracted by
ARTHUR J. HUTCHISON, M.B.

(*Continued from* p. 566.)

Pseudo-Hæmoptysis arising in the Naso-Pharynx. By RICARDO BOTEY (Barcelona).

In six years the author had seen a score of cases of this kind, and was surprised that our special literature took so little notice of the subject.

He excluded all cases in which hæmorrhage in the cavum was due to ulcer, malignant tumour, or traumatism. According to the literature, hæmorrhages from the upper respiratory tract, which simulated hæmoptysis, always arose from the larynx or a varix of the lingual tonsil. The author, on the other hand, maintained that in almost all cases the cause of these false hæmoptyses was to be sought in the naso-pharynx. The larynx and lingual tonsil were seldom at fault.

Dr. Botey cited six of his cases in support of his position. The patient always coughed but little, but his spit was frequently blood-stained; examination of nose, pharynx, larynx, root of tongue, and chest gave negative results. If one examined the patient during

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