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**BACTERIOLOGY IN RELATION TO DISEASES
OF THE THROAT AND NOSE.**

By JOHN MACINTYRE, M.B., C.M.

(Read at the Meeting of the British Laryngological Association, March 20, 1891.)

PART I.

Mr. President and Gentlemen,—In every branch of medicine and surgery the study of bacteriology has become an essential part of our work. It is therefore quite to be expected that in a society like ours this subject should form an important part of the practice of each surgeon. Within the past two or three months, the facts known to most of us have been emphasized by the recent discoveries and attempts to base our diagnosis on a sound and scientific basis. Without attempting to detract in the slightest from the value of the discoveries at present on trial, it will not be forgotten by those who are conversant with our literature that many workers have been for a long time doing their best to prove the necessity of early recognition of the more incipient affections, such as tubercle.

The Council have decided that a discussion should take place on the study of bacteriology in affections of the throat and nose, with special reference to its influence on diagnosis and treatment; and in many respects the upper part of the respiratory tract offers an opportunity for observation unequalled in any other part of the body.

In introducing this discussion we have decided to approach the subject from three different points of view. In the first place, to refer to a few of the more important general facts bearing upon the subject, without a

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knowledge of which it is impossible to appreciate its true value. Secondly, to devote some time to the consideration of the results following the introduction of the micro-organisms into the tissues. Thirdly, to take into consideration the methods of treatment at our disposal.

Microscopic specimens, cultivations, diagrams, photographs, etc., have been placed before you, so as to demonstrate, as far as possible, the different points taken up in this paper.

Probably no department offers greater difficulty to the surgeon or physician than that upon which we are about to enter, and certainly in no department is it more necessary that every possibility of error should be excluded by forethought, efficient training, and careful manipulation. Indeed, in the hands of the most skilful doubt was for long thrown upon many of the now established facts because of inefficient methods, and no one can estimate the amount of difficulty and labour later experimenters have had to undergo, in order to correct the earlier and, in many cases, misleading statements placed before the profession. No sooner have we asked ourselves, What are these micro-organisms? than we are beset with the first difficulty, because, as yet, no one has been able to classify these organisms on a scientific basis, and their true place in the vegetable kingdom has not yet been assigned. All attempts to base or classify fungi on the presence of chlorophyll or morphology must be unsatisfactory, but the true place which they occupy in Nature may be safely left to the consideration of those more particularly devoting themselves to the study of botany. It is quite sufficient for our purpose to know that they are the lowest forms of organic life, that the structure in most cases is pretty well defined, that they are, with one or two doubtful exceptions, devoid of chlorophyll, and incapable of evolving material for their structure from organic matter. As they mostly multiply by division, the term "Fission-fungi" has been given to them, and so they are classified as "Schizomycetes."

We have comparatively little interest in any of the other forms of fungi, although the mould-fungi, or fungi proper (Hyphomycetes), in some instances are interesting from their pathogenic action in the lower animals, mainly in insects. Yeast-fungi (Blastomycetes), so far, are only of interest to us in the single instance of thrush, while the animal-fungi (Mycetozoa) have not received sufficiently careful consideration to make them of anything like scientific value to us at present.

A great amount of interest has been excited of late in the theory involving the parasitic nature of infectious diseases, and the causal connection between micro-organisms and specific affections has to a considerable extent overshadowed the other parts of this study. If, however, we wish to understand the action of these organisms upon the tissues, it must never be forgotten that bacteria may be found in the body perfectly harmless. Secondly, they may perform physiological functions, and, as we hope to show in this paper, they may even have a beneficial effect in certain pathological conditions. It is therefore necessary to recognise the form, function, and general vital phenomena of micro-organisms before taking up those which are really or doubtfully pathogenic in nature. Ever since 1828, when Ehrenberg proved the presence of minute living organisms constantly in our surroundings, the subject has given rise

to great interest. Caignard Latour and Schwann eight years later did great service by demonstrating the vegetable nature of yeast. This discovery might be looked upon as the foundation of the vitalistic or true germ theory, and Schwann in his later work, in 1837, by asserting that in the air there are present fermentative and putrefactive germs, led to the causal association of these in the minds of men. Before this time the association of micro-organisms with the fermentative processes was considered an accidental one, or, at the most, that the cells might act so as to condense the oxygen and pass it over to the other substances, and so produce the decomposition of the sugar. To prove that the process was really a physiological one it was necessary to demonstrate that living cells were present in all fermenting fluids, that by the exclusion of these cells the process would not be developed, and in this connection the names of Van de Broek, Pasteur, Lister, and Cheyne will be for ever remembered. It is needless now to refer to the magnificent work which demonstrated these two important points, nor to do more than mention the names of Ehren, Tyndal, Pasteur, Cohn, and Sanderson, who did so much to show that these fermentative organisms are carried everywhere, and that, unless carefully excluded, fermentescible substances will undergo this change. Although these facts were placed on a comparatively sound basis, the work was by no means complete, and that of Pasteur, in his researches upon the different kinds of micro-organisms giving rise to different and specific actions, can never be over-estimated. The progress of the vitalistic theory from the assumption that one ferment only existed, to that in which it was shown that numbers existed, and that each might have a specific action, was an important step in the history. The objections to the theory, such as fermentation in spite of supposed exclusion of germs, the presence of minute living forms in fermentescible fluids, the comparatively small power which micro-organisms showed in the breaking-up of albuminous solutions, and the presence of so-called chemical fermentatives, are now of little more than historical interest. The sources of errors in the experiments on the one hand, and the hypothetical views of the chemists on the other, are now of comparatively little value, except in the sense that they afford us examples of the necessity of great care and attention in manipulation in order that the progress of science may not be hindered. There can now be little doubt in the minds of most men about the association between these germs and the processes above referred to, although an amount of doubt exists in the minds of some about the parasitic nature of germs in the production of disease; that is to say, while it is generally admitted that they may, by their life processes, destroy organic material, split up higher into simpler compounds, afford nutrition for the higher plants containing chlorophyll, and produce fermentation, yet for a considerable time a line was drawn between these and the possibility of minute plants producing disease in the lower and higher animals. But the possibility of this is by no means a new idea, for Miller tells us that Varro, in the first century B.C., suggested that epidemic diseases might be due to some invisible element—a *contagium vivum*.

Early in this century Bassi placed this on a somewhat satisfactory

basis, and in 1838 Pouche clearly proved the causal association of the mould-fungus with disease. In 1840, Henle's deductions on this produced a great influence, and ever since then the theory of the parasitic nature of disease has been advancing, although each step has been vigorously opposed. The result has been the magnificent work of Pasteur and Koch, and for the particular methods of investigation of the latter the scientific world must ever remain indebted. Koch may or may not be estimated in the future by his cure of tuberculosis, but the work done by him in the study of these organisms, in the methods of cultivation outside the body, the isolation of different species, and his discovery of the bacillus of tuberculosis, will ever be regarded as classical landmarks in the study of infectious diseases. It may be, as some even yet assert, that the bacteriological question has been too far pushed in medicine, but those who are at all sceptical of the causal association of these micro-organisms will have great difficulty in disproving the mass of facts which are now being placed before the profession from all parts of the world. In fact, we might fairly state that there are few things in medicine resting upon a surer basis than the parasitic nature of disease, and the facts made known by Koch on tubercle alone are sufficiently convincing, and we must remember that there are affections less doubted than it.

It must not be forgotten that it is no mere accidental or common association to find these organisms in the tissues, because before an organism is considered to be the cause of a particular affection it must have been found in the blood or tissues of the animal affected. It must also have been cultivated through many generations outside of the body, and after reintroducing it into the tissues of another a similar affection must be produced. Lastly, the same organism must have been found in this second host and cultivated again outside of it, to place all possibility of coincidence or accident out of the question. We are forced to the conclusion that the parasitic theory of disease is not only the most rational, but one which leaves no doubt upon the minds of those who have carefully carried out the experiments in a typical case, or who have even had the advantage of seeing others do so.

These organisms consist of minute, round, oval, or cylindrical cells, devoid of chlorophyll, and requiring already formed organic compounds for their life. They vary in size, measuring transversely on an average $\cdot0001$ m., and two to four times that measurement in a longitudinal direction. The cells have no nucleus, are composed of protoplasm, and the small and most of the larger forms have a homogeneous translucent appearance. Some of them in their substances or membranes, should they have the latter show distinct colours. For the most part they are produced by fission, in others by spores, and it may be by separation of a portion of the cells from the original cyclus. Antagonism between the different kinds of bacilli has been noted, and in cultivating several generations of different species by a process of exclusion it comes about that in the end we may only have one instead of a number present, as if the strongest had crowded out the others. Lastly, it may be that their products, through too great acidity or alkalinity, may arrest their own growth—in other words, to a certain extent they are self-destructive.

Speaking more particularly, they may be considered as (1) having an action on lifeless matter, zymogenic or fermentation bacteria ; (2) chromogenic or colour-forming bacteria ; (3) ærogenic or gas-forming bacteria and (4) saprogenic, or those that produce putrefaction. In connection with these, we must ever remember that the products of living organisms vary, and so they may be harmless or prejudicial. The best example of the latter are the ptomaines, which are now being so carefully sought after, and whose physical properties are being so thoroughly investigated.

A few such, as some of the spirilla, have a reaction something like that of starch with iodine ; others, particularly the sarcinæ, have a distinct membrane. Some are movable and capable of a rotary movement or oscillation, and, as Loeffler has shown, have cilia. The analysis of their construction is as follows : Water, 84·81 per cent. ; albumen, 13·03 per cent. ; fat, 1·20 per cent. ; ashes, 0·64 per cent. ; residue, 0·32 per cent. (Nencki). A glance at this composition is interesting considering the nutritious material upon which we usually cultivate them, consisting as it does of albumen, carbo-hydrates, and a small quantity of salts. Temperature in excess in either direction has a great effect upon them, 25° to 40° C. being the range ; above this and below 5° C., growth is retarded or arrested. Some of them require oxygen for their development and are termed ærobic, some anærobic are independent of this gas, while others will grow for a time with or without oxygen. Acids and alkalies in excess retard them, while light and electricity have not been found as yet to have much effect upon them.

It may have seemed quite unnecessary for us to point out these physical characters, but we have not done so simply to remind you of the vital phenomena of these organisms, but rather by way of suggestion, because many of the facts which we have mentioned have been taken advantage of by different workers in therapeutics. For example, the rendering of the soil unsuitable for the growth of the specific germ lies at the bottom of Koch's work. The arrest of the growth of these germs by temperature has been attempted by means of the apparatus for inspiring hot and dry air, and others have attempted to arrest their growth by keeping the patient in cold air. Again, experiments have been attempted to do this by means of the stains in use for detecting the different species. Attempts have also been made to use acids and alkalies, and the antagonism of these organisms has even been utilized by the inoculation of tumours, lupus, etc., with the streptococcus erysipelas. In fact, there is no observation about the vital phenomena above mentioned which has not been carefully weighed in the hope that it might be turned to some therapeutic use. There only remains, therefore, in this part of the paper to refer to one other feature, viz., the forms which those bacteria assume. In doing this we have found it advantageous to adopt De Bary's simple classification.

Three main forms are distinguished. The round forms are commonly known as cocci and the terms "micrococcus," "diplococcus," etc., in such frequent use explain themselves. The term "bacterium" was intended for short straight rod forms, but is not so frequently used in classification. The rod-like forms are now grouped under the head of "bacilli," and the

third are the spiral or corkscrew form, "spirilla." By the combination of several cells, varieties of the above may be formed. For example, we may have streptococci or those in chains, groups or staphylococci and zooglæa forms produced by the gelatinization of the membrane, and so on.

Under the microscope typical forms of the bacteria have been placed, and on the screen a number of photos of them will be shown later in the evening.

(To be continued.)

**CASES ILLUSTRATING THE EFFECT OF TUBERCULIN
(Koch's Remedy) and of
CANTHARIDINATE OF POTASH (Liebreich's Remedy)
ON CASES OF LUPUS AND TUBERCULOSIS.**

BY LENNOX BROWNE, F.R.C.S.E.,

Senior Surgeon to the Central London Throat, Nose and Ear Hospital.

(Read at the Meeting of the British Laryngological Association, March 20, 1891).

THE cases of some of the patients brought here this evening have been already reported up to a certain date in my recent publication on "Koch's Remedy in relation specially to Throat Consumption."

Case I. is that of A. F. (No. 6 in the book), who is suffering from lupus of the face, especially of the nose and larynx. Treatment was commenced on December 14th, 1890, and from that date up to the present the patient has had eleven injections, commencing with two milligrammes, and extending to two centigrammes. It cannot be said that the lupus of the nose is cured, but there is diminished reaction at each fresh injection, which may indicate that there is less lupus tissue to be attacked, or as some would have it, that the system has become habituated to the poison. The condition of the larynx has, however, exhibited a great though gradual change for the better, a change which is not comparable with any treatment I have hitherto seen pursued with that exceedingly torpid disease.

Beyond these evidences of the remedy on visible lupus tissue, the influence of the injections on old scars has been most interesting. On the day following the second injection, it was noticed that three red patches had appeared, one at each angle of the jaw, where there were sores two years ago, which had healed spontaneously, and a third under the chin; this patch was the largest, and was much swollen. It represented the site of a gland which had suppurated two years previously, and which had apparently been quite healed. The changes in appearance of the scar formerly treated by Dr. Campbell were also interesting, and afforded very satisfactory evidence of the success of his treatment. The colour was much intensified, and less glazed; at the extreme margin of the upper and outer angle, as well as at the lower and inner, there was very slight desquamation, but there was no breaking out whatever of the main