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THE TRUTH ABOUT KOCH'S CHOLERA GERM.

BY PROFESSOR RAY LANKESTER.

LAST year, when the German Imperial Government sent Dr. Robert Koch and his companions to India to prosecute their investigation of the causes of cholera, English men of science felt a certain sense of shame that Germany should step in, in order to carry out work which properly belonged to England. It was well-known to the medical profession in England that for many years able and cautious investigators such as Dr. Timothy Lewis and Dr. Vandyke Carter had been, under the auspices of the Indian Government, carrying on continuously their search for a reply to the two questions:—(1) Is cholera caused by a bacterium (bacillus)-like organism? (2) If so, what, precisely are the form, habit, and properties of that organism? It was felt that these excellent observers might very possibly have failed (as they themselves conscientiously state that they have failed) to answer either of these questions satisfactorily for want of personal experience in the most recent developments of the art of "bacterium-hunting" as practised in Europe. On the other hand, it was known that Dr. Robert Koch was one of the most skilful and successful of bacterium-hunters. He it was who, after having added much to existing knowledge as to the bacillus of cattle anthrax, and the bacteria which infect wounds in various animals, had recently discovered a bacterium—the bacterium or bacillus tuberculosis—which there was (and is) the strongest ground for regarding as the cause (that is to say, the immediate exciting cause) of the dire disease known as tubercle, phthisis or consumption. Accordingly much was expected of Dr. Koch's visit to India. If any man could be expected to discover and clearly establish the existence of a bacterium as the cause of cholera, it was Robert Koch.

Allow me here to insist further on the words "clearly establish." It is one thing to find a corkscrew-shaped or a rod-shaped or a crotchet-shaped bacillus swarming in the intestine of a diseased person, and another thing to clearly establish that the particular bacillus in question is the cause of the particular disease from which the man is suffering. We are all of us at all times swarming with bacteria, micrococci, bacilli, vibrios, and spirilla. The mouth of every man, woman, and child contains thousands of these organisms of various shapes and kinds. It is here that they were first of all discovered just two hundred years ago, by Leuwenhoeck, the Dutch microscopist, who described them in the Philosophical Transactions of our Royal Society. Not only is the mouth of man, but every moist part of the surface of the body, and above all the intestine, precisely in those persons who are perfectly healthy, swarming with various kinds of bacteria. No one knew this better than Dr. Koch; no one knew better than he that in order to clearly establish that a particular bacillus produces a particular disease it is not enough to show that the bacillus occurs abundantly in the intestines of persons suffering from that disease. Dr. Robert Koch gained his own great name in reference to the bacillus of consumption by showing far more than this about it. He took the little organism (the bacillus of consumption), when he had detected



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THE LIBERAL ULTIMATUM.

HARTINGTON'S speech on Saturday enables the general to see a little of what has been going on behind the scenes. Mr. GLADSTONE returned from Midlothian. The Government now thoroughly reassured by the popular demonstrations of success that an overwhelming majority of the nation is opposed to the action of the Peers, has decided that it is strong enough to stand on its terms to its discomfited antagonists.

Before discussing the nature of the overtures to which Lord HARTINGTON alluded, it is well to remember that the proposal is Lord HARTINGTON'S, but Mr. GLADSTONE'S. That is on the surface. Lord HARTINGTON is not in charge of the Franchise Bill. Whatever his own views might be, he would not intrude them upon the country in a matter of such vital importance, if they differed from those of his chief. We may therefore depend upon it that "Lord HARTINGTON'S compromise" is really Mr. GLADSTONE'S ultimatum, now proffered to the Peers in the forlorn hope that they or some of them will find in the suggestion a fig-leaf to conceal the shame of abandonment of an untenable position. What is the ultimatum? Lord HARTINGTON wrapped it up somewhat mysteriously, but it amounts to this. The Government pick up Lord COWPER'S compromise, and offer it to the Peers as a golden bridge by which to escape from the position in which they find themselves. Lord HARTINGTON says in effect: "You object to pass the Franchise Bill, you know what we are going to do with Redistribution. Well and good. Promise to pass the Franchise Bill, and we will tell you what we are going to do about Redistribution. Only say what it is that you actually require to have in the way of information, and it shall be forthcoming. If, on examination of the text of our Redistribution Bill, you do not find that it is founded upon sound and fair principles, we shall not complain if you throw the Franchise Bill; but if you are satisfied that it is a fair Bill, not tainted with gerrymandering, then do you pass the Franchise Bill, and join with us in making the Redistribution Bill as good as it can be made so as to be a fair representation irrespective of party to the whole nation." That is the Liberal offer, and it is a very fair and reasonable one, in proof of which it may be noted that the extremists on both sides declare that it gives up everything they are fighting for. The offer is not merely an overture—it is also an ultimatum. Lord HARTINGTON put his foot down very firmly upon the Tory demand that the Peers should be allowed to hang up the Franchise Bill until the Redistribution Bill came up from the House of Commons. That, he said emphatically, is not a compromise, but a declaration. In offering to table the Redistribution Bill, the Government has done its utmost for peace. Beyond that it cannot go.

Let us see how the negotiation stands. Lord SALISBURY rejects the Franchise Bill because he does not know what the Government are going to do about Redistribution. The Government replies, "Will you pass the Franchise Bill if we show our hand about Redistribution?" Lord SALISBURY answers, "If your Redistribution Bill is a fair one, what then?" "Reject the Franchise Bill," says Lord HARTINGTON, "but we are so confident as to our determination to pass justly that we are willing to run that risk." But Lord SALISBURY replies, "Your Redistribution Bill may be changed at nurse; it will be transformed by the House of Commons; we cannot rely on your draft of what you propose to do as equivalent to the Bill that will be sanctioned by the House of Commons. What then?" The Ministry replies to this: "That is a risk which we must run. We have offered to place sufficient confidence in the good faith by assuming that you will not make a reasonable theme of Redistribution a pretext for rejecting the Franchise Bill. You must place sufficient confidence in the dictation of the Ministry to believe that he will keep the Bill practically as it is." That is a fairly satisfactory reply, but it will not satisfy Lord SALISBURY. He will say that he trusts no one, least of all Mr. GLADSTONE and the House of Commons, and that, as security for the Redistribution Bill being transformed or obstructed out of existence, he must adjourn the third reading of the Franchise

Bill until after the Redistribution Bill comes up from the House of Commons, or he will insert a clause to the effect that the Franchise Bill shall come into operation on January 1, 1886, providing that the Redistribution Bill has been passed by that date. When the Franchise Bill comes down from the Lords with that addendum, what is the Government to do? Throw out the Bill and wreck everything? Hardly. It would be wiser to send it back, accepting the proviso with a slight verbal amendment. Instead of enacting that the Bill shall come into effect on January 1, 1886, if by that date the Redistribution Bill is passed, it could run that the Bill shall come into effect on January 1, 1886, or on the date when the Redistribution Bill is passed. Such a slight verbal alteration would secure the extension of the Franchise in any case on January 1, 1886, and earlier if the Redistribution Bill received the Royal assent before that date. That, however, is a matter for arrangement hereafter. The important thing to-day is to know whether the Tory peers will return a conciliatory answer to the Liberal overture.

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blood heat. He propagated it from one tube to another until he had a thoroughly "pure culture" of the bacillus, free from all trace of contamination by particles derived from the original diseased lung, which might have clung to the bacilli originally introduced into the serum, just as soil may adhere to seeds picked from the surface of the ground. This pure culture of the bacillus tuberculosis was seen, when examined by the microscope, to be precisely the same thing as the bacillus found in the lungs and expectorations of phthisical patients. Now came the test. The pure culture of bacillus tuberculosis was injected (in minute quantity) into the tissues of rabbits and other animals, and the infected animals thereupon dying of consumption, various parts of their bodies were found on examination to be swarming with a fatal growth of bacillus tuberculosis. The disease was thus reproduced by the "germ," or "specific organism," after it had been thoroughly isolated, and after it had been actually cultivated for some generations apart from a diseased animal. That, at any rate, is the record of experiments published by Dr. Robert Koch, and confirmed by other experimenters.

Koch himself, as much as any one, has insisted upon "pure cultivation" and "reproduction" of the disease as the only important evidence—in fact, the only evidence worthy the attention of serious men—in favour of the connection of a particular micro-organism with a particular disease as the cause of that disease. Had he merely discovered that bacilli tuberculosis exist in the diseased tissues and sputa of phthisical subjects, and had he then failed to produce phthisis in any animal by introducing them into its body, very few, if any, medical men at the present moment would think it probable that the bacillus tuberculosis is the cause, or a cause, of consumption. They would consider it as being probably an instance of the multiplication and swarming in unhealthy tissues of one of the many bacterial organisms normally harboured by the human body. Happily Dr. Koch did not in this case fail to satisfy the culture test.

These things being so, when news was received from India that Dr. Koch had discovered a comma-shaped bacillus as the cause of cholera, a very strong impression prevailed (which, I confess, I shared) that Dr. Koch would not have allowed such a statement to be sent to Europe unless he had "discovered" such a cholera bacillus in the true sense—namely, had clearly established the relation of the bacillus to the cholera by pure culture and inoculation-experiments. No direct statements were received from Dr. Koch, while every week more explicit reports were published by the newspapers obtained from correspondents who were not specially conversant with the subject. At last we heard of Dr. Koch's return to Berlin and of honours and money being given to him by the Imperial German Government. Still, no report was published, and those who believed Robert Koch to be a skilful investigator and a conscientious reporter of his observations, as well as a sober reasoner, waited patiently for the report, refusing to believe the unauthorized gossip as to what he had and what he had not seen and concluded. At last we have a report by Koch in a very full shape, together with a picture of the so-called comma bacillus, in the *Berliner Klinische Wochenschrift* of last month. It is only right that the public, whom Dr. Koch has so long allowed to be mystified by imperfect accounts of his "comma bacillus," should now be distinctly and emphatically assured on the subject by the definite statement of those who have studied Koch's report, and are qualified to judge of it by having themselves pursued the investigation of bacteria.

For my own part, then, I do not hesitate to say: (1) that Koch's comma bacillus is *not* comma shaped; (2) that it is *not* a bacillus but a spirillum; (3) that although it does sometimes (but not always) occur abundantly in the intestines of cholera patients, there is not a tittle of evidence to show that it causes cholera, no experimental attempt to produce cholera by its agency having succeeded. These conclusions are derived from Dr. Koch's own statements. While Dr. Koch is, as was to be expected, perfectly candid and convincing in the account which he gives of his observations, the extraordinary feature in his report is the dogmatic declaration that this organism, which is not in any way proved to possess disease-producing powers, nevertheless must and shall be henceforth regarded as the cause of cholera.

We have, moreover, some additional news as to Koch's bacillus since the publication just referred to. Dr. Timothy Lewis, of the Army Medical School, who for many long years studied microscopically the intestines and evacuations of cholera patients in Calcutta, has demonstrated since the publication of Koch's report that the so-called comma-shaped bacillus is identical in form with one occurring commonly in the mouths of healthy persons. This is no rash assertion on Dr. Lewis's part. He has a longer and more minute experience of the different forms of bacteria, bacilli, vibrios, and spirillum than has Dr. Robert Koch. The latter says in his report that he has never seen a micro-organism which could be confounded with his (Koch's) "comma bacillus." Lewis (according to an official memorandum of the Army Medical Department, August, 1884) goes to Marseilles, obtains from cholera subjects fresh specimens of Koch's "comma bacillus," places them under the microscope side by side with a common curved spirillum found in healthy persons' mouths, and defies competent observers to distinguish one from the other. The competent observers, so defied, confess they are unable to distinguish them. We must accept Koch's statement that he has never seen an organism capable of being confounded with his comma bacillus, and therefore we must suppose that he has not seen all the forms of micro-organisms which occur in healthy human bodies, as it would have been well for him to do before observing and reasoning about those which

occur in disease. The final *coup de grâce* will have been given to Koch's rash assumptions concerning his comma bacillus if it should be true, as stated recently, that pure cultivations of it have been swallowed by experimenters in India with impunity.

Such being the facts with regard to the much-vaunted discovery of the cholera germ by Dr. Robert Koch, we may note one or two features connected with the history of this discreditable business:—

1. The study of the relation of bacteria (bacilli, &c.) to disease ought to be more generally undertaken by the State authorities of civilized countries than it is. It should not be possible for the whole of Europe to be stupefied as it has been during this summer by Dr. Koch's comma bacillus.

2. We may congratulate ourselves that the Indian Government is at this moment employing, at the recommendation of the executive of the Royal Society of London, a thoroughly impartial and competent observer, Dr. Klein, to make an investigation at Calcutta into the relation of micro-organisms to cholera. We cannot but regret that, while such an investigation naturally requires years, Dr. Klein's sojourn in India is limited to a few months.

3. The history of the comma bacillus will, it is to be hoped, serve as a warning, not only to the general public, but especially to statesmen and Government officials, as to the folly of accepting with open mouth and closed eyes the sensational results obtained when the healthy march of science is forced by spasmodic pressure and international jealousy.

Dr. Koch was distinctly put forward by the German Imperial Government as a rival to the French investigator Pasteur. The pressure upon him urging him to announce a definite result was irresistible. He has formulated such a result on the most flimsy grounds; his Government has rewarded him, and for some time official science in Germany will not dare to expose the worthlessness of his theory. Meanwhile (and this is the most serious and alarming feature in the whole affair) the German Imperial Government has not only sent Koch to Toulon and Marseilles that he may dogmatize to the benighted Frenchmen upon the treatment and prevention of cholera epidemics, as though his comma bacillus were really proved to be the cause of cholera (while no one knew better than he that it was not so proved), but actually the German Government is anxious to dictate to Europe about the quarantine of the Suez Canal, pretending to superior knowledge on the subject in consequence of being able to claim for its initiative the discovery of the comma bacillus.

Whatever may be the ultimate conclusion as to Koch's comma bacillus it is an outrage on common sense to advocate measures against cholera epidemics based on the assumption that this organism causes them. It is possible that it may be properly demonstrated before long that this particular organism of all those observed in the human body is the cause of cholera, but Dr. Koch has not proved it to be so, nor even rendered it highly probable that it is so.

OCCASIONAL NOTES.

"The aim of the meeting at Skierniewice," writes a well-informed Russian correspondent, "was the maintenance of the *status quo* and the adoption of measures against the universal revolution. As to the *status quo*, which it is decided to preserve, one thing is certain—Austria is not allowed to occupy Serbia. It would be considered a breach of the agreement if she did so, but she is allowed to annex Bosnia and Herzegovina. On the other hand, the union of Bulgaria and Roumelia ought not to be considered as a breach of the *status quo*. There are besides some small questions, such as the improvement of the Montenegrin frontiers, &c. If some day or other Austria should go to Salonica, Russia will occupy the Dardanelles; England will get Egypt; France, Tripoli."

The source from which we receive the above information compels us to regard it with more attention than we usually pay to confident revelations as to the secret deliberations of Continental potentates. We believe the truth to be that Austria has received *carte blanche* in Bosnia and the Herzegovina, on the strict understanding that she is not to send a single soldier into Serbia, and a general undertaking—which, we fear, is hardly so precise as it might be—that she will not object to the unification of Bulgaria and Eastern Roumelia. Beyond that nothing is settled, but there seems to be reason to believe that the three Emperors may have talked over the ultimate partition of the Balkan Peninsula, and that the Czar let his allies know that if Austria must have Salonica Russia's price is the occupation of the Dardanelles. If that is distinctly understood in this country, Lord Salisbury's policy of inviting Austria to the Aegean will lose what little popularity it ever enjoyed—and that was not much.

The International Congress sitting at Washington to fix upon a prime meridian seems likely to prove abortive (as a more important conference did) owing to the stiffness of France. Most of the delegates, it is said, are in favour of the adoption of Greenwich; but, failing the selection of Paris, the representatives of France are not even sure whether

