

THURSDAY, DECEMBER 3, 1885

THE ETIOLOGY OF CHOLERA

THE announcement by Dr. Koch, as chief of the German Cholera Commission, that he had discovered a micro-organism which was not only peculiar to cholera, but which had a causal relation to that disease, was all along felt by many to have been made on insufficient evidence, and in consequence the India Office in 1884 appointed Drs. Klein and Heneage Gibbes to visit Bombay, Calcutta, and other Indian cities, with a view of studying the disease from the micro-pathological point of view. Their report was received early this year, and whilst it supported Koch's statements to the effect that choleraic dejections were generally characterised by the presence of the comma-shaped bacilli which had been described, it distinctly denied many of the assertions which had been made by that observer, and it altogether set aside the notion that the comma-bacillus bore any causative relation to the disease. The point at issue was felt to be of such importance that the India Office somewhat recently appointed a Committee of physicians to consider the report made by Klein and Gibbes, and to advise them on the matter.

The Committee in question do not profess to have done more than to study the subject as it has been dealt with in the several reports issued by Koch, Klein, and Gibbes, and to communicate their views of the merits of the several reports to the India Office. They deal with the contentions of Koch under several headings. Thus, in the first place, they refer to his assertion that the number of comma-shaped organisms in the intestinal tissues and contents is in proportion to the acuteness of the attack, and that these organisms generate within the body a ferment by which the system is poisoned.

As to this, it is admitted by Klein and Gibbes that if all that Koch asserts on this point were correct there would be strong grounds for believing that the comma-bacilli must in some way or other be related to the cholera processes; but their observations are in direct opposition to the assertion made. As regards the intestinal tissues, and notably the mucous membrane, it was found that, in some most acute cases in which the post-mortem examination was conducted as soon as possible—at times in a quarter of an hour—after death, the comma-bacilli were only conspicuous by their absence; and that these organisms were only present in dead tissues, including the mucus flakes. Indeed, it is contended that the comma-bacilli are only putrefactive organisms; and the Committee, having these facts before them, express the opinion that no direct relation exists between the number of comma-shaped organisms and the gravity of the attack.

Another of Koch's contentions is to the effect that the comma-bacilli are not found except in connection with cholera. Now Klein and Gibbes maintain that these bacilli, or some that in morphological respects appear like them, are found in diarrhoea stools, that they have been met with in cases of dysentery and enteric catarrh, and that in other cases they have been found, together with certain putrefactive organisms, in as large numbers as in many cholera stools. And further, Klein has, since the

issue of his report, found that by ligaturing a portion of the bowel of a monkey, large numbers of comma-bacilli were produced, and that these have been found, after cultivation, to present the same character as the so-called cholera bacilli. Besides which, Klein has found comma-bacilli, similar in appearance to those found in cholera, to be ordinarily present in various parts of the alimentary tract in health, and as regards some taken from the mouth, he has succeeded in cultivating them, and in demonstrating that their action on the media in which they grow is identical with that of the bacilli found in cases of cholera. And the Committee, whilst not convinced that the absolute identity of the two sets of bacilli has been proved, are inclined to agree with Klein's contention.

The third point examined is Koch's statement that the presence of comma-bacilli in a tank which supplied certain cholera-affected villages in Calcutta with water was, practically, a proof of the causal connection between the organisms and the disease. As to this, Klein and Gibbes report that they, too, examined the water from this tank, and that it revealed undoubted comma-bacilli in every respect identical with those found in choleraic dejecta; they further added that the water had been contaminated with choleraic evacuations, and that, notwithstanding these two conditions, its extensive use by many human beings had not been followed by a single case of cholera. The reporters hence submit that the water did not contain the cholera virus, and that this latter has nothing to do with the comma-bacilli. Similar evidence as to other tanks is also adduced, and it is added that these tank-commas, having been cultivated, are found to be identical with Koch's comma-bacilli. The question as to the existence of any causal connection between comma-bacilli and disease in animals as the result of inoculations is also discussed, and it is regarded as demonstrated that neither the alvine dejections of cholera nor cultivations of isolated comma-bacilli obtained from such dejecta are capable of producing cholera, nor indeed any disease resembling it.

The Committee, therefore, have concluded that, though comma-shaped organisms are ordinarily present in the dejections of cholera patients, they are not found in the blood or in any of the tissues, even when these are examined in a recent condition; that comma-shaped organisms of closely allied morphological appearance are ordinarily present in different parts of the alimentary canal in health, and can be developed there to an unusual extent in diseases characterised by hyper-secretion of the intestine; and that there is no evidence to show that the comma-shaped bacilli found in cholera induce that disease in lower animals or in man.

According to the Committee, we are now much in the same position as we were before Koch's experiments were instituted, in so far as the prevention of cholera is concerned; and Dr. Timothy Lewis, the Secretary to the Committee, and who has had a wide Indian experience in connection with the micro-pathological study of the disease, further points out that there is nothing new in Koch's observations except in so far as an ingenious and beautiful process facilitating the investigation of micro-fungi is concerned. Dr. Lewis asserts, indeed, that he had made hundreds of cultivations of the bacilli in question, and that he had long since arrived at the conclusion that they were identical with some of the minute vibrios which has

so frequently been referred to by former writers as being present in cholera dejecta; the comma being, in short, nothing more than a segment of one of these vibrios which had become detached during the process used by Koch. It is true that Koch's friends deny that any comma found elsewhere than in the cholera intestine grows under cultivation, in the same way as the one he has described, but so far, this is a mere assertion, not a proved fact; and it is evident that we are but at the commencement of any proper apprehension as to the significance of these vibrios. This is pointed out in an appendix to the Committee's report, and the lines of future investigation into the subject are laid down. But for the present the prevention of cholera can only be found in the prosecution of well-advised sanitary measures, and whilst it is of the utmost importance that labours such as Koch and former investigators have carried out should be continued and put to the most rigid test, yet micro-pathology cannot, at present, be regarded as having made more than a small advance towards the solution of the question under discussion.

A MANUAL OF TELEGRAPHY

A Manual of Telegraphy. By W. Williams, Superintendent of Indian Government Telegraphs, &c. (London: Longmans, 1885.)

A MANUAL compiled to order for the use of the *employés* of the Department—very well written, very well printed, very useful to the Department, and very interesting to the technical reader. It embraces a general description of the apparatus used in India, the faults they experience, and the remedies they apply; a full account of the elaborate system of testing reared under the care of the late Louis Schwendler, the able electrician of the Department; and a clear account of the electrical phenomena which interfere with telegraph working and require watching and removal.

It is supplemented by an excellent *résumé* of the laws which determine the strength of electric currents under various circumstances, and a series of formulæ and mathematical solutions of various problems that occur in practice. It is in reality a primer to an admirable work on "Testing," written by Schwendler and edited by another very able electrician who died in India—R. S. Brough.

It is remarkable how India, practically isolated telegraphically from the rest of the world, originated and maintains a system *sui generis*. It was sown by O'Shaughnessy, it was nursed by Robinson, it is maintained by Cappel. It has had engrafted upon it much of the German element, due to the education of Schwendler in the great house of Siemens; but it remains quite distinct from the rapid system in use in England, and also from that in America—more Continental than English, and American only in its long circuits and sound reading. It has been singularly fortunate in the able officers that have served it, most of whom are highly educated gentlemen selected by competitive examination, and well trained in technical matters before assuming office. The proceedings of our societies, especially those of the Telegraph Engineers, contain frequent valuable communications from India, and this last volume fully maintains the reputation of the Department.

There are some curious errors, particularly among those rocks upon which so many young writers are wrecked, *viz. definitions*.

There is a strange, but excusable, confusion between *electrification* and *potential*, while there is an inexcusable confusion between *current* and *quantity*. Definition 1 says "*electric quantity* is the amount of electricity present in an electrified body," and definition 2 says "the unit of quantity or current is called an "Ampère, Weber, or Oerstedt." Now the unit of quantity is called a *coulomb*, and current is not quantity, but quantity per second, a very different thing, and is called an *ampere* only. It was called a weber, but this term has quite died out since the Paris Congress of 1881, and no one ever called it an oerstedt out of India. The relation between quantity and current is shown by Faraday's great law:—

$$Q = Ct$$

It is a pity that p. 5 cannot be reprinted. Definition 16 is curiously worded: "The unit by which capacity is measured is called a *farad*, or more generally for convenience a *microfarad*." A casual reader would think that the same unit is indifferently called a farad or a microfarad, whereas we learn later on that the one is one-millionth of the other.

At p. 57 we read of a very strange practice. The only cause of errors in the signalling of figures (on which, it must be remembered, the most important issues may depend) is due to a practice, unfortunately too common, known as "exaggerating signals," by which a letter is given more characters than it really possesses: for example, the letter *h*, a most common victim of this ill-treatment, is, by the addition of an extra dot, mutilated into the figure 5. We trust this strange practice is confined to India; we have never heard of it anywhere else.

The *résumé* of laws at p. 241 is very good indeed; but why denominate Ohm's and Kirchoff's laws, and not those of Ampère and Faraday?

The novel practice, in technical books, of printing notes as well as references on the margin instead of at the bottom of the page, has been adopted, and the convenience is certainly very considerable. The printing and get-up of the book are admirable. It should be added to every telegraph engineer's library.

OUR BOOK SHELF

Elements of Inorganic Chemistry. By James H. Shepard, Ypsilanti High School. (Boston: D. C. Heath and Co., 1885.)

THIS little book is evidently intended as a sort of mutual companion of the teacher and student, and is for beginners only, as the author informs us. It is, however, a mixture of elementary and somewhat advanced information on the subject, and certainly would be somewhat difficult for a beginner to be left alone with. The book is well supplied with questions for the student to attempt, and also with suggestions to the teacher as to where questions may be with advantage put. Most of the substances known as elements are mentioned, and their properties to some extent described, even including the so-called rare metals. A chart of "The Natural Classification of the Elements," according to "Mendelejeff," and an appendix on reagents is also included.