LECTURE

ON

THE ACTION OF THE CHOLERA-POISON ON THE BODY; AND ITS NATURE AND HISTORY OUTSIDE THE BODY.*

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[Concluded from page 357 of last number.]

HAVING described the action of the poison on the system, we shall now consider how it enters. This is one of the most important points of the inquiry, embracing, as it does, the contagious or non-contagious nature of the disease; on which there were formerly very opposite or antagonistic opinions. More extended observation has clearly demonstrated, by an accumulation of evidence from independent intelligent observers all over the world, that the disease is communicable, or transmissible, from a diseased person to a healthy one. There are, doubtless, many apparent exceptions to this law; but negative evidence may be merely darkness, or want of light, which prevents the object being seen. From what we have learnt of the action of the poison when under restraining influence, it is easy to conceive the poison entering the system, and being so held in check by natural processes, as to be passed off without inducing any marked symptoms. There are remedies which assist nature in this stage. There is also the curious fact that habitual contact renders the system less susceptible to the influence of this poison; in the same manner as, by habit, a man may enjoy swallowing doses of arsenic, corrosive sublimate, or opium, which would cause death to ordinary individuals. The exemption of physicians and hospital attendants, which is most marked in Calcutta, where the disease is endemic, and also elsewhere in cholera epidemics, may be explained by this theory, which is strengthened by the fact that visitors or strangers, coming to a place where cholera is epidemic, are more liable to suffer than the residents who have been some time under the influence of the attack. This immunity should encourage those whose duty takes them to the bed-side of the sufferers; but to allow those to approach whose presence is not essential, is to expose them to needless danger.

In this disease the morbid symptoms are produced by the presence of a specific foreign body in the system; and, until that is removed, health cannot be restored. This implies the entrance of the foreign body and its exit. The entrance may be through any of the natural channels of communication between the body and the outward world, viz., the skin, the lungs, or the bowels; and there is strong evidence that it may enter by any one of these. The handling or wearing the clothes of a person who suffered from the disease, has, in many instances, been followed by attack: this would indicate the skin as the channel. Visiting a cholera ward, attending cholera patients, or being present at funerals, are often followed by attacks. I have observed numerous illustrations of this, and suffered myself from the first two causes.

Many instances are recorded of attacks following visits to barracks, or camping grounds, previously occupied by cholera patients, or using privies which cholera cases had used. A peculiar smell has been noticed, and places situated in a line with certain drains have been observed to be liable to attack. These cases indicate the lungs as one channel of entrance.

But there is every reason to suppose that the most frequent channel is by the intestines, and that through the water that is drunk. We have seen how readily the ally of the cholera-germ propagates in tank-water; the rapidity with which this takes place, and the people become infected, was illustrated in two particular cases in village tanks in the Hurdwar epidemic. There are many instances of wells being contaminated, and the water-supply of towns, causing those who use the water to be attacked. Rivers, into which sewers are discharged during epidemics, are found to communicate the disease to the inhabitants of ships and houses in the vicinity. This has been illustrated in ships anchoring near the sewers in the Hooghly, when cholera is prevalent in Calcutta. The severe attack in the cantonment of Peshawur in 1867 may be explained in the same way. It is supplied with drinking water, from an open canal. A large party of Hurdwar pilgrims returning to Afghanistan, passed the station on the 18th and 19th June. The disease appeared on the 20th. The roads to the Khyber Pass and Kohat, and the canal, converge at the northern end of the cantonment. Cholera appeared at Jellalabad and Cabool, when this party reached these places, as also along the line of road before reaching Peshawur. The presence of the

disease with the party was not detected by the authorities at Peshawur; but their inquiries may have led those suffering to diverge from the line of road, and it would be in accordance with universal custom to go to the vicinity of water, for the purposes of nature. One of those affected pilgrims might thus have vitiated the stream, which would have affected the whole cantonment the following day. This view is strengthened by the fact that the Europeans in cantonments were attacked before the inhabitants of the city, which is very unusual in other stations, or in Peshawur in other attacks of the epidemic.

When the poison enters by the stomach through the food or drink, it may directly cause collapse without the preliminary stages of *malaise* or diarrhoea.

We come now to the investigation of the channels through which the poison escapes, or is eliminated from the system: and these are nearly identical with those by which it enters. In the stage which does not advance beyond *malaise* the poison is thrown off, without any marked symptoms, by the natural secretions and excretions of the body. I have noticed immediate relief in this stage, following a copious discharge of urine; and the same has been mentioned to me by others. As it enters through the lungs, so it may be passed off. It is reported that priests, in the performance of the last sacred duties of their profession, have on several occasions been affected: this may have been from the breath of those to whom they ministered. The disease spreading in crowded or ill-ventilated wards may arise also from tainted breath; but here there are other sources from which the poison may have emanated.

There is a characteristic discharge from the skin of profuse clammy perspiration, which has a peculiar sickly smell; and this may be considered one of the channels by which the poison escapes, especially as the clothes of diseased victims are a marked means of disseminating the disease.

The evacuations from the bowels contain the germ in all stages of the disease—from diarrhoea to collapse; in fact, the congee stools appear to be the last vital channel through which nature endeavours to throw off the poison. The presence of the poison in these evacuations is proved by the facts which have been observed from their having been communicated to water, and thence spreading the disease; by direct experiment of giving them to animals, either fresh, or in various stages of preparation; and also by inference, if not directly proved by observation with the microscope. On this latter point, I speak with reserve; the low minute vitalities which have been found associated with the discharges in this disease may merely be *allied genera*, and not the real cholera germ. I can conceive the existence of an active poison which is invisible. There is one direct test by which a blind man may detect its presence in the congee stools, the *smell*—a peculiar, mawkish, sickening, odour, which it is difficult to describe, but which is easily recognised by any person who has seen much of the disease. This peculiar smell was remarked by Jameson, and many of the earliest writers; and though it has not been noticed in the recent European works on the disease, it was one of the subjects discussed in our meetings at Simla. Every one then allowed that there was a peculiar smell from cholera-patients; though some considered it as merely cadaverous, and some thought they had observed the same in other diseases. Since then I have frequently discussed this point, and I have always found that it has been perceived in the congee evacuations, whether from the mouth, or the bowels; and in the profuse perspiration of this disease. I have noticed it in some cases of diarrhoea, but I am not certain at what earlier stage it may be perceived. It would form a valuable aid in diagnosis, and I hope the subject will be carefully investigated.

The natural history of the poison, or germ, outside the body has now to be considered, and is a subject of deep interest and importance. As a preliminary step, it is advisable to ascertain how far the lower vitalities, associated with that of cholera, as found in cholera-stools, are influenced by the natural and artificial agents applied experimentally. These allied vitalities increase rapidly in water, especially if impure. This is also the history of the cholera-germ. Tanks or wells to which cholera evacuations have had access, have immediately produced the symptoms of the disease in those who used the water from them. It is evident in this case that the germ must have remained in a moist condition during its external existence, and that no modification of soil, as to porosity or dryness, could influence its course. Professor Pettenkofer imagines that the external life of the germ is dependent on the subsoil water, combined with a peculiar porous soil, and that both these are essential to the development of a certain stage of its existence, which renders it again capable of exciting the disease. This is a comprehensive theory, as there is subsoil water wherever there is soil or land; but the disease may spread where this remains unaffected by the rain-fall, from 30 to 300 feet below the surface. This is of daily occurrence. It is also difficult to connect this theory with the prevalence of cholera on ship-board, hundreds, if not thousands, of miles from land.

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When these lower vitalities were dried, all motion ceased; but after an interval of some weeks, on being moistened, the germs immediately renewed their activity. There are many instances of the cholera-poison adhering to pilgrims or travellers across a dry and sandy country, and then communicating itself to the people at their homes; and there are instances when the disease appears to be contracted on the line of road, which had been contaminated by preceding affected parties. In these cases the germs may have continued active, if the place or season were moist, or they may have been dry and dormant till revived by water from the fresh arrivals. The epidemic disease has often broken out with intensity, after a fall of rain. The state of the temperature accelerated or retarded the growth of the animalcules under observation; they developed with great difficulty in a low temperature, and here is a marked analogy between them and the cholera-germ. A certain degree of moisture also appears necessary for its development, and this is always present in the human body, and in it the germ may be carried, and developed, at all seasons, and is capable of communication from it, in the hot dry winds of India as well as in the cold of a Russian winter. During the moist rainy season in India the disease spreads most readily, in Europe and America, autumn appears best suited to its propagation.

There appears to be some influence independent of, and more powerful than, moisture regulating the reproduction or diffusion of the disease. This is supposed by some theorists to consist of a peculiar epidemic state of the atmosphere; without explaining in what this peculiarity consists; but that it is very general—even extending from Ajmere to Kurrachee in one day in 1845, and more recently all over India, Europe, and America, at the same time, in the epidemic of 1865. There is no difficulty in tracing the progress of an attack through this medium, whether by land or sea, and in any direction of the wind or compass. I confess I do not understand this vast inappreciable impregnation of the atmosphere of a place, country, or quarter of the globe; the local and partial manner in which individual buildings, ships, or towns, are constantly being affected or exempted, precludes the idea of the attack being general in the atmosphere. Personal communicability is allowed to be a fact by this theorist, but only secondary to the sublime epidemic wave in the atmosphere, about which no explanation is given, and which (if it exist) is completely beyond human control. It is highly objectionable to propound theories which would lead to the neglect of practices, or precautions, which have proved efficacious in warding off attacks of this epidemic. It is more profitable to pursue investigations which may lead to the perfection of those means which experience has proved to be useful, and to render their application more practical.

The disease is found to rage with great intensity in places where conservancy is neglected, and crowding, want of ventilation, and bad food prevail. Some suppose that these alone are sufficient to cause cholera, and that their removal, by proper sanitary rules, would obviate the appearance of the disease. This fallacy is less dangerous than the theory just noticed, in so far as the removal of these defects tends considerably to diminish the virulence of the attack; but it cannot prevent its being, in many instances, very severe. Witness the severe attacks at Peshawur, Lahore, and Meerut, in 1867, and at Peshawur and Allahabad in 1869; where all practical sanitary measures have been carefully attended to and carried out at great expense, under the most intelligent medical officers in India. It is highly desirable that the most efficient sanitary rules should be carried out. I do not appreciate their advantage; but some people are inclined to over-estimate the value of conservancy.

The conclusions at which I have arrived are the following. The cholera-germ is an animalcule excessively minute, and probably invisible. It generally enters the system through the lungs, but often through the stomach, and sometimes through the skin. Whilst mixed with the blood, in the circulation, it acts on the sympathetic or ganglionic system of nerves, as a sedative, inducing, when in large quantities, paralysis of their functions, or suspension of the secretion of the organs supplied by them. This animalcule undergoes an active change in its existence in the mucous surface of the intestines, where it multiplies in excessive numbers, probably living or subsisting on the epithelium, and causing the congee-like evacuations. In its most intense form there is total paralysis of the sympathetic. There are two natural agents by which this development of the germ in the intestines is retained: one before collapse, viz., the *gastric juice*; and the other after collapse, viz., the *bile*, which had been shut up or retained in the gall-bladder. The germ passes out of the system in its earlier stage through the lungs and skin, and in its developed stage through the intestines; when outside the body, it retains its vitality, and continues to pass through its various stages, multiplying and reproducing when in a suitable medium, of which moisture is an essential, and decaying animal or vegetable matter are important elements. It may be retained in the dry or dormant

stage for days or months, out of which it may be rendered active by the addition of moisture under certain circumstances, of which season forms an influential element. The reproduction of the germ may be restrained, or its vitality destroyed, by certain chemical agents, as fermentation and putrefaction are by antiseptics. I do not say what this specific germ is; but classify it with other lower vitalities, which possess properties very much analogous, and indicate the means by which its dissemination may be restricted and guarded against and its action on the body restrained.

I hope I have thus afforded a connected view of the action of the cholera-poison, and of the restraining influence of the *vis medicatrix nature*, which furnishes a guide to the treatment of the various stages of the disease. The uncertainty which now regulates the treatment, and the increasing and fearful mortality from the disease all over the world, shew the importance of the subject. I entreat all who now hear me—and I could not have a more experienced or intelligent audience—to aid me in elucidating this most difficult subject. The eyes of the profession in Europe are directed to India for information; and I have every confidence that our reply will be worthy of the old Indian Service, over which I have the honour to preside.

CASE OF VOLUNTARY STARVATION: DEATH ON THE TENTH DAY.

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At the present moment, the facts contained in the following case appear to be of sufficient importance to warrant their publication.

I was sent for on Sunday morning, August 20th, 1854, to Mr. John Chard, aged 58, landlord of the "Ship," Hereford, who up to that time had been a stranger to me. He was a thin spare man, in fair health, and apparently little disposed to a paralytic seizure; but I learned that he had long indulged freely in spirits, and was rarely sober when he retired at night. He had risen that morning apparently well, and it was only when the family assembled at breakfast that anything remarkable about him was observed, since it was his ordinary habit to be silent and sulky in a morning. His wife and daughter remarked that he put his teacup to his mouth without even sipping any of its contents, presently repeating the act with a similar result. In vain they attempted to get the poor fellow to tell them what was the matter. To make short of it, Chard not only could not swallow, but was unable to perform the act of suction in the smallest degree; nor could he by any effort emit the feeblest sound; yet he was well, his mind was unaffected, and he clearly indicated to me, on my arrival, by signs, that he had no suffering of any kind, no headache, no giddiness, no loss of power, except in the organs affecting speech and deglutition.

Chard was ever a man remarkable in his way—taciturn, wilful, and obstinate. His relatives knew him well; and, having taken me aside, they informed me that he was rarely ailing, and had never condescended to take medicine; that it was likely he would not give his consent to the adoption of any means for his recovery on this occasion, however forcibly the subject might be pressed upon him; and such I soon found to be the case. I then returned to my patient and explained as clearly as I could the nature of his attack—that it was a rare and grave form of paralysis, and that some time and the use of certain means would be requisite before he could hope to speak or swallow again, but that his case was not a hopeless one; and that, meanwhile, he must be sustained by nourishment administered by the stomach-pump, and so forth. He listened to it all, and then, by energetic signs and angry gestures, showed unmistakably that he "would none of it"; and further proceeded to illustrate his meaning by delineating with his finger on the hearth-rug the outline of a coffin: he pointed to it with a shrug, shook his head significantly, and so gave me the *congé*. He kept his purpose, too; he never gave way to the last, spite of the cravings of nature, the entreaties day after day of his relatives, myself, and of his devoted clergyman, the late Rev. J. Hanbury. The next day (Monday) was brewing-day; he was up betimes as usual, signalled his orders, and overlooked the process with his usual care. The same occurred on the morrow; but he now began to be weak, and obliged to resort to his arm-chair by the fire. He was up dressed and in his business on Wednesday—I think on the Thursday and Friday also—when weakness compelled him to remain in bed, which he did till his death on the afternoon of Tuesday, the 29th, the tenth day.

Towards his end he seemed to be delirious; but as he was speechless it was difficult to appreciate the fact. His pulse increased in frequency as he became feebler; he appeared thirsty; and his animal heat was sustained with difficulty. I greatly regret that no examination of