CROONIAN LECTURES
ON THE
CLIMATE AND FEVERS OF INDIA.

Delivered before the Royal College of Physicians of London.

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LECTURE III. PART II.—*Concluded.*

Enteric Fever.—It was not until the year 1853, when attention was called to certain pathological changes in the intestines of persons dying of fever in India, that it began to be suspected that protracted and fatal cases were identical with the typhoid of England. Careful observation of the morbid appearances after death, and the symptoms and progress of the disease during life, led observers to believe that the diseases were one and the same, modified, it might be, by climate and the influence of malaria; and in a few years typhoid fever became fully recognised as a prevalent and fatal form of disease, especially among young and susceptible Europeans, a class notably represented by the young soldiers of our army in India. Annesley had left it on record that he had never remarked any appearance of fever from a specific or contagious source in India, and that, although believing in the influence of infection as regards the continued adynamic fever of temperate climates, he had never, during an experience of thirty-seven years in India, observed fever to proceed from contagion in that part of the world. The fevers, therefore, in India, and he believed of warm climates generally, are the effects of exhalations from the soil, and of vicissitudes of season. But great advances have been made in our knowledge of the nature of fevers since he wrote, and it has been fully established that relapsing typhus and typhoid fevers are Indian diseases. Within the period of my service in India, attention was first directed to the existence of typhoid fever of India; it now appears in the sanitary report as the chief fever death-cause among our young soldiers. It would, however, be as reasonable to say that it had not existed in England before Zincke and others defined it as a specifically distinct disease, as that it did not exist in India before Scriven, of the Bengal Medical Service, pointed out its presence in that country, and separated it from remittents in India, as in England it was separated from typhus. The honour of this important step in fever pathology is clearly due to Scriven, and his views were confirmed by Dr. J. Ewart, a Fellow of our College, and the late Dr. E. Goodeve, who published a clinical lecture on the subject in the *Indian Annals of Medical Science* of January 1859. But these gentlemen made no discovery of a new disease; their merit consisted in pointing out one, but which had hitherto been overlooked as distinct from other diseases with which it had been associated and confounded. Annesley, Twining, Martin, and others had pointed out the diarrhœa, enteric ulceration, and other phenomena characteristic of adynamic types of fever. Annesley says*: "The fevers of warm climates, especially as observed in the Eastern hemisphere, seldom go through their entire course without evincing a predominance of morbid action in some viscus or texture. Marks of disease of the small and large intestines are generally confined to their internal tunics. The duodenum, jejunum, and ileum, especially the duodenum and termination of the ileum, very frequently are diseased in their mucous surface, which is inflamed in patches, sometimes covered with a muco-purulent secretion, and studded with small ulcerations, particularly the termination of the ileum. In several cases the ulcerations, which sometimes are large and far apart, at other times small and agglomerated, especially the former, have nearly penetrated the tunics of the intestines, and in a very few cases I have observed this occurrence actually to have supervened, the contents of the bowels being partly effused into the peritoneal cavity, and having produced peritonitis. Marks of inflammatory action are occasionally met with in the peritoneum, omentum, and mesentery, in all the forms of fever; and in protracted cases of the remittent and intermittent types, especially those in which the liver and spleen have been obstructed or otherwise diseased, considerable effusions of a serous fluid into the cavity of the abdomen are not uncommon. In these cases the peritoneum presents either a sodden appearance or congestion of the veins. In many of those cases, also, the mesenteric glands are enlarged, of a light colour, and hard consistence. Diseased appearances of the mesenteric glands are not associated alone with the dropsical effusions, as they are frequently observed when no such effusion is present, and when the mucous surface of the bowels is diseased, and the liver and spleen enlarged, and otherwise changed in structure." Sir R. Martin, speaking of the congestive continued fever of Bengal, says: "In neglected cases we find hepatic abscess and sometimes ulceration of the mucous digestive surface. The latter I found to be very prevalent among the labouring classes of natives whom I had to treat at the Native Hospital of Calcutta, on account of neglected fevers of from fifteen to twenty days' duration, and a large proportion recovered." Twining, in 1842, describing what he called congestive fever, says: "There is often much congestion at the root of the mesentery, and in the fat and cellular structure surrounding the duodenum, where it is bound down across the spine. In a few rare instances, where patients have died after a protracted fever of this sort, superficial ulcerations of the mucous membrane of the small intestines were found. I will not venture to assert that the ulcerations above alluded to ought to be considered as causes of the fever of the cold season; and my reason for not deeming that pathological condition a primary affection existing at an early period of the disease is, that active purgatives may be repeated daily for a long time at the commencement of this fever without producing irritation—in fact, they almost always afford relief. Should extended observations prove that these ulcerations of the small intestine exist generally in the cases which terminate fatally, and that such a pathological condition is rarely met with in the inspection of subjects that have died of other descriptions of fevers in Bengal, I should be inclined to adopt the opinion that a peculiarity of the disease would be thus ascertained, which might establish a resemblance to some modifications of European typhus, although the resemblance be not strictly correct in all its details." Dr. Morehead remarks that the observation of a case, together with the reports of Scriven, Ewart, and Goodeve, removed the doubts he had previously entertained as to the existence of typhoid in India, and says: "The investigation will require to be prosecuted with much care, in order that the tendency so common in medical research to exaggerate the importance of new subjects of inquiry, to the neglect of established truths, may be sufficiently controlled; it is to be recollected that disease of Peyer's glands, either in the stage of turgescence or ulceration, is not peculiar to typhoid fever only. About 1851, Assistant-Surgeon Lee made several *post mortem* examinations at the General Hospital of cases of fever of the hot weather, occurring chiefly among European seamen, and was surprised to observe ulceration of Peyer's patches, and was reminded of cases of dothienteritis which he had just been seeing in Edinburgh. Dr. Macpherson had not been in the habit of examining the small intestines minutely in fever cases, it being the received doctrine that they were not much affected in tropical fevers. The fevers in which the ulceration was discovered did not appear to him to differ from fevers which he had been treating for many years, except in so far as he was accustomed to see the types of fever vary considerably in different seasons. In or about 1853 my attention was arrested by a case of fever at Lucknow in the person of a young Frenchman, aged 28, who died after a fever of more than three weeks' duration, attended with diarrhœa, hæmorrhage from the bowels, iliac gurgling, tympanites, stupor, sordes, and, finally, death; a collapse evidently supervening on perforation. He had been exposed to malarial influences; the fever was regarded as climatic, for there was no reason to suppose that he had been exposed to the influence of fœcal poisoning. I then thought of the possibility of malarial fever assuming the enteric form. Dr. Maclean, C.B., says: "So far back as 1838 I treated fevers in Secunderabad, in the Deccan, and in China as far north as Nankin, extending over more than twenty days, with bowel complications. The mortality exceeded that of fevers distinctly malarial, and they were not amenable to quinine; death from hæmorrhage from the bowels was frequent, and the intestinal lesions were those we now recognise as characteristic of enteric fever."* Dr. Gordon, C.B., says: "In fevers as I saw them in British soldiers, enteric complications, including ulcerations precisely like what occurs in specific fever in this country, occurs in fevers (in India) that cannot be traced to anything pythogenic or otherwise specific. If a non-specific fever in the tropics occurs in a young delicate lad, it will almost to a certainty become complicated sooner or later in its course by diarrhœa or dysentery, and ulceration will occur in small or large intestines, Peyer's glands included." I do not gather from Dr. Gordon's reports and papers that he denies the existence of specific typhoid fever in India, but rather that he insists on the necessity of sifting all cases, with the view of ascertaining if cases recorded as specific fœcal enteric fever may not

* *Diseases of India*, p. 525.

* I refer to Dr. Maclean's observations as proof that fever with enteric ulceration existed previously to 1851, not in reference to etiology.

have been of malarial or climatic origin. Dr. Chevers says: "The question, Is enteric fever at present a common or a rare disease in India? is certainly one of the most perplexing, as it assuredly is one of the most practically momentous questions with which medical men in that country have to cope. It being a plain fact that if we, encountering a case of paludal remittent, with bowel complication, insist upon calling it true enteric fever, and treat it as such, withholding that free and steady use of quinine which is the only remedy, that case will almost inevitably end in death. Dr. Bryden did a good and very needful work in giving enteric fever a place in the register of cases; but after admitting this, I confess my unwillingness to admit that we have proof sufficient to convince us that 571 European soldiers of the Indian army died in six years of true enteric fever." Dr. Wall, of the General Hospital of Calcutta, writes: "I believe that a large proportion of cases returned as typhoid fever have no right to that name. If a man die in India after having an elevated temperature, and an ulcer can be found in his intestine, the case is at once called typhoid. My experience is that this form of ulceration often occurs in cases that would better bear the name 'remittent' than anything else." Dr. MacConnell, the very able Professor of Pathology in the Medical School of Calcutta, says: "As regards typhoid or enteric fever in India, and its etiology, I am inclined to believe that the evidence of a specific poison is not nearly so generally available here as in Europe, and that probably climatic influences, *plus* want of proper sanitation, gives rise to not a few cases in India. There is great difficulty in diagnosis. In all the cases that I have seen here and verified by *post mortem* examination, neither the course of the fever nor the range of temperature has been at all typical, and the presence of rose spots or of any specific eruption has been quite exceptional. Of course it is more difficult to see rose spots on the dark skin of a native, but they have been looked for carefully and repeatedly. In not a few cases the etiology of the disease seems to differ from that usually assigned to it in Europe, viz., specific fœcal contamination, but may arise possibly from climatic causes, combined with non-specific fœcal evacuations or other like poisonous material productions, the result of insanitary conditions in dwelling-houses, sewers, cesspools, drinking water, and all other sources of personal human contamination. It affects individuals rather than communities, and thus exhibits a behaviour quite different to that of the specific poison and its resulting phenomena in temperate regions or climates." Dr. Alfred Clarke, of the Army Medical Department, says: "Of the staff, some hold that a specific poison or germ is not absolutely a *sine quâ non*, but that ordinary filth causes may develop it *de novo;* that climatic influences, acting on young and undeveloped constitutions predisposed in some way specially to develop typhoid, may also start the disease. The experience of our soldiers in Zululand seems to confirm this view. I have seen genuine enteric fever in India, where all filth causes, in the ordinary sense of the term, were absent; and once started, the disease may spread rapidly, or appear to do so, without being actually contagious. The outbreak in Natal, January 1882, is an example." Dr. Woodward, of the United States Army, says: "In the fall and early winter of 1861 reports began to come from various quarters that a new form of fever was prevailing in our camps. The medical officers were well acquainted with ordinary typhoid, and it was precisely these men who first called attention to fevers that differed in many important particulars from those to which they were accustomed at home". A board of inquiry, after careful examination, recorded the opinion "that, while a certain number of cases of ordinary typhoid existed in the army, the large majority were bilious remittent, which, not having been controlled in their primary stages, have assumed the adynamic type which is prevalent in typhoid fever. The best instructed medical men, recognising an unusual type, called it Chickahominy fever." Dr. Woodward, believing this form of fever to be the result of the combined influence of malarial poisoning and "the cause of typhoid fever", proposed the name typho-malarial, which was adopted. Speaking of *post-mortem* examination of persons dead of this fever, Woodward says: "between the simple inflammatory enlargement of the closed glands and the more luxuriant process which occurs in typhoid, every possible transition existed. I for one confess myself unable to draw a line between the two conditions. . . . . The sloughing and ulceration is, I think, sufficiently well explained by the intensity of the process without conjuring up in imagination an undemonstrated specific something to account for it." It seems tolerably clear from this that in America the existence of climatic fever with ulceration in the small intestines, distinct from the specific enteric fever, is recognised; it has been placed apart, and is regarded as the result of the combined action of a malarial and typhogenic poison, though there are not wanting indications that it may be the result of progressive action of a febrile condition however set up. M. Léon Cotin says: "A theory was advanced by M. Boudin that intermittent and typhoid fevers were antagonistic, and that where one existed the other was absent; but it has been abundantly shown that in Algeria and in Italy the mortality from both has been excessive. These facts prove that malaria confers no immunity; indeed, intermittents and typhoid appeared simultaneously in the same regiments in Algeria and in Rome." In India, localities notoriously malarious are not remarkable for the prevalence of typhoid, but no part of India, except the hill stations, can be regarded as exempt from malarial influences; and that no part of India where European stations are located is exempt from typhoid; but there appears to be nothing in India to support the theory of antagonism between malarial and typhoid fever; that if, as is thought by some, fever with enteric ulceration is that of miasmatic origin, the question of relative prevalence and mortality proves nothing more than that the fever had assumed one type rather than the other; very careful analysis of the history of individual cases and outbreaks should be made, especially in such developments of fever as have occurred in regions like Burdwan, the Doab, and other districts where low and continuous forms of fever, ascribed to miasmatic influences have prevailed. Some interesting reports have been published on the Burdwan fever by Drs. French and Roy, of the Bengal Service; they attribute it, as do others, to paludal influences; in their account of the cases there is much that is suggestive of enteric fever. Examination of the intestines might have discovered enteric ulceration. Unfortunately there are no necropsies recorded, and this is one of the great difficulties attending study of disease in India. That typhoid fever with ulceration occurs in India among the native population is beyond dispute; but how much of it depends on specific poisoning; how much on general causes; and what are the distinctive phenomena in life and lesions after death, are subjects that require further inquiry. I repeat my conviction that there is much fever of climatic origin which is as like specific typhoid as one case of typhoid may be like another, and that it is of the same character as that called by Americans "typho-malarial", and by the French "typhoïde palustre". After many years' experience, such is the conclusion I have arrived at, and I find that similar views are entertained by others. M. Léon Cotin says authors of great weight have expressed the opinion that the paludal typhoid is the result of the combined action of paludal and typhoid elements, and refers to some that occurred at Nancy in 1875, when the infection was at the same time telluric and putrid. But he says that the fever in other circumstances is the transformation of a paludal into a typhoid fever, and is of opinion that all acute febrile conditions, accompanied by a marked alteration in the secretions and by gastro-intestinal complications, may induce the spontaneous development of typhoid ("Fièvre Typhoïde", *Archives Générales*, 1878, p. 283), in such cases it is natural that it should be impossible to recognise the affection during life, for the two diseases have ceased to be distinct, the remittent fever being transformed into typhoid. On this subject M. L. Cotin has written to me as follows:—"Mes recherches personnelles m'ont inspiré la conviction que la fièvre typhoïde est et a toujours été fort commune dans les pays chauds; qu'elle y a été longtemps méconnue, parce que l'on ignorait ses symptômes et ses lésions: que sa fréquence y a été grande, surtout quand on a envoyé en ces pays des contingents considérables de jeunes soldats. Je donne la preuve de ces faits à la page 31 d'une brochure sur la *Fièvre typhoïde palustre*. Quant à la nature et à l'origine de cette fièvre typhoïde des climats chauds, elle peut certainement dépendre de l'influence des foyers *typhoïgènes* analogues à ceux des climats tempérés (miasmes des égouts, des matières fécales, etc.); mais, suivant moi, elle tient surtout à la transformation, dans l'individu lui même, de la fièvre malarienne qui infecte l'organisme, et met celui-ci en puissance de créer la fièvre typhoïde par auto-infection. Dans cette même brochure j'indique pourquoi cette transformation a lieu surtout chez les individus jeunes, nouvellement expatriés, et dans les pays chauds où l'empoisonnement malarien donne lieu à des accidents fébriles spécialement intenses." Dr. J. Wise, late civil surgeon of Dacca, in Eastern Bengal, has had many opportunities of observing and recording all that is connected with their etiology, symptomatology, and pathology. He has noted the occurrence of a variety of bowel complications in malarial fevers, and has recorded cases in which ulceration has been found. My own opinion, after much consideration and observation, is that it is a true paludal or malarious fever, due to the same exciting causes as are universally believed to produce ague, namely, to miasmata given off from decaying or fermenting organic matter, and not necessarily connected with emanations from drains, cesspools, or privies. The irresistible mass of facts collected by Murchison, Budd, and others, prove that enteric fever in Europe is truly pythogenic, and that in most instances it is caused by decomposing fæculent matter. In India we cannot accept that as the sole, or perhaps chief, exciting

cause of enteric fever. Dr. Parkes (*Practical Hygiene*, ed. 1866, p. 455) also entertains doubts that the generally accepted cause is the only one to which enteric fever is to be referred. No one has more persistently and ably affirmed that enteric fever is generated in India by other causes than fæcal emanations than Dr. Bryden. In 1872 he wrote: "Eight years since, from the facts then at my disposal, I made the generalisation, that the typhoid fever of the British soldier in India is primarily due to climatic influences. The belief that defective conservancy will be found in every case when typhoid fever shows itself is very apt to lead to the conclusion that any statement to the contrary must be erroneous. This is a narrow view, and it is not warranted by any feature in the aspect of typhoid as we meet with it among our soldiers." (*Appendix to the ninth Report of the Sanitary Commissioner with the Government of India*, 1872.) Dr. Wise's remarks on malarial pneumonia with enteric symptoms are interesting and valuable: "The disease with which paludal enteric fever is most frequently and easily mistaken is asthenic, or typhoid, pneumonia. This is a most common disease in Bengal, either appearing idiopathically, or secondarily, to other diseases. Among the natives it generally assumes the type called bilious, in which gastric and enteric symptoms are most conspicuous. In thirteen cases I made careful examination of the small intestines after death from this disease. In ten, congestion, more or less intense, and varying from a pink to a port-wine colour, with patches of extravasation, were found in the mucous membrane of the ileum; in one an ulcer of the duodenum with extravasated spots in the ileum existed; in one Peyer's glands were congested and pitted, while the mucous membrane around was deeply injected; and in one Peyer's patches were singularly distinct, their surfaces being humid and reticulated, the solitary glands were swollen and mammillated, and the mesenteric glands were enlarged, containing a milky fluid like chyle. But pneumonia with typhoid symptoms is no less common as a complication of intermittent or remittent fever—the febrile pneumonia of Morehead. As cases are seldom seen among natives until at least a week has elapsed it is often difficult to distinguish the primary disease. If the patient is intelligent, and is seen early, a correct conclusion may generally be arrived at; but when he is delirious, with a black furred tongue, has twitching of the muscles, and diarrhœa, it is often impossible to decide. Pneumonia with enteric symptoms is often, I believe, confounded with pneumonia secondary to paludal enteric fever. In my experience, inflammation of the lungs rarely appears in the course of any of the malarious group of fevers before the end of a week, while in enteric fever it is generally during the third week. In all cases of doubt, twenty-grain doses of quinine given twice a day, or five-grain doses with antimony every four hours, as recommended by Morehead, will decide the question whether the disease is secondary or not. There is nothing more certain in medicine than this. A few doses of quinine given to a patient prostrate with febrile pneumonia work a wondrous change; they check the fever, and the patient passes in a few hours from a state of misery into one of comparative ease and health. Of all the practical benefits conferred by Dr. Morehead on the people of India, none probably will be more enduring than this one, which he was the first to recognise." Surgeon-Major A. Clark informs me that typhoid fever has prevailed very extensively in Natal and Zululand during the war. Since January 1, 1879, to May 31, no less than 267 admissions for enteric fever have been recorded. Many of these occurred in healthy camps on ground previously unoccupied (virgin soil), and in bodies of picked men. The water supply, as a rule, good; no sewers or drains; conservancy, dry earth or trench, and carefully attended to. Surgeon-General Woolfreyes describes this fever as "typho-malarial". He says: "I am of opinion that it is climatic, the true autumnal fever. It, as a rule, commences with sore throat, a peculiarity; the rose-spots are invariably present, and in fatal cases the lesion of Peyer's patches are well marked." At the time that enteric was reported so common in the first division, jaundice also prevailed very extensively, but was unknown in the second division. Enteric has also been reported as causing much sickness amongst the troops in Afghanistan. Here, again, camps were often pitched on virgin soil, though the water supply was far from satisfactory, and dead camels so constantly polluted the streams. It prevailed with cholera and severe remittent fevers. Altitude made no difference, cases being admitted in camps several thousand feet above sea-level. Enteric cases are reported from nearly every station in the Bengal Presidency, some such as Cambellpore, in the Punjab, where the cases of enteric fever have occurred from time to time, without any discoverable connection with each other, and in the great majority of cases in the persons of new comers. In every instance the disease was closely marked by the usual characters, and could not possibly be mistaken for any other. If enteric fever, according to the commonly accepted theory of its origin, is always associated with defective sanitary arrangements, then Ascension, of all places with which I am acquainted, ought to be exempt from it. There is no such thing as a sewage drain or cesspool in the island, all sewage and other filth being removed daily and thrown into the sea, to leeward of all dwelling-houses. The water (partly collected from the roofs of buildings during rain, and partly condensed) is stored in iron and cemented stone tanks removed from all possible source of contamination, with the exception of the summit of Green Mountain, where there is a soil resulting from the decomposition of grey trachyte. The island is a mass of volcanic rock and ashes, incapable of supporting any vegetable life whatever. My investigations have utterly failed to connect the fever with any of the conditions commonly believed to be essential to its production. Dr. Don, of the Medical Department, says: "The early symptoms of these fevers are usually so much alike, that it is often quite impossible on admission to determine what form may ultimately supervene. Many times have I seen cases admitted under febricula, then changed to simple continued, and finally to enteric, as the fever developed. This was forced on us by the supervention of phenomena which it was quite impossible to anticipate. They occur simultaneously, concurrently, and mixed up at the same time and place, in the same regiment or community. From the same barrack or company room one man may be admitted into hospital with febricula, a second with simple continued, and a third with enteric, all on the same day. All these fevers have the same seasonal period of prevalence. During winter and spring they are at a minimum, or wholly absent; from June to October is the season of their prevalence north of the line, with a corresponding reverse period in the southern hemisphere. I think they can be better explained by a study of the internal or predisposing causes: "1. Constitutional, hereditary, or acquired predisposition. 2. Age. 3. Want of acclimatisation. I cannot help thinking that enteric lesion is to be found in several forms of a closely allied fever; at the same time this bowel lesion does not necessarily imply a specific causation under every circumstance and in all parts of the world. In short, there can be no doubt that enteric fever cases constantly crop up in hot climates, the causation of which is inexplicable, either by a theory of propagation or of pure pythogenesis." I am indebted to Dr. Kynsey, P.M.O. of Ceylon, for an interesting memorandum on the fevers of that island, which seem to be of a milder type than those of India. It singularly illustrates the confusion which still obtains about the nosology of tropical fevers, and attests the existence of a form of climatic continued fever which resembles the specific enteric. There can be no doubt as to the existence in Ceylon of genuine enteric fever, but there is a strong tendency to call all protracted fevers by this name; but I am convinced there is a form of fever in the tropics indistinguishable during life from this fever, and without the characteristic lesions of Peyer's glands after death.

Anomalous Fever in China and elsewhere.—Dr. P. Manson, of Amoy, China, has sent an account of an epidemic of continued fever in China. It was of a circumscribed prevalence and presented anomalous characters (*China Imperial Maritime Customs Report*, 11 Special Cases, No. 2, 1881). In some respects it resembled enteric, in others malarial fever. Quinine in some cases was of benefit, in others it failed. The fever was of a continued type, with high temperature, up to 105° or 106°, diarrhœa, delirium, and some rose-coloured spots. In some of the cases, he says: "The symptoms of typhoid were present; in others they were not, beyond the fact that the fever was continued and was uncontrolled by quinine. In one case that did intermit, quinine had no effect." Dr. Grabham, a Fellow of our College, writes from Madeira, November 16, 1879: "In Madeira, where I have had much experience during the last eighteen years, there are present from time to time cases of typhoid whose origin is precisely that pointed out as referable to general and climatic causes. I have long ago convinced myself that it is vain to seek to trace many well-marked cases of pure typhoid to sources of filth contamination. I have again and again seen such cases arise in situations many hundreds of feet above Funchal, far away from all dwellings, and in regions where the cold drinking water springs from beneath basaltic columns of rock. It is quite certain that however they acquire it, nevertheless such patients, equally with those who have imbibed their disease from polluted water, are able to spread their infection to others." Dr. Johnston Ferguson, Surgeon-Major, writes: "I, too, have long been of opinion that typhoid fever may have origin in other causes than the filth to which in most cases it is rightly assigned, and this more especially in tropical and subtropical climates. During a service of twenty-seven years I have treated typhoid fever in the Mauritius, Barbadoes, and Bermudas, and the conviction has gained strength as my experience has extended." Surgeon-General Irvine informs me that an outbreak of enteric fever has taken place among our troops in South Africa. The P.M.O.

attributes it to the fouling of the streams on which the camps were pitched, by dead cattle and filth of all sorts, the heavy rains washing the foul matter into the rivers. In this case, the origin of the disease seems attributable to animal emanations, but not especially to a specific contagion developed in human excrement; epidemic outbreaks are probably generally to be explained by such causes. The strength of the troops was—Officers, 107; men, 2,939; women, 43; children, 69. Of these one officer was attacked, but recovered; 183 men were attacked and 33 died. The women and children escaped. No details having reached me, I am unable to give any account of the symptoms of the disease or of the *post mortem* appearances, nor why the women and children should have escaped. The sanitary report for Assam, 1880, contains an account of an outbreak among the sepoys of a native regiment stationed on the north-eastern frontier, which clearly proves the existence of the disease, and in this case it would seem to be traced to defective water. The civil surgeon of Góalpára gives a description of a case and *post mortem* examination, which leaves no doubt as to the nature of the fever. It is by careful study of such outbreaks as this, of isolated cases, in regard to locality, water, sanitary condition, previous history of the sufferers, and personal attributes, such as age, race, temperament, time of year, etc., we may hope to discover the true causation. That enteric fever should have specific origin in temperate climates is no proof that it may not have others in climates of a different character. Some of the low forms of fever described in this country, and in France and America, as typho-malarial, paludal typhoid, seem to be of this nature, and in this connection Dr. S. Harley's views on this subject seem to me of great interest. The apparently increased proclivity of the meat-eating and spirit-drinking races to enteric fever is interesting in reference to the possible effect of the diet of the European soldier in India; but though it may be more frequent, it is not confined to meat-eating natives, as shown by Dr. Wise's cases. I concur in Martin's remark that as regards the etiology and causation of enteric fever much uncertainty unquestionably exists. Even in Europe, where its connection with a specific poison, or with the products of fæcal or other organic decomposition, contaminating air or water, seems to be established by a large number of observations, the cumulative effect of which amounts to very forcible evidence, it cannot be said that we have exhausted our knowledge of the causes of this fever. I believe a considerable amount of climatic fever occurs in the tropics, in which the symptoms and phenomena so closely resemble those of true enteric fever that they may be, and are, mistaken for them, and that the *post mortem* discovery of ulceration attests the severity of the disease, does not proclaim its original cause. I would ask all medical officers in India to study each case in all its aspects most critically, for no one will deny that we have still much to learn about fever in tropical climates. If it be admitted that specific fever may originate in effluvia and emanations generally, and is not restricted to a specific contagium developed only in human excrement, it is probable that in this source we may find its origin, for there are few localities in which organic exhalations do not taint the air or pollute the soil or water. Still, the fact that these conditions are often so rife, and yet this form of fever so unfrequent, and that the effects of season, locality, age, and want of acclimatisation play so important a part in developing it, seems to indicate that climatic conditions are largely concerned. Let me turn to the latest reports and see how the matter is viewed at present. The preponderance of opinion is in favour of a specific origin for all enteric fever; but there is a certain vagueness as to etiology, varying from the extremest specificity of a contagium to the results arising from decomposition of organic matter generally, or even malaria. No one, I think, disputes the existence of enteric fever, and I doubt if any exception would have been made to the name "enteric" did it not imply a specific contagion, which in this respect covers views of specific causation which is inapplicable as a general term for India. A most valuable report has recently been drawn up by Brigade-Surgeon J. Marston, the able and accomplished secretary to the head of the Medical Service in Bengal, who has had ample opportunity of seeing the disease at home. He says: "I came out here imbued, rather than otherwise, with a belief in the views of European pathologists; but Indian experience has compelled me to recognise that those views as to the causes of enteric fever are too exclusive, and quite inadequate to account for the facts; they do not cover anything like all the facts, and they are irreconcileable with some of them. But how can any specific or other fæcal contamination of air, milk, or water account for such facts as these? 1. The remarkable proclivity to this disease exhibited by recent arrivals in this country. 2. The occurrence of cases at certain seasons, at stations extending over vast areas of country—miles and miles. 3. The isolated nature of such cases in a great many instances. 4. Their occurrence at certain definite seasons, *e.g.*, at the hottest and driest, when the wells are lowest, and at the end of the monsoon, when they are highest. 5. Again, from the British dominions in India up to Kabul, you had, at almost all the military posts occupied by the various columns in Afghanistan, cases of enteric fever, notwithstanding that many of these posts must have been occupied by Europeans for the first time in history. I have tried unsuccessfully, and others have done the same, to obtain reasonable proof out here of the operation of those causes set down as the only and invariable causes of enteric fever at home. The more I think of it, the more convinced I feel of the inadequacy of the usually accepted views to account for all, or anything like all, the facts in this country." On the whole, I think, as a tentative and working hypothesis, that there are two forms of it in India, which cannot, however, be clinically or pathologically differentiated: one (the larger class) which does not depend on the contagion of any specific poison generated in the intestine of one person and conveyed to another through some vehicle, nor, indeed, on any fæcal poisoning, or poisoning of any kind, unless it be that the patient is autogenetically poisoned by his own fæcal matter; the other, occurring in outbreaks (not singly, in isolated cases), and with a history by which the cases can be traced to some common cause, such as infection, fouled air or water, diseased or high meat, etc. In the first variety, however, I am disposed to think climate—meaning by it to include the whole combination of changed physiological conditions environing the young and newly-arrived soldier in this country—plays a very important, if not the main part. It is a notable fact that of a number of fatal cases returned as remittent fever, where the *post mortem* appearances disclosed an absence of any intestinal glandular lesion, the subjects are older men and longer resident in the country; whereas, where ulceration of Peyer's patches was found, but the fever has been diagnosed as remittent or enteric fever, the subjects are, as a rule, younger and less long resident soldiers.

"Making every allowance for carelessness on the part of some, and for the tendency, inseparable from all official systems of registration and reporting, to execute clinical work in a perfunctory manner, or to assign some cause without considering its relevancy or adequacy, medical officers have utterly failed in India to satisfactorily trace out the intimate connection of the disease with filth-causes of specific infection, with which, according to European authorities, it is invariably connected. Such failure has not been due to any want of zeal on the part of the medical officers, who have striven to harmonise the conviction due to the doctrines in which they have been educated with the results of their Indian experience."

It seems quite clear that the conviction forces itself on the medical authorities, that the causal relations of this form of continued fever are not, in India, limited to those which give rise to it here; and I feel convinced that there is, at all events, sufficient to give interest to searching inquiry, which will probably show, not that there are more fevers, but more causes, than has been believed. I would, for the sake of precision of registration, urge the adoption into the nosological returns of something that should distinguish climatic from specific fever.

The symptoms are much the same in India as elsewhere, modified, perhaps, by malarial influences. By some it has been thought that any difference the disease may present in India from that in England is due to the added action of malaria. There are distinctive characters which differentiate enteric from remittent fever in the early stage, though it is often exceedingly difficult, if not impossible, in the more advanced stages, to distinguish them. At the outset, it may be insidious; and for the first few days there are only *malaise*, chills, perhaps diarrhœa, loss of appetite, weariness, aching of the limbs, and headache. The patient at length lays up; the pulse quickens; the temperature rises; the skin becomes hot and dry; there are thirst, heaviness, and dulness; whilst the thermometer indicates a rising temperature, gradually rising until it reaches 104° or more, with a remission towards the evening. The abdomen becomes distended; and there is tenderness on pressure, especially in the right iliac region, with gurgling. The diarrhœa may increase, become of a yellowish colour; the excretion perhaps tinged with blood. The tongue is red at the tip and edges, dry, cracked, and tender. The teeth begin to be covered with sordes. During the second week, the characteristic spots make their appearance, but are often absent, and on the dark skin of the coloured races are difficult to detect. As the disease progresses, the patient becomes delirious. The delirium is at first wandering; but it gradually becomes incoherence, and may be noisy or muttering, with complete prostration. The diarrhœa increases; the tongue is dry and glazed; the teeth covered with sordes. There may be epistaxis, or hæmorrhage from the bowels, and the patient becomes unconscious. The temperature rises to 106°, or even higher. The patient has subsultus of the tendons, muscular twitchings, picking of bedclothes. Death supervenes from exhaustion, or from peritonitis caused by perforation of the ulcerated bowel.

The ordinary duration is three weeks, often more; in severe cases, it may terminate fatally much earlier, probably before the intestinal ulceration has taken place by the intense action of the poison on the nerve-centres; but, in milder cases, it may terminate earlier. About the fourteenth day, the symptoms sometimes improve, the temperature begins to fall, the general symptoms abate, the diarrhœa decreases, and the appetite and sleep improve.

I have already referred to its great fatality among our young soldiers during the early part of their service; and a certain amount occurs in the civil population, and generally, though not always, among young people. Every year I had cases of enteric fever, with all the characteristic phenomena. The worst, and a fatal case, that recurs to me, was one of a gentleman nearer fifty than forty years of age, in whose case it would be difficult to trace a specific origin of the disease. I regarded the case generally as an ordinary example of the enteric fever, but I never could feel satisfied that the origin was quite the same, unless, indeed, organic miasmata be allowed a wider extension than that depending on fæcal matter; were this admitted, causation would not be so far to seek.

The diagnosis between specific enteric and climatic enteric is often very difficult. The close resemblance between some remittents and the specific forms is very great. It is by observation of the earlier symptoms and study of the previous history that the distinction will be practicable. In the specific form, the invasion is gradual, and it is not for some days, during which the temperature rises in the evening, until about the fourth evening, that it attains to 104°. In the climatic or malarial forms, the premonitory symptoms are more sudden. There is more marked chill or rigor, the *malaise* is greater, the temperature rising to 104° or 106° as early as the evening of the first or second day, though these distinctions are not always well marked. There is diarrhœa in both, and, all the other symptoms of ulceration being established, the phenomena become identical. The rose-coloured spots are by some regarded as pathognomonic, but they are often observed in cases of specific enteric, and it is very difficult to detect them, or to distinguish them on the dark skins of natives; it is quite possible that they may, standing in relation to the bowel-ulceration, occur, however that condition is established.

There is, as in all fevers of malarial origin, a disagreeable sensation of chill from contact of air, even when the body-temperature is very high. Dr. Wise has observed that the stools are always acid; to this he has paid much attention, and he thinks it a point of considerable importance. He further remarks that the anxiety depicted on the countenance of the specific typhoid patient is wanting. When it occurs in the course of simple ardent or paroxysmal fevers, when the rise of temperature at the outset is more abrupt and sudden, and when the thermograph is irregular, I believe that the origin is more general than a specific pythogenic source. I admit the extreme difficulty of diagnosis after a certain stage, and when intestinal ulceration has taken place, and can well imagine that septic absorption from these ulcerations may so modify the symptoms that there is practically no real distinction. In short, I believe, as I have before said, that, in India, enteric lesions are apt to supervene in the course of miasmatic fever, and that in this condition they become identical with specific enteric fever. If asked, Why seek for any other explanation than that accepted in this country? I reply, that there is more evidence that ordinary climatic fever may assume the typhoid, *i.e.*, enteric condition, than that all enteric fever is caused by fæcal contamination.

It has been said that an important means of diagnosing these diseases is the treatment by quinine. In remittent fever, if large doses of quinine be given, the fever will in most cases be cut short, which is not the case in typhoid. Quite true; but there is not much danger of confounding a remittent, with well pronounced remissions, with typhoid. The cases in which there is difficulty are the continued or continuous remittents, and there quinine will not cut short the fever, though it will reduce the temperature, and for this reason is a most valuable remedy. In fever with enteric ulceration, however caused, it is not to be expected that it could be cut short, and therefore quinine cannot be regarded as the crucial test; though in the earlier stages, before ulceration has set in, it certainly may prove so.

It is on points of detail of this kind that further observation is required; and I would ask our colleagues in India and the tropics to consider this among other desiderata, for it is in the study and careful observation and comparison of these special features that the main issues will be determined. General descriptions abound; what is wanted is further investigation, with the absence of all bias in favour of this or that theory, of the facts bearing on etiological and pathological relations of these fevers.

Treatment of Enteric Fever in India.—It would unduly prolong the subject to enter into further details; nor is it necessary that I should say much on the subject of treatment, for in fact it is exactly that which is adopted here, and consists mainly in the careful administration of fluid nutrients, avoiding all that could excite or irritate the disordered bowel. Diarrhœa should be controlled, not unduly checked; temperature should be reduced by apyretics or diaphoretics; and the use of quinine in moderate doses is useful in pyrexia, however caused; whilst as to the mode and extent of its administration, the circumstances of each particular case will be the proper guide. As regards wine or other forms of alcohol, I have administered it according to the effect it produced. As to nourishment, animal broths and milk—perhaps diluted with some alkaline water—have been the most appropriate; avoiding any possible source of gastro-intestinal irritation, even after convalescence was well established. Relapses occasionally occur; and a nearly fatal one in an officer of long service, who, in the fourth or fifth week, suffered from a recurrence of dangerous symptoms, simply as the result of eating a few raisins given him by the nurse, left a strong impression on my mind as to the importance of caution as to diet. The temperature-charts will show the varied character of the pyrexia, and how little there is that can be said to draw a distinct line of demarcation between the different forms of fever. I regret that I am unable to analyse them at length; but will only ask you to look at them and the specimens which represent enteric ulceration from fever patients in India, for which I am indebted to Professor Aitken, of Netley, to whom, as to many of my brother officers in India and at home, I am so much indebted.

I am reluctantly compelled to bring this lecture to a conclusion. I knew the subject was extensive; but it was only in attempting to compress it into the short space allowed to three lectures that I realised the magnitude of the work I had undertaken. I am sensible I have omitted much that should have been said, and that I have but imperfectly availed myself of the time at my disposal. I had hoped to have considered the subjects of typhus, relapsing, dengue, and Indian plague; but these for the present must be deferred. It only remains for me to thank you for the attention with which you have listened to my imperfect endeavour to add something to the story of Indian fever.

ABSTRACT OF LECTURES
ON THE
ANATOMY, PHYSIOLOGY, AND ZOOLOGY OF THE EDENTATA.

Delivered at the Royal College of Surgeons of England.

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Lecture I.

The name assigned by Cuvier to this group, which some naturalists think ought to be regarded rather as a subclass than an order, is often objected to as inappropriate; for, though some of its members are edentulous, others have very numerous teeth. It is, however, now so generally adopted, and its meaning so well understood, that it would be very undesirable to change it. In fact, similar reasons might be assigned for ceasing to use nearly all the other current ordinal designations; for it might be equally well objected that all the Carnivora are not flesh-eaters, many of the Marsupialia have not pouches, and so forth. On this subject, it is well to bear in mind two aphorisms of two most eminent former occupants of the Hunterian Chair. It has been written by Owen, that "the sooner a term becomes an arbitrary sign, the better;" and by Huxley, that "it is better for science to accept a faulty name, which has the merit of existence, than to burden it with a faultless newly invented one."

Accepting the word, then, some limitation must be placed upon the group as understood by Cuvier, as the Australian Monotremes, the *Ornithorhynchus* and *Echidna*, the structure of which was at that time imperfectly known, were formerly included in it, but are now, by almost universal consent, removed to an altogether different section of the class.

If the teeth are not always absent, they invariably present, as compared with those of the more highly developed mammals, certain imperfections, which are, indeed, almost the only common characters which bind the animals of the group together. They always belong to the kind called *homodont;* that is, are not separated into distinct groups, as incisors, canines, premolars, and molars. They never have more than