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Contributors

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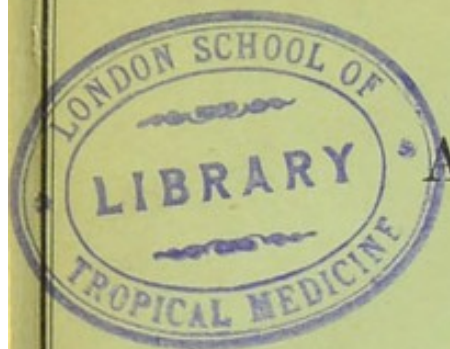
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AN ADDRESS

ON

✓ TROPICAL MEDICINE.

DELIVERED AT

THE EIGHTH INTERNATIONAL CONGRESS OF HYGIENE AND
DEMOGRAPHY, BUDAPEST, 1894.

BY

THEODORE DUKA, M.D., F.R.C.S. ENG.,

Surgeon-Major-Lieutenant-Colonel, Her Majesty's Bengal Army (Retired),
PRESIDENT OF THE TROPICAL SECTION.

HERTFORD

PRINTED BY STEPHEN AUSTIN & SONS.

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IN the third century before the Christian era, the great Buddhist king Piyadassi Raja, in one of his edicts, which can still be read on the Lâts in India, standing there as a testimony to his enlightened spirit and benevolence, commands that the health of the subjects of his vast dominions should be duly cared for. This, as far as is known, is the most ancient record engraved on pillars of stone in which we find public health regarded as a matter of State concern. In our day hygiene is no longer the exclusive affair of one country. It includes in its international development the vast dominions of ancient monarchies of the East as members of a large agglomerate, composed of all sorts and conditions of men, of different nationalities, Governments, and creeds. The resolution of the last Congress of Hygiene and Demography concerning this Section may be regarded as bridging over an interval of twenty-two centuries. The London

Congress declares that, "looking to the interest shown by India, the meeting recommends that in future hygienic and demographic congresses a Tropical Section be formed with the view to a full discussion of questions affecting sanitation and the origin of disease in tropical climates." The present Congress is, therefore, the first that has had the duty imposed upon it of organizing a special Tropical Section. The executive committee, in their kind and generous partiality towards myself, but contrary to my desire and advice, have done me the honour of entrusting the presidency of this Section to my care and charge. I must, therefore, beg your indulgence if you find the duty has been committed to feeble hands; but I know that I can rely on the kind co-operation of all the members of the Section, and particularly on that of my colleagues. First and foremost, then, I beg to bid you all a respectful welcome.

The tropical zone, speaking geographically, and including the vast portions of our earth under its immediate influence, comprises more than one-third of the surface of the globe, with a relatively larger population than the temperate or polar zones. We may take it for granted, I think, that the large number of scientific men who have already done so much in the field of hygiene and demography generally will continue their work on the problems which still require

further elucidation in tropical regions. In a necessarily short address like this it is not possible to review the results of labours of the distinguished men who have been working in the tropical field. The few remarks I desire to make must consequently be restricted to subjects immediately connected with East India, where I lived and spent some of the best years of my life in the service of its Government. When I first landed in Calcutta more than forty years ago hygiene, as it is understood at the present day, had not been thought of; no railways were then open in Bengal, and none of the means that now exist were available for grappling with the well-known scourges of the East—namely, the periodic visitations of famines and epidemic diseases. When we compare the condition of things of half a century ago with the present time the progress that has been made seems little short of marvellous. Those who are unacquainted with the actual past and with the inherent obstacles ever present in the path of any reform in India may no doubt easily find shortcomings which they are so ready to condemn. Visitors to India during the cold weather cannot have any personal experience of the heat of the tropics with a temperature at least 20° F. higher than that of most parts of Europe. Exhausting and even perilous to health as the climate is to Europeans, the work which they find to do has to be done—the

administration of the country cannot stand still. The hot season is followed by the rains, the mean amount of which may be put down at forty-two inches, but varying considerably, of course, in local distribution: whilst in Scinde, the Indian desert, and in the country about Multan there is a rainfall of about four or five inches only, it reaches on the spur of the South-eastern Himalayas, on the Khasia Hills in Assam, a yearly fall of 600 inches. Along the western coast as many as 200 inches are registered, whereas at a distance of less than eighty miles inland scarcely twenty inches of rain fall in the course of the year. This rainfall, as is well known, is periodic. In the North-Western Provinces it begins in the winter season, taking a course from west to east, and ceasing at the confines of Bengal; but before these winter rains have ceased in the north the spring storms have gathered in the Bay of Bengal, often developing into destructive cyclonic storms that devastate the sea-coast, and sometimes the country for hundreds of miles inland. The summer rain, or what is known as the south-west monsoon, commences at the end of May or beginning of June, and lasts till September; heavy clouds covering the horizon, the atmosphere is saturated with moisture, and the Gangetic delta approximately presents almost the appearance of an inland sea. The area of Hindostan is about 1,559,960 square miles; its

population, including Burmah, approaches 300,000,000 (287,000,000), and according to the last census return is spread over 717,549 places, of which only 2035 are classed as towns, the rest being classified under the heading of villages. The urban population is in the proportion of 9·48 per cent. to 90·52 of rural. The density of the population varies enormously, from four souls to the square mile in Upper Khyndwin and seven in Salwin to 930 in Saran, not mentioning that of Bombay, which is said to be 35,000 to the square mile. The geological and topographical conditions of the country present many varieties. Scinde is almost a sandy desert, whilst Calcutta and its vicinity on the Gangetic delta stand on an alluvial, fertile soil about ten feet deep, beneath which is a stratum of clay. In Bengal generally the water is very near the surface; in the western provinces of India it is often at a depth of 800 ft.; and, whilst one part of the country is inundated by heavy rains, another part may be at the same time suffering from drought. The atmospheric phenomena in India are, like the country itself, on a vast scale. It must be borne in mind that India has many climates and races, and is as large as the whole of Europe, Russia excluded. The people are for the most part very poor, and belong to different nationalities, profess various religions, follow different social habits and customs, and observe diverse modes of

burying their dead. The caste system and fatalism also play an important part. As a child of a hot climate, the disposition of the native is naturally apathetic: he desires to be left alone, to live and die in the caste in which he was born; he is ignorant and intensely conservative in his habits and customs. These racial and caste difficulties have consequently all to be taken into account, as well as those of climate and soil, and they add immensely to the obstacles to be encountered and overcome in the practical application of sanitary measures to the country itself and to the personal hygiene or to the dwelling-houses they occupy.

It is almost needless to enter upon a description of the sanitation of an Indian village, for there is a total absence of it. The huts composing the villages and hamlets are erected for the most part on flat land or on slightly elevated ground exposed to the scorching sun and fiery winds or drenched by rain. The people drink from the pond in which they bathe and in which their cattle wallow, surrounded by the refuse of their daily lives. The cattle consist of cows and buffaloes, occasionally of goats, donkeys, and pigs. All live under the same roof and lie upon the ground beside their master and his family. There is hardly a window or an opening for ventilation. The dung-pit is not far

from the well-water supply, where the washing of clothes, of animals, and of men is carried on from day to day; and the women provide their households from this source with water for cooking purposes and for drinking. The people have so lived for centuries, knowing and apparently caring for nothing better. These and many others are the difficulties that obtrude themselves upon the sanitarian and the municipal and Government authorities. Sanitary measures, moreover, involve a large expenditure of money, and if the question presents itself between taxation and disease, more enlightened people than the Hindoo come to the same determination as he does—namely, to run the risk of contracting disease rather than incur the outlay of providing safeguards against it. Notwithstanding all these impediments much has indubitably been accomplished both by the Legislature and the executive, especially in the way of systems of water-supply and drains. Works for water-supply have already been carried out, and are still being extended in many large towns. In Calcutta, for example, the mortality from cholera alone has been reduced by an improved system of water-supply to one-third of its former rate. A vital question in connection with tropical hygiene is the value of European life and the rate of mortality among the troops occupying a country and of the civil population residing permanently in

it; for it is mainly on these, after all, that the strength and permanence of the Government of India rest. After the Crimean War the Royal Commission inquired into the sanitary condition of the British Army, and in 1859 its operations were extended to India, and the reports showed that the annual mortality of European troops in India stood at 69 per 1000 for many years prior to 1859. Certain measures were speedily adopted for the better housing, feeding, clothing, and employment of the soldier, with the result that the death-rate steadily diminished, until it was as low as 10 per 1000; but disease and death-rates are, of course, liable to great fluctuations according as epidemics are absent or present.

In a congress about hygiene and demography we are mainly concerned with the diseases affecting masses of the people in connection with the conditions environing them at the time of their prevalence. I propose to touch as succinctly as practicable upon three diseases, with a view of stating what our progress has been and what points, as it seems to me, still require further elucidation. These may be conveniently arranged under: (1) malarial or paludal affections, (2) typhoid or enteric fever, and (3) cholera.

1. MALARIAL OR PALUDAL AFFECTIONS.

Malaria and malarious fevers prevail in all quarters of the globe. In the Tropics they are intensified by climatic conditions. In South Italy towns and villages are built on mountain slopes. Altitude affords some protection against the influence of malaria. Indian experience teaches us the same fact, but, according to Surgeon Parke, an altitude of even 10,000 ft. affords no guarantee against it in sub-equatorial Africa. Laveran's discovery in Algiers in 1880 of a polymorphic protozoon or vegetable micro-organism in the human blood, which he called "*plasmodium malariae*," confirmed subsequently by Marchiafava and Celli in Italy, and by Councilman at Baltimore in America, has placed the study of fever and of allied affections on a basis widely different from the theories entertained before. Laveran describes several (four) forms of the protozoon. In acute malarial fever the amœboid bodies adhere to or occupy the red globules, deriving their black pigment from them; these dark pigmented bodies of various shapes produce melanæmia, that being the deterioration of the blood caused by the parasites. The existence of these micro-organisms is accepted by competent authorities as conclusive of malarial affection. Quinine seems to kill the parasites and to cure the disease.

The crescentic forms are common in the blood of the quartan and irregular types and in malarial cachexia. Other fevers, such as the ardent, thermic, bilious, remittent, and fevers complicated with cerebral symptoms arising under tropical conditions, present no melanæmia, no parasites being discovered in the blood, and therefore they are not, it is thought, to be classed under malarial. The presence of pigmented bodies has been confirmed in certain malarious regions of the globe, but it is not yet determined whether they invariably occur in every malarious country or in all cases of malarious fever. A paper will be read before the Section by Surgeon-Major Ronald Ross, in which the writer brings forward certain adverse criticisms on the deductions put forth in connection with the plasmodium malarix, and Surgeon-Major Oldham very pertinently still discusses the question, "What is Malaria?" Inoculation with melanæmic blood produces symptoms of fever. *En passant*, I may remark that there seem to be some points of alliance between malarial disease and cholera. Both are apparently connected with the presence of micro-organisms. Atmospheric conditions play an important part in their epidemic prevalence, and the clinical features of one disease may sometimes closely simulate those of the other. Mention is made by the Sanitary Commissioner with the Government of

India for 1892 of a severe outbreak of malarial fever at Peshawur which lasted from September to December. Brigade-Surgeon Brown reports fifty-four fatal cases of remittent fever which were extremely difficult to diagnose from cholera, so closely did they mimic that disease in their clinical features. There were purging, vomiting, cramps, and suppression of urine, followed by collapse. Whether the plasmodium malariae was present in the blood of these patients, it is not stated. This virulent form of climatic fever has also been described from time to time by other observers, especially recently by Dr. Alcide Treille, in his very interesting report on "Le Cholera Africain."

2. TYPHOID OR ENTERIC FEVER.

A young soldier or civilian arriving in India is exposed to very different influences from those which surround him in his native home; he is a novice not merely in general experience, because of his age, but he is utterly ignorant of the new conditions that surround him in his tropical abode, where he is exposed, perhaps, to attacks of fatal diseases before his system has accommodated itself to its new environments. Typhoid fever is the malady to which the young European soldier is most liable during the

first two years of service. There may be a great difference as to the nature and soil conditions of the station to which he may be sent, but these do not seem to affect materially his liability to this disease. The Army reports show that out of seventy-three regiments and batteries which went to India between the years 1871 and 1878 and were dispersed to various districts and stations, only nine remained free from typhoid fever. The same susceptibility to the disease still continues in the European Army of India. Estimating the liability to die from typhoid fever at 100, the risk of mortality of a recently arrived young soldier, according to the latest sanitary report for 1892, stands at 65·99 during the first and second years of Indian service as compared with 13·67 from the sixth to the tenth year of residence in that country. The constitutional liability of the young soldier to this form of fever, which was first described by Scriven in Burmah in 1853, was subsequently statistically worked out by Bryden, and it is certainly a very striking feature. The glands of the small intestines, examined after death, show distinctly the pathogenic changes. The age at which we send our soldiers to India may be termed the "enteric fever age." After middle age Peyer's patches and the solitary glands cease, as a rule, to be liable to these morbid alterations, and these individuals in all

countries usually escape an attack of typhoid fever. Various opinions as to the causation of typhoid fever in India have been adduced. There are two points from which the origin of the disease may be viewed. One is external infection, the other internal, autogenetic, within the system. Budd and Murchison's infection and pythogenetic theories have to a great extent been superseded by the results of the investigations of Eberth, Gaffky, and others, establishing the fact that a specific bacillus is found in the lymphatics, mesenteric glands, spleen, liver, and kidneys, and that these bacteria constitute the toxic element of enteric fever. A plausible hypothesis has been put forward by Surgeon-General Marston in explanation of the vulnerability of the British soldier to this fever in connection with the new environment and changed condition of life to which a young and recently arrived European in the tropics is subjected, and particularly to the high temperature, causing a greater physiological activity in the lymphatics and intestinal canal, with its system of Peyer's and solitary glands. It must be remembered that under a short service system the European military population, as I have said, is exclusively composed of young men of what may be termed the "enteric fever age"—from eighteen to thirty. The sameness of the results of microscopic evidence would go far to establish the identity of all pathological conditions, and the

question has yet to be determined whether every case of typhoid fever, however produced, presents the characteristic bacillus of Eberth and Gaffky—a result which, it is presumed, has not yet been attained. It is, moreover, very important to determine the exact relation which Eberth's bacillus holds with regard to the bacillus coli communis. Typhoid fever occasionally attacks the coloured races. In the gaol returns of India several deaths from it are recorded; still, the disease among the natives of India is very rare as compared with its prevalence among Europeans, as shown in the following return of the annual report for 1892, which is quite corroborative of the figures in previous returns:—

Admissions and Death-rates per Mille from Enteric Fever among the European Troops, Native Troops, and Gaols of India compared.

	1882-91.		1892.	
	Admissions.	Deaths.	Admissions.	Deaths.
European troops	14·7	4·13	22·1	5·52
Native troops	0·3	0·09	0·4	0·13
Gaol population	0·2	0·10	0·3	0·15

Among the native troops the mortality from the fever is also, as we see, relatively very small, and it is noteworthy that the cases which do arise seem to occur mainly in the Goorkha regiments, the military

and dominant race of Nepaul, who feed very much like Europeans, drink alcoholic beverages, and eat meat. The Hindoo, being a vegetarian, eschews animal food, and the Mahomedan substitutes opium for alcohol. British officers seem to suffer in about equal proportion with the men of their regiments, but the women and children, who drink more water and milk than the men, but are much less exposed, apparently suffer less. Assuming that the Eberth-Gaffky bacillus is veritably and indeed the cause of enteric fever, the question of the causation of this fever is narrowed to a consideration of the life-history and development of this micro-organism, and of the way in which it effects an entrance into the body of its victims. Further, fuller, and more precise information is required before a practical application can be made of our advances in bacteriological knowledge in this respect.

3. CHOLERA.

Since Koch's comma bacillus seems to have been universally accepted as pathognomonic—or shall we say pathogenic—of Asiatic cholera, by reason of its being found in the evacuations during life and after death in the intestinal canal of cholera patients, the

various hypotheses of the origin and pathology entertained in former times have had to be modified, if not altogether abandoned. Virchow adds his great authority in support of Koch's views by stating that "the cause of cholera is a specific bacterium passing from patient to patient by means of fluids, especially drinking water, and, swallowed with food or drink, being multiplied in the alimentary canal, gives rise to cholera."¹ Whilst accepting for the present the views thus enunciated, it must be confessed that many difficulties still arise. Assuming the comma bacillus of Koch to be the pathogenic cause of cholera, and rejecting all other hypotheses as useless, including even the generalizations of Bryden, by means of which the course of an epidemic in India has been frequently forecast with tolerable certainty, there still remains much that we do not understand. Looking, for example, at the most recent Indian epidemic, it is stated² that the disease broke out with great violence within the endemic area—that is, in the district of Purniah—in March, 1891. The great annual fair of Hardwar was held the next year, cholera making its first appearance among the pilgrims there in March, 1892; they are supposed to have carried the disease

¹ Davidson: Hygiene and Diseases of Warm Climates, p. 400.

² *Op. cit.* p. 386.

as they went into the Punjab, whence it spread to Kashmir and Kabul. In May—that is, a month or six weeks later—cholera reached Persia and Samarkand, and in June it spread death and desolation in several towns on the Caspian Sea. Astrakhan was visited by it, and the authorities publicly certified its presence there on June 18th. It spread over localities on the banks of the Volga. Before July 6th cholera had reached Saratov and Kostroma, some 700 miles up the river, in the centre of European Russia, and in the south it appeared at Shusta and Tiflis. In the month of August the epidemic had already ravaged the north of Europe, and by September 3rd it had reached New York. In this steady progress there seems to have been no interruption, no stoppage, on the route of the epidemic. The year before, we are told, it remained within the limits of the endemic area. On this occasion—that is, in 1892—the fatal bacilli appear to have been carried with a surprising rapidity. I am, of course, aware of the fact that the comma bacillus multiplies with great rapidity, and that cholera spreads frequently along the course of streams and rivers, and it is conceivable that infection of a stream by even one individual may give rise to wholesale poisoning of the riparian population along its course. But the epidemic is not restricted to

the vicinity of rivers. Attacks of cholera occur in numerous villages at a distance which do not use river water at all. How did these wells and separate and independent sources of water-supply get their comma baccilli? And when the disease attributable to the presence of these micro-organisms in the well-water ceases, what becomes of the enormous crop of these microbes, or why does the bacillus so suddenly lose its pathogenetic properties to become innocuous? Other accounts have been published regarding the Kumbh Mela of Hardwar, stating that "the cholera which reached Europe in 1892 was disseminated from Hardwar in 1891," but the Sanitary Commissioner states that but a few doubtful cases occurred that year among the Hardwar pilgrims, and they dispersed free from the disease, which had, however, ravaged Lower Bengal and spread in the North-Western Provinces, in Oudh, in Madras, and in Bombay prior to the Kumbh Mela. About 70,000 persons assembled for the bathing festival of 1892. Cholera appeared on March 22nd and followed, it is alleged, the track of the pilgrims, especially into Dehra Dún, but epidemic cholera was already there at the end of 1891 and in many parts of the province prior to the date of the Hardwar Fair. "Cases of cholera occurred," continues the Sanitary Commissioner, "to the west of the Punjab and prob-

ably in Afghanistan before the outbreak of the disease at Hardwar."

Another important point worthy of notice is the fact, which all those who have had any experience among the troops in barracks or prisoners in gaol have had opportunities of witnessing—namely, the beneficial effect which follows upon the emptying of barracks or gaols or changing the camping ground of the troops. This seems to indicate the influence of place and environment rather than persons in localising the cholera cause. No cordon, no special means of isolation, is established round the camp, yet the disease not only did not spread from the supposed point of infection, but, on the contrary, in most cases it ceased almost immediately. How did the bacilli lose their infecting power so suddenly? And how are we to account for so-called sporadic cases, such as one case only in a barrack-room occupied by many soldiers living exactly alike? The discovery of the comma bacillus is an important feature in the history of cholera, and as its position now stands this bacillus is authoritatively regarded as the exclusive cause of that disease, the microbe being communicated from man to man, and especially through the agency of water; but it is also acknowledged that an incubation period, sometimes of several days, is necessary to produce the characteristic symptoms. Such being the case, it seems

pertinent to ask, How did the infection in 1892, for example, spread with such rapidity among such enormous numbers? And, again, why was the direction of the epidemic uniformly from east to west, commencing in the Punjab, across Persia, Turkey, Russia, and Northern Europe, to America? The question necessarily arises as to whether the new agency is adequate or not to account for all the phenomena of cholera epidemics, on the exigencies of the bacillary theory? Sporadic cases and cases occurring in the endemic area may be isolated in the hope that the spread of infection will be prevented, but how is the rapid spread of the disease to be explained if the comma bacillus *alone* is the true cause of the disease and has to find its way into the alimentary canal of the patient to give rise to cholera in him and, by multiplication in his body, afterwards to others? The rate at which the epidemic travels and the definite course which it assumes have to be accounted for, whatever agency be adopted. How far Haffkine's experiments, now progressing, may modify our views it is as yet impossible to surmise, nor is it easy to explain the almost endemic and persistent prevalence of cholera near Paris in 1892 and its non-extension to England, with every facility for its spread in that direction by sea traffic. As a counterpart to Koch's views and deductions we cannot overlook the fact,

moreover, that many observers, such as Rumpf in Hamburg, Lesage and Macaigne of the Institut Pasteur, Metchnikoff, Lubersch, and others, have proved that true Asiatic cholera occurs *without* the comma bacillus,¹ and the negative experiments of Pettenkofer, Emmerich, Stricker of Vienna, Hasterlick, and Klein lead to the conviction that cultivations of comma bacillus may be toxic, but there is still no positive evidence that they produce cholera.

The important subject of parasites, not merely in connexion with intestinal affections and diseases of the skin, but with reference to periodic fevers and the *filariæ sanguinis*, has obtained much light from the successful investigations of Dr. Patrick Manson.

The study of hygiene and demography of tropical and sub-tropical countries has shown the way to a practical solution of many hitherto obscure problems. The excessive heat and snowclad mountains, drought and deluge; the sub-Himalayan belt of jungly and marshy region, the Terai, abounding in deadly malaria; above it, on a higher elevation, the most salubrious mountain air: all these diversities of soil and climate offer numerous points of supreme interest for study and investigation in matters of hygiene and pathology. The result of microscopic discoveries, the

¹ Dr. Wall: "Asiatic Cholera," page 142.

knowledge of the nature of micro-organisms, bacilli, and the various micro-parasites, have already placed diagnosis and treatment in a more satisfactory position than they were formerly, and what still remains obscure and unknown may hereafter be brought to light through the labour of investigators springing up in the midst of every civilised nation of the world.

