RETROSPECT OF THE SUCCESSIVE EPIDEMICS OF CHOLERA IN EUROPE AND AMERICA, FROM 1830 TO 1890.

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Now that the cholera, which during the last three years has been slowly but steadily advancing westwards from its Indian home, has apparently halted for the present on the very threshold of Europe, it may be interesting and instructive to take a retrospective view of the course of previous waves, and to formulate our conceptions of the factors determining the prevalence and progress of the disease.

I shall not attempt to combat the opinion entertained by men of whose ability I have the highest opinion, but who would themselves frankly admit their unacquaintance with bacteriological work or literature, viz., that cholera is conveyed not by human intercourse but by telluric, meteorological, or other hypothetical agencies or occult influences, unknown, and indeed unknowable.

Nor is it necessary to refute the notion prevalent among the populace of the countries bordering on the Mediterranean that cholera is contagious in the same sense as small-pox or scarlatina, a notion which underlies the practice of quarantine in those regions. I shall assume that is recognised by scientific and competent observers in this country as well as in India, Germany, and America, and by the most thoughtful and independent minds in France and Italy, that its communicability is closely analogous to that of enteric fever; that is, that the virus is a specific microbe present in the evacuations, at any rate in the early stage of the disease, distinguishable by cultivation from some others which in form appear identical with it; that the virulence of the contagion increases for some days after its discharge from the body; that it gains access to other human organisms, solely or almost exclusively by ingestion, and that mere contact with or proximity to infected persons is practically free from danger, though specifically soiled clothes, bedding, etc., may

act as fomites, retaining the poison under certain circumstances in an active state for long periods; that under very unfavourable sanitary conditions of overcrowding amid soiled and infected surroundings, it may enter by the respiratory passages, but that the most frequent modes of infection are "eating with unwashen hands", or drinking water fouled by the excreta of previous cases.

It is thus carried, not by merchandise, but by the persons and clothing of the crowds attending fairs and pilgrimages, caravans, pilgrim, emigrant, and troop ships, if one or more be infected prior to their departure, and it is developed in an epidemic form in any place where the local conditions are such as to admit of the contamination with choleraic evacuations of the soil and water, whether of rivers, reservoirs, or wells.

General insanitary conditions may favour its propagation, but water plays by far the most important part; thus, otherwise insanitary towns, as Rome and Seville, provided with water from sources beyond reach of contamination, have enjoyed an almost complete immunity from cholera, though enteric fever and diphtheria are always present; while, on the other hand, an infected public water-supply may set up a local epidemic where the general sanitary conditions leave little or nothing to be desired, and in this consists one of the dangers incident to the use of rivers as sources of water-supply.

Lastly, while in a few regions of the globe, notably lower Bengal, cholera is never absent, the microbes existing and perpetuating themselves in the soil; there are others, as the remaining provinces of India, where they remain dormant in the soil, ready to break forth into activity at various intervals, depending on seasonal conditions or aggregations of even healthy human beings on previously infected sites; and still others, as in Europe and America generally, where it does not appear capable of maintaining itself for more than a few months, or a year or two at the outside.

Spain, with its subtropical climate, is, I believe, gradually bringing itself under the second of these divisions; and I am convinced that the recent epidemic was a recrudescence or revival of that of four years ago, unconnected with and entirely independent of the "contingent" that is still hovering on the confines of the Red Sea, the Levant, and the Euxine.

The incubation period has been variously estimated at from a few hours to several weeks; the latter assumption is absurd, and the alleged instances are to be explained by

"deferred infection", conveyance of fomites, or by errors of observation. It usually ranges between twenty-four and forty-eight hours, but may be shorter and is rarely longer; indeed, for purposes of quarantine, four days is the utmost reasonable period; six would constitute an extreme limit, allowing for the not infrequent prolongation of the ill-defined and by no means characteristic symptoms of the initial stage, consequent on the feebleness of the infection or the great power of resistance possessed by the individual.

The dependence of cholera on human agencies for its transport is clearly shown by the uniformity with which successive epidemics have followed the regular routes of trade or of pilgrimage, in Persia, Transcaucasia, the Euphrates Valley, Arabia, and Syria, while the rapidity of its march everywhere corresponds to the facilities for travel and intercourse. Where men march on foot in caravans it is slow, where railways exist it advances by leaps and bounds, and where there is much coasting trade, or free communication between neighbouring towns, it diffuses itself in every direction. Dr. De Renzy, writing in 1872, said: "Epidemics of cholera are becoming more and more frequent in the upper provinces of India; and from thence are easily carried over into Persia. The winds are the same, but travel has much increased. Calcutta and Lahore, only twenty years ago, were five months' journey apart, now only five days. Tens of thousands of Hindoo villagers now travel where few did before."

Australia alone, of all the quarters of the globe, has to this day enjoyed exemption from visitations of cholera, its communication with the rest of the world being conducted solely by large and well-appointed vessels, and being mainly with Great Britain, where epidemics have been few and far between. The intercourse with China is under strict supervision; but should an immigration of Indian coolies, comparable to the stream of emigration from Europe to America, ever set in, I am convinced that Australia would soon cease to maintain its unique immunity.

On the conveyance of cholera from Hindostan to Persia, Lieut.-General Sir Alex. Burnes wrote twenty years ago: "The most extensive arrangements have long been made to convey pilgrims and merchandise, and with them cholera, to and from North-West India and Persia. The Lohanee Afghans are a migratory, commercial, and pastoral people, who proceed annually from the borders of Persia down into Hindostan in order to purchase merchandise. At the end of October, as winter approaches, they leave Khorassan in

Persia and descend into India, where they remain until after the great fair at Hurdwar. They commence their return towards the end of April, and all reach Cabul and Kandahar by the middle of June, in time to dispatch their investments to Herat and Bokhara, and then pass on into Khorassan in Persia, where they remain during the summer. They march in three great divisions with 24,000, 19,000, and 7,000 camels respectively."

Due west of Cabul and Herat lies Meschid, the Holy City of Northern Persia. For eight months in each year all the roads to and from Meschid are thronged with pilgrims, some sixty thousand of whom on an average come from India and Afghanistan, and as many from Anatolia, Transcaucasia, and the countries east of the Caspian Sea.

Then there are two other shrines, Mesched Ali and Mesched Hussein in the valley of the Euphrates, which, though somewhat less holy, are in high favour with the Mussulmans of India on account of the greater facilities afforded by the sea passage, the discomforts of which they endure in order to save the time which the tedious pilgrimage through Afghanistan involves. Bad, however, as the accommodation that they can obtain in exchange for a few hard-earned rupees on board the vessels on which they embark at Bombay or Kurrachee may be, it is luxurious in comparison with that of the river-boats to which they are transferred at Bussorah, near the head of the Persian Gulf. Old and young, poor, ill-fed and ill-clothed, already suffering from sea-sickness and exposure, and some probably carrying with them the infection of cholera, dysentery, or enteric fever, are crowded together like sheep in a pen, with no provision for decency or shelter from the burning sun or rain. Many die on the passage, but the dead continue their journey along with the living, the miserable fanatics believing that the salvation of the souls of their friends is equally secured whether they reach the holy place alive or in a state of advanced putrefaction, there to receive a hasty interment.

Lastly, there is the holiest shrine of all, that of Mecca, where the Prophet himself lies buried. To it pilgrims flock from every part of the lands of Islam, from Bengal to Morocco, from Zanzibar to Astrakhan and Khiva, by sea and by land. The Anglo-Indian, Anglo-Egyptian, French and Russian, perhaps even the Turkish Governments, may exert some control over the shipping, but enormous numbers of pilgrims come overland from all parts of Arabia and Syria, the Euphrates Valley and Persia, the well-to-do on camels, the poor on foot. Camped around Mecca, with scanty and

unwholesome food, no shelter from sun or rain, and no precautions to prevent the whole soil from being saturated with the excreta of man and beast, they die by thousands, where only hundreds are officially reported, and the corpses, scarcely covered by the sand, are soon exposed by the wind or rain, and by dogs or birds of prey.

From a comparison of successive epidemics Dr. J. C. Peters has described several distinct and well-marked routes followed by cholera on each occasion. Two, the Central Asiatic and the North Persian routes, start from Cabul; the former proceeding by way of Balkh, Bokhara, Khiva, and Orenburg to Russia; the latter by Herat and Mesched, to Astrabad and Teheran. From Astrabad and from Teheran *viâ* Reshd it is carried across the Caspian to Baku and Astrakhan; while another route from Teheran proceeds overland to Tabreez, where it diverges towards Tiflis to enter Russia, and to Erzroom and Trebizond, to be carried along the shores of the Black Sea in every direction.

The Persian Gulf route, which is followed by almost every epidemic, after touching at various ports on either side of the Gulf, gives off a branch at Bushire, which, passing north-eastwards *viâ* Shiraz and Ispahan to Teheran, follows the route already described as the North Persian; while the main body proceeds up the valley of the Euphrates and Tigris by Bussorah and Baghdad to Diarbekir, and in a north-westerly course to Aleppo, which, though not a seaport, is in close communication with Iskanderoon, Alexandretta, and Latakia.

The Red Sea route, which had not been followed previously to 1865, has ever since attracted the chief attention of the Governments of Europe, with the exception, perhaps, of Russia, on account of the enormous extension of communication with the East consequent on the opening of the Suez Canal, with the increased facilities afforded thereby for the Mussulmans of Northern Africa and European Turkey to resort to Mecca. Alexandria is in constant intercourse with the seaports of Spain, France, Italy, Greece, Turkey, the Danubian States, and Russia, even Marseilles and Odessa being within a few days by steam, while these ports, with Trieste and Constantinople and Smyrna, are again centres of diffusion.

Cholera, which had for two or three centuries been described by Portuguese, Dutch, and French physicians in India, and had from time to time decimated our armies since 1808, first extended itself beyond the limits of Hindostan in 1821, when it ravaged Persia and Arabia, and,

travelling along the shores of the Caspian, reached Astrakhan in 1823. It then subsided, and did not reappear in these lands until three or four years later.

In 1827-8 it again invaded Persia and the trans-Caspian countries, reaching Astrakhan, Orenburg and Perm in the autumn of 1829, and in the course of the following year Tcherkask, Nijni Novgorod, Saratov, Moscow, and most of the great centres of population in the Eastern governments. In 1831 it burst out with fearful intensity, invading the western provinces from Petersburg to Odessa. At this time the Polish revolution broke out, and the massing of troops from infected districts, together with the sufferings inseparable from so desperate and relentless a struggle, developed the disease with appalling virulence. Every effort was made to keep it back from the German frontier, but without avail; and it soon extended over the whole of Germany, Austria, and Western Europe, advancing with such rapidity that its appearances in the most distant places seemed almost simultaneous.

The first cases in England occurred in July and August 1831 on board of some vessels in the Medway, where numerous sail had arrived from Riga during the preceding weeks. In October it broke out at Sunderland and Gateshead among the discharged crews of vessels engaged in the Baltic trade and persons associating with them. It speedily spread to Newcastle and Edinburgh, thence to Glasgow by the canal, and onward to Belfast, Dublin, and Cork, reaching London in February 1832.

Between April 28 and June 3 four vessels, carrying 370 emigrants from Limerick, Cork, and Dublin, arrived at Grosse Isle in the St. Lawrence, after having lost on the voyage no fewer than fifty-nine passengers from cholera. During these three months 30,000 emigrants arrived in Canada, of whom over 7,000 passed through Quebec between the 3rd and 5th of June. These carried the disease in every direction, up the river and lakes as far as Michigan, from Montreal and Ontario to New York, from Erie to Ohio, Kentucky, Pennsylvania, and Tennessee, and from Chicago to the valley of the Missouri and Upper Mississippi. The United States troops, at that time engaged in a desultory warfare with the Indians to the west of these rivers, suffered severely, having contracted the disease from using infected boats.

In 1833, New York was invaded direct from Europe, and became a centre for the diffusion of cholera through the adjacent States, and as far south as Charlestown, while the

disease, which had been raging in Cuba, Vera Cruz, and the Mexican shores, was imported into New Orleans, whence it spread along the southern coast to Alabama and Florida, and up the valley of the Mississippi as it had previously travelled down it. In 1834, cholera again entered the States from Canada, and lingered there till the end of 1835, when it finally died out.

Meanwhile, in India, cholera, though never absent, had been subject to very marked fluctuations. Between 1836 and 1839 it had spread over Afghanistan, Persia, and Arabia, almost reaching the Mediterranean; but retiring again beyond the Indus. In 1840-2 it raged in China, spreading during 1843-5 over Balkh, Bokhara, and Samarkand, and in the following year reinvaded the north-west provinces of India from without, thus reversing its usual course. In 1845 it prevailed in Afghanistan and Central Asia, and in 1846 it burst out among the pilgrims at Mesched, rapidly extending over the whole of Persia; from Tabreez it spread northwards to Baku and the western shores of the Caspian, and from Baghdad southwards to Bushire, whence it was carried by pilgrims to Mecca.

In 1847 it reappeared at Derbent in April, and at Astrakhan in July. From Tabreez it reached Tiflis, spreading thence to Gori and Poti on the Black Sea. From Teheran it was carried by the caravan route to Erzeroum and Trebizond, which it reached in September. A large Russian army was at this time concentrated in the Caucasus, and a great military road was in course of construction between Tiflis and Moscow, through Stavropol, Taganrog, Voronetz, and Toula, all which places were involved in succession. From Astrakhan it followed the course of the Volga, the most important highway of commerce in Russia, attacking every town from Saratov to Kazan, turning south-eastwards to Orenburg and westwards to Nijni Novgorod, where the great fair served to propagate and diffuse it, as does that of Hurdwar in India.

Meanwhile, the cholera was carried from Trebizond to Constantinople and Odessa; and from Constantinople to Smyrna and the seaports of Syria. From Odessa it ascended the Dnieper into Poland, while from both Odessa and Constantinople it was conveyed up the Danube to Roumania, Bulgaria, and Hungary. Here, as in Poland, in 1831, war was raging, though on a still larger scale, and the aggregation of some 800,000 Austrian, Hungarian, and Russian troops fomented the epidemic, which their subsequent dispersion carried throughout Italy and Germany, though it did not reach Paris until March 1849. Early in October 1848

it was carried from Hamburg to London, and a week or two later to Hull and Sunderland, while Edinburgh received it direct from Russia. By the end of 1849 scarcely a town in Great Britain and Ireland had escaped, and the same might be said of every country in Europe, except Denmark, where a most rigid quarantine was maintained. In Paris, 33,000 cases occurred in the three months of April to June; and in London, during August, the deaths numbered 1,200 weekly.

The institution of a house-to-house visitation in London, and the larger towns of England and Scotland, was not only successful in arresting the progress of the plague, but threw a flood of new light on its etiology and mode of propagation. That it was transportable was but too plain to be gainsaid, though the theory of its being contagious, in the usual meaning of the word, was no longer tenable, and was abandoned by the physicians of England and Germany. The belief that the poison was contained in the evacuations, and that it was propagated by the contamination therewith of water, clothing, bedding, or food, advocated by Sir J. Simpson and Sir R. Christison of Edinburgh, Dr. Kirk of Greenock, Dr. Parkes of London, Prof. Von Gietl of Munich, and W. Wagner of Berlin, began to gain adherents on all sides; while the connection between it and the premonitory diarrhœa was recognised by many who, as yet, hesitated at accepting this explanation of its causation and spread.

The relation between cholera and insanitary surroundings was ably shown by Dr. Southwood Smith and Sir Edwin Chadwick in the Report of the Royal Commissioners, which revealed a state of things existing in the metropolis which in the present day would appear incredible. The whole of Lambeth and Bermondsey was intersected by "open ditches of the most horrible description". St. Olave's and St. Thomas's were "a disgrace to the civilised world". In Whitechapel "there was neither sewerage, drainage, cleansing, nor a good supply of water". "The characteristics of the streets of Hackney were overflowing cesspools and privies, cowyards and piggeries, with a loathsome ditch." The state of Battersea, Plumstead, and other low-lying districts was dreadful; and even in parts of Kensington, Shepherd's Bush, and Hampstead, things were little better.

The circumstances attending the introduction of cholera into the States in this year possess, both from an etiological and prophylactic standpoint, an interest which cannot be overestimated. Two ships, the *Swanton* and the *New York*, left Havre on Oct. 31 and Nov. 9 respectively, with German emigrants, the former bound for New Orleans and the latter

for New York. Havre was at the time free from the disease, and the vessels consequently received clean bills of health; but many of the passengers had come from infected districts in Germany, Hungary, and Poland. Cholera broke out on board the *New York* on November 25th, when she had been sixteen days at sea, and on the *Swanton* on Nov. 26th, or twenty-seven days after her leaving Europe. One was in latitude 42°, the other in 25° 47′, or a thousand miles apart. It is absurd to suggest that the disease had been contracted in Europe, for even if one should admit the possibility of an incubation period of over sixteen days, no one has yet imagined that it could be prolonged beyond a month; while, considering that there was no cholera on the American continent, and that a strong south-east wind was blowing for some time before the outbreak, it is hard to speak with courtesy of those (and there are some) who pretend that the infection was conveyed aerially! This wind was extraordinarily hot, but preceded, in the case of the *New York*, by a cold, chilly wind, during which there was, in the words of the captain, "a general overhauling of baggage for warm clothing." One passenger was known to have in his trunk clothing that had belonged to a man who had died of cholera in Germany. The obvious and only rational explanation is that the infection was contained, and retained its vitality, in the closely-packed and unventilated baggage, the opening of which was brought about by the sudden and extreme changes of temperature. The *New York* arrived at the city of the same name on Dec. 1st, and the *Swanton* at New Orleans on Dec. 11th; each vessel having in the interval lost several passengers from cholera. The disease in each case was carried by the new-comers in different directions; at New York it subsided during the severe cold of January, but at New Orleans the deaths rose steadily from 400 in December, and 600 in January, to 2,500 in June 1849. During December other vessels arrived from Germany at New Orleans and other ports with cholera on board, thus keeping up a succession of imports of infected persons and things, while the dispersion of the immigrants, the flight of terror-stricken citizens, and the ordinary coasting and internal trade carried the pestilence to places as remote as Cuba, Sacramento, and San Francisco. It died out, however, before the commencement of the year 1850.

The widespread epidemic of 1854, which extended to Great Britain and the United States, and is commonly reckoned by the medical historians of these countries as a separate visitation, was, as a matter of fact, not the consequence of any

fresh invasion from the East, but merely a resuscitation or exacerbation of the previous epidemic, which had never entirely died out on the continent of Europe, summer or winter, from 1847 to 1859, reinforced by occasional importations from Asia *vid* both Russia and Egypt. In 1850 it had almost died out, though it lingered along the Polish frontiers of Germany and Austria, especially in Bohemia, but it broke out in 1851 in Berlin and Vienna, Trieste and Malta, Pesth, Marseilles, and Northern Italy, though the rest of Germany, Holland, and France remained free. It persisted in Russia and Poland, and had raged at Mecca and Cairo. In 1852 it was confined to Russia and Eastern Prussia, but in 1853 it spread westwards over the entire continent, scarcely abating even in the depth of winter. England was invaded late in the autumn by arrivals from Hamburg and the Baltic ports; London, Liverpool, Manchester, and Edinburgh suffering most severely. Twenty-eight infected vessels left England, Holland, France, and Germany for America, with, together, 1,141 deaths on board during their passage. It continued to rage in Persia, and in 1854-5 it decimated the population of every town in Europe and the allied armies in the Crimea; while Denmark, Switzerland, and Greece, which had hitherto, thanks to strict quarantine regulations, been exempt, were attacked for the first time—an immunity totally inconsistent with any hypothesis of the transportation of the disease by winds or "epidemic waves". In the case of Greece its introduction was evidently by means of the troopships of the allies. It is nearly certain that in America and on the continent of Europe cholera continued to linger, especially in New Orleans and the Mississippi Valley, from 1849 to this time, while infected arrivals from Europe set up small local epidemics at different places in Canada and the States in every intervening year. But, as I have already mentioned, the great importation which may be looked on as the starting-point of the general epidemic took place in November 1853. The first persons attacked were the emigrants landed from ships on which cases had already occurred; but though they disembarked at New York, they did not manifest the disease until their arrival a few days later at Detroit and Chicago, when, as Dr. Alonzo Clark observes, they first unpacked their infected luggage. During the early months of 1854, similarly cholera-smitten vessels continued to arrive, and the railways and river-boats conveyed, first, infected immigrants, and afterwards infected citizens, to the remotest cities and States, while from New Orleans the disease was exported to the West Indies and Mexico, Jamaica and Cuba suffering most severely.

For ten years, however, both Europe and America enjoyed repose, and the next visitation is remarkable as marking a new epoch in the history of cholera, viz., its introduction by way of the Red Sea, wholly or in great part. I am far from asserting that such importations had not occurred from time to time, for it is in the highest degree improbable that with the awful outbursts of cholera at Mecca and with the annual fairs or festivals at Tantah, in Egypt, where from half-a-million to a million persons of both sexes mix in horrible orgies at the tomb of Said el Bedoui, and whence the cholera had several times spread over the whole of northern Africa, it was not carried to Europe; but prior to the inauguration of the liberal policy of the late Ibrahim Pasha, the opening of the Egyptian railways, and above all of the Suez Canal, the intercourse between Egypt and the countries of Europe was utterly insignificant compared with what it is now, while the the canal has brought the privilege of a visit to Mecca within reach of every Moslem in the countries bordering on the Mediterranean and Black Seas. If we except a few isolated cases at Malta, cholera had been unknown in Europe since 1855, at any rate west of Russia, until on June 11, 1865, it was brought to Marseilles by some pilgrims returning to Algiers. In this town the deaths rose from sixteen in June to 768 in December. From Marseilles it was carried to Paris and Havre, to Naples, Valencia, and Barcelona, while other vessels from Alexandria conveyed it to Ancona, Smyrna, Jaffa, Beyrout, and to Constantinople, which, constituting a second centre, communicated it to Varna, Galatz, Trebizond, and Odessa, from which last port it penetrated into Russia. From Galatz it passed up the Danube, invading Roumania, Bulgaria, and Hungary, and by the end of the year the whole of Europe was again involved. In England, however, beyond a few cases at Southampton, it did not appear until May 1866, when it broke out among some German emigrants *en route* to America; and in June in London, where the earliest cases were those of recent arrivals from Hamburg and the Baltic. No sooner, however, had it obtained a footing than the weekly mortality rose from sixteen in the last week of June to 1,053 in the first of August, when, thanks to an energetic house-to-house visitation and sanitary measures, it as rapidly declined. The total deaths reported in London from June to December were 5,548, of which half occurred in the second month of its progress. Elsewhere the mortality was comparatively light, and the smaller towns and rural

districts escaped entirely. The connection between cholera and the water-supply, first recognised in 1854, received in this epidemic conclusive demonstration, and the British Isles have ever since enjoyed absolute immunity.

In November 1865, cholera was introduced into Guadalope from Marseilles, and the *Atalanta* arrived in New York from Havre with cholera on board, but the consequences were averted by quarantining the ship.

On March 28th, 1866, the *England* left Liverpool for Halifax with eighteen saloon passengers, 1,185 Irish and German emigrants, and a crew of 120. Four days later, one death from cholera occurred, but the weather being rough, tho hatches over the steerage were battened down. The consequence of this cruel procedure was that, on her arrival six days after, forty-six of the emigrants had already died, and though the sick were then transferred to a hospital ship and the healthy placed in tents, the subsequent deaths raised the total to 267. None of the saloon passengers or crew were attacked, although they remained on board the *England*. The *Virginia* and the *Peruvian*, also from Liverpool, lost respectively 116 and 115 passengers from cholera. The whole number of vessels arriving in New York with cholera on board between April and November 1866, was eighteen, carrying 8,491 persons, of whom 872 died of cholera before or soon after landing. No accurate information was obtainable from other ports, but it is certain that the epidemic was propagated from the various points of arrival and from those in the interior at which emigrants assembled before proceeding to their ultimate destinations; while the unsettled state of the country at the close of a long war, with the massing and movements of large bodies of troops, presented the most favourable conditions for the dissemination of the disease.

While the last epidemic was expiring in Europe another invasion was looming from the Far East. From 1867 to 1869 cholera raged in North-West India, a terrific explosion having followed the great fair at Hurdwar in the first of these years, and extended as far as Teheran. In 1868 it was revived by the pilgrimage to Great Mesched, and before the close of the year had reached Astrabad and Reshd on the Caspian. In 1869, Persian traders brought it into Russia as far as Nijni Novgorod, and in 1870 it was introduced simultaneously by the North Persian route *viâ* Tiflis and Poti to Taganrog, Kertch, Rostoff, and Odessa. A fresh outbreak occurred at Nijni Novgorod during the fair in September 1870, where 200,000 traders were assembled from Persia, Central Asia, and all parts of Russia, the latter

carrying it to their homes throughout the empire. From Odessa it spread also to Kief, Moscow, and St. Petersburg, Warsaw, Dantzig and Königsberg, and westwards through Roumania and Hungary to Austria and Bohemia, and from Hungary to Northern Italy, while steamships from Genoa carried it to Brazil and Rio. Constantinople escaped owing to rigid quarantine until 1871, but it was then carried from that city to Alexandria. Its westward progress had been checked by the suspension of intercourse between Germany and France during the war, but at its close, France, Spain, and Portugal, in fact, every country in Europe, was involved. Cholera ships from the Baltic and North Sea ports, from Havre, the Mediterranean, and Constantinople, arrived in London, Hull, Cardiff, and other English ports, but the judicious measures adopted by the British Government were in every instance successful in averting the danger.

In like manner the arrival of cholera-smitten vessels at Halifax, New York, New Orleans, etc., during 1872 was followed by no results; but in 1873 these precautions broke down, and cholera extended over the whole length and breadth of the land. It would appear that in the majority of cases it was not by means of persons actually suffering from the disease, or by ships on which cases fatal or otherwise had occurred during the voyage, but by means of infected clothing, that the importations took place—a danger which it was almost impossible to avert. Thus, to quote from the report of the supervising surgeon of the Mercantile Marine, Dr. Woodworth: "In 1873 three distinct outbreaks of the disease occurred at widely remote points in the United States, from poison packed and transported in the effects of emigrants from Holland, Sweden, and Russia. These people, and the vessels in which they were carried, had been perfectly healthy, and the people remained so until their goods were unpacked at Carthage, Ohio; at Crow River, Minn.; and at Yankton, Dak., respectively. Within twenty-four hours after the poison particles were liberated the first cases of the disease appeared, and the unfortunates were almost literally swept off the face of the earth." These instances, which might be multiplied, sufficiently demonstrate the almost insuperable difficulties incident to the circumstances of a country like America, and which do not present themselves in England, where emigrants from infected continental States merely call *en route* without unpacking their baggage. But in one way or another foci of infection were set up in countless centres, whence the disease was propagated in all directions, though the efforts at their suppression

by stamping out each local outbreak were so far successful that the epidemic did not maintain its hold on the population, or even linger beyond the end of the year in which it began.

In Europe it smouldered in various places, breaking out from time to time until the latter part of 1874, when it seemed to have completely exhausted itself. In 1881 cholera was unusually severe at Mecca, and again in 1883, when it assumed an epidemic form in Egypt, without, however, extending further.

It was in June 1884 that the first cases in Europe appeared at Marseilles, or more probably at Toulon, the infection having been introduced by troopships from Saigon, where it had long raged. From Marseilles it was carried to most parts of France, though the mortality was heaviest in the south. In three months over 5,000 deaths had been reported, half at least from Marseilles itself. Thence it spread to Italy and Spain, and in a less degree to Algeria. The first cases in Italy were at Spezzia, but soon almost every town in the country was attacked, and the people were panic-stricken. At Naples the mortality was appalling, as also at Palermo. Rome alone escaped, having the advantage of an unimpeachable water-supply from the ancient aqueducts. The deaths throughout Italy up to November, when the epidemic was practically extinct, were estimated at between 11,000 and 12,000.

In Spain it appeared first, and was, as usual, most severe in the province of Valencia and Murcia. In Madrid the deaths were 1,366, or not more than occurred in a couple of days in 1865, before the introduction of a pure water-supply. Seville, with water laid on by a British company, would have escaped as completely as Rome, had not the people in the suburb of Triana used the river water for some time; and in Toledo the disease subsided so soon as the Governor compelled the inhabitants to resort to springs outside of the town, placing armed sentries along the river banks. On the other hand, at Granada, one in eight of the population died, and in Saragossa the mortality was not much less.

In Germany, where in all previous epidemics the mortality had been very high, only a few isolated cases were, as in England, observed among persons arriving from France or Italy, owing evidently to the great improvement in the sanitary conditions of the towns, and especially to the general introduction of public supplies of pure water.

In 1885, cholera lingered in its old haunts in France and Italy, but the only serious outbreak was in Spain, where it reappeared at Jativa, in the province of Valencia, and spread

to other towns in the eastern provinces; and the same may be said of the following year, though there may be some doubt as to many of the alleged cases elsewhere.

Europe had remained wholly free from cholera until early in the summer of the year 1890. While all eyes were directed to the slow but steady onward progress of the disease in Persia and the valley of the Euphrates, it suddenly and unexpectedly appeared in the province of Valencia. Mecca had not as yet been reached, Egypt was free from suspicion; in short, the circumstances of the outbreak, which originated in a small inland town, precluded all notion of its having been imported from abroad, though its true character admitted of no dispute. It was ascribed—and I am disposed to believe rightly, or at least very probably—to the opening of some excavations in a site saturated with excreta since the last epidemic. Be this as it may, it is impossible to resist the conclusion of its indigenous origin. Such resuscitation of old foci is familiar enough in Indian experience, and when one reflects on the subtropical character of the climate of southern and south eastern Spain, and the pollution of the soil in and around the towns, there seems no reason to question the probability of the "naturalisation", so to say, of cholera there, as in N. W. India, Persia, or Arabia, where, though not strictly endemic, it appears to be capable of retaining its vitality in a dormant or latent condition for several years, waiting some favourable circumstances for its revival. At one time it threatened to become general, but, by the end of the year it had died out, and for the present, at any rate, the danger may be considered as past.

Meanwhile we must look eastwards, where the history of the earlier invasions seems about to be repeated. Advancing by the old routes through Northern Persia and the Euphrates Valley, it has long since reached Tabreez, Reshd, and Derbent in the north. It has hung for two years around Baghdad, and has travelled up the river as far as Diarbekir, if not to Wan, while it has more recently followed the caravan road to Aleppo. At Mecca the mortality was almost unprecedented, probably tenfold as great as reported; though Egypt almost miraculously escaped.

Tabreez is on the highroad to Tiflis and Trebizond; Reshd and Derbent are in constant communication with Astrakhan, and Aleppo with Alexandretta, Latakia, and Beyrout, in which towns, and in the surrounding districts, cholera has been present, more or less, since the autumn, the weekly mortality, even in January of the present year, having been such as in Europe would have been considered alarming;

so that we may expect with the return of another summer that the history of the former epidemics of '48 and '54 will repeat itself.

Though quarantine may have been at times successful in special circumstances, it is impracticable in Europe, whether on land or in inland seas; but the happy experience of Great Britain since 1866, of Germany since 1874, and of single towns like Rome, Seville, Lyons, and others, has shown that in pure water-supplies the only safety lies, though general sanitation enhances the probability of escape.