KOBER (Geo. M.)

The Etiology, distribution and prevention of Land and Ship Cholera —

Cutting from: Virginia M. Month, Richmond, 1893-4,
XX.

Art. III.—The Etiology, Distribution and Prevention of Land and Ship Cholera.

By GEORGE M KOBER, M. D., of Fort Bidwell, Modoc Co., California.

The home of cholera is in the delta of the Ganges and in other parts of India and the Orient. Epidemic extensions take place by sea or overland by means of persons suffering or recovering from the disease, or by means of infected articles. Cholera is generally introduced into Europe by way of Arabia, Egypt, or the coast of Asia Minor; sometimes it follows well-beaten routes of travel from Persia into Russia and the Continent. In this way, epidemics have visited Europe in 1830, 1831, 1837, 1848, 1852, 1866–67, 1871, 1873, 1884, 1885, 1886 and 1892, and from there the disease generally invades our own continent in the same or following year.

Etiology: Some physicians, among them Guerin and Cunningham, believe Asiatic cholera to be of an autochthonous origin, and that epidemics are not the result of an infectious substance excreted by the patient. They rely for their argument upon the fact that many instances have been observed which could not be connected with a pre-existing case, but we all know how difficult it is to exclude every possibility of infection.

Pettenkoffer is of the opinion that the cholera germ is of an ectogenous character, similar to the germs of malaria, which can only develop and mature into a pathogenic factor, under suitable conditions as regards heat and moisture *in the soil.* According to his doctrine, contact with the disease offers no danger; epidemic extensions on ships, through the medium of the water supply, dejecta and soiled linen, are impossible; restrictions in travel and disinfection of the cholera patients, excreta and effects, are perfectly useless, but attention to the soil which furnishes the local and *seasonal* predisposition is of the utmost importance.

In the recent cholera epidemic in Germany (1892), Munich escaped, and as commerce and travel between that city and those in which the epidemic raged was unrestricted,

Pettenkoffer refuses to believe the escape of Munich to have been due to the non-transport of the comma bacillus to that city. He attributes its exemption to the absence of certain atmospheric and local conditions, necessary to the development of the disease.

On the other hand, Prof. Koch and his adherents—which constitute by far the majority of sanitarians—maintain that the "comma bacillus" is the specific etiological factor of the disease; because, this germ is constantly found in the intestinal discharges of cholera patients, when examined in the fresh state and in the early stages of the disease, and has never been found in other diseases; moreover, inoculations of pure cultures of this bacillus into susceptible animals have produced the disease in question, and several accidental infections by experimenting physicians have been reported from Berlin. Pettenkoffer and Emmerich, in October last, with a view of showing their contempt for the cholera bacillus, actually swallowed a bouillon culture, and the former developed a choleraic diarrhœa, and Emmerich a mild attack of cholera; in both cases the watery stools contained cholera bacilli. Whilst not denying the observation of Bauer and Von Ziemssen—that the clinical picture of these attacks differed materially from Asiatic cholera—we cannot ignore the possibilities that neither subject afforded the necessary individual predisposition; that the bacilli having been cultivated on agar and in bouillon had lost a measure of its original virulence; and lastly, we certainly must admit the occurrence of very mild cases of cholera. The unbiased observer in reading the experiments referred to will naturally conclude that if the train of symptoms, accompanied by reproduced cholera bacilli in the discharges, were not characteristic of cholera, he will be at a loss to account for them in any other way. Indeed, the majority will find in them a confirmation of Koch's conditions, upon the proof of which alone can it be definitely stated that a particular micro-organism is the cause of a certain disease. They are as follows:

"1. The micro-organism must be found in the blood,

lymph, or diseased tissues of man, or animal suffering from or dead of the disease.

2. The micro-organisms must be isolated from the blood, lymph or tissues, and cultivated in suitable media outside the animal body. These pure cultivations must be carried on through successive generations of the organism.

3. A pure cultivation thus obtained must, when introduced into the body of a healthy animal, produce the disease in question.

4. In the inoculated animal the same micro-organism must again be found."

Neither Koch nor his adherents have ever claimed that the cholera bacillus is the only etiological factor in the production of an epidemic, but we do aver that it is the one factor without which no case of cholera can occur.

The testimony of all the observers in the recent epidemic in Germany shows that the disease can occur in such a mild form that no suspicion as to its nature would be aroused, were it not for the biological examination; and Dr. Biggs (*Am. Jour. Med. Sciences*, January, 1893), is quite certain that such examinations made by Dr. Prudden and himself were alone the cause of the exclusion of epidemic cholera from New York in 1887, and of the greatest importance in assisting the health department in the outbreak of 1892.

Characteristics and Biology of the Cholera Bacillus: For the purpose of microscopical examinations we should make a cover glass preparation of the intestinal mucus, dry the specimen in the air, heat it over the flame, stain with gentian, violet or fuchsine, and examine for the characteristic bacilli. (See Figs. 6 and 7). Sometimes they are sparsely present, or other micro-organisms may preponderate; in such an event, mix one part of the suspected dejecta with two of alkaline bouillon, and keep in an open glass vessel about twelve hours, at a temperature of between 65°—104° F. The common bacilli will develop colonies near the surface, and small samples prepared on slides as above directed will reveal their character.

Plate cultures should also be made. For this purpose mix a little of the flocculent mucus in a test tube with 10 per cent. lightly alkaline nutrient gelatine, which, after

thoroughly shaking, pour upon the plates. The colonies develop within 24–48 hours, at a temperature of 60° to 65° F., and are circular, with irregular edges, coarsely granular

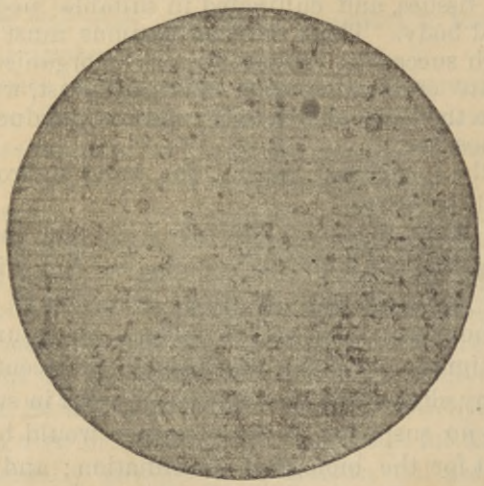

FIG. 6.

FIG. 7.

and pale. Around the colony there is a zone in which the gelatine is softened, and its surface depressed. The con-

FIG. 6. Cover-glass preparation from a culture of cholera in peptone solution, developed for twelve hours at a temperature of 36°C. (96.8°F.). Magnified 700 diameters.

FIG. 7. Contact cover-glass preparation from a plate culture developed at a low temperature. Amplification about 700 diameters.

tour and general characteristics of these plate cultures vary somewhat, depending upon the temperature under which they were developed, the size of the diaphragm, and whether examined after 24 or 48 hours' growth (see Figs. 1, 2, 3, 4).

FIG. 1.

FIG. 2.

FIG. 3.

FIG. 4

Every physician should make himself familiar with the details of a bacteriological diagnosis, so clearly described by Prof. Dunham (in the *Am. Jour. of Med. Sciences* for January, 1893).

FIG. 1. Colony of cholera bacilli on a plate culture forty hours after its preparation. Photographed with Abbé condenser and small diaphragm. The refraction of the light by the depressed surface of the softened gelatin around the colony is perceptible. Amplification about forty diameters. Culture obtained from intestinal contents of the first case.

FIG. 2. Colony of cholera bacilli on a plate culture two days old. Magnified about 75 diameters. Small diaphragm.

FIG. 3. Two colonies of cholera bacilli on a plate culture forty hours old. One of the colonies shows an extension of the liquefaction for a short distance beyond the central mass of growth. The edge of the central mass is ragged, and portions of the growth have become detached.

FIG. 4. Cholera colony on a plate culture after liquefaction of the gelatin had begun, but had not extended beyond the colony of bacilli. Photographed with a very small diaphragm. The edge of the colony shows the milled effect described in the text.

As an additional safeguard, Dunham advises that as soon as the colonies upon the plate cultures have grown enough to develop their characteristic appearance, material from them should be used to make gelatine tube-cultures. The culture medium is prepared from a cold aqueous extract of lean beef, to which one per cent. of peptone, one-half per cent. of salt, and ten per cent. of gelatine are added. The tube is inoculated and exposed at a temperature of about 70° F. After three or four days, a funnel-shaped colony or "hanging drop" preparation will be observed, with the base towards the surface of the tube. (See Fig. 5.) By means

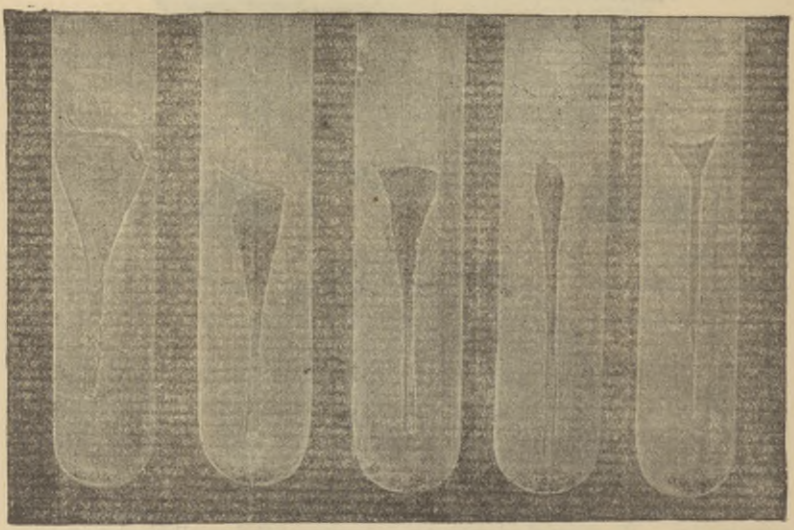

FIG. 5.

of a sterilized platinum wire, a portion of this colony is transferred into two cubic centimetres of a sterile solution of one per cent. peptone, one-half per cent. of salt in distilled water, placed in the incubator at about 96.8° F. for

FIG. 5. Gelatin tube cultures of cholera from the first case (McAvoy), one, two, three, four, and six days old. Temperature during development about 70°F. The culture medium was prepared from a cold aqueous extract of lean beef, to which 1 per cent. of peptone, ½ per cent. of salt, and 10 per cent. of gelatin had been added, according to the methods usual in the Hygienic Institute in Berlin. The reaction of the gelatin was faintly alkaline.

six hours; or, if kept at a temperature of 70° F., then at the expiration of twenty-four hours examine the form, arrangement and motility of the individual bacteria of these "hanging drops." After this, pour a few drops of concentrated strictly pure sulphuric acid down the inner surface of the tube, so that a layer of the acid is formed below the culture. Watch for the "Bujwid-Dunham Re-action," marked by a distinct rose tint, sometimes tending towards lilac. By means of these methods, it is absolutely possible to diagnose Asiatic cholera from cholera morbus, cases of arsenical poisoning, etc.

It is quite true that micro-organisms, similar in appearance to the comma bacillus have been found by Finkler, Prior, Lewis and Miller, but they are never identical, and can be readily distinguished by the plate and tube cultures.

Whilst the comma bacilli develop best in contact with oxygen, they do not cease to multiply by exclusion of the air; they develop best at a temperature between 86° to 104° F.; a temperature below + 60° F. arrests their growth, but even a temperature of — 14° F. does not destroy their vitality; they are effectually destroyed by drying (an argument against aerial transport in a dry climate); also by a temperature of 190 to 212° F. Exposure to a five per cent. solution of carbolic acid, or 1:500 solution of corrosive sublimate, also the normal gastric fluid, will kill the germs. Cholera germs may multiply in suitable soil, at a depth of ten feet; when heat and moisture are present, they do not develop spores.

Uffelman (*Berl. Klin. Wochenschrift*, 1892, No. 48,) has shown that the bacilli remained viable in water for from five to six days; in milk, for about three days; on the surface of bread exposed to the air, for about a day; between slices of bread kept more or less moist, for eight days; in butter, for three days; on cooked meat kept moist, for eight days; on apple and cauliflower, for four days; on paper, for about one-and-a-half days; on copper and silver coins, for only ten minutes, after thorough drying; on dry clothing, for four days; but on moist linen, for twelve days, or even longer.

It was shown that for two hours after walking through cholera dejecta, house flies were capable of infecting nutrient media, and that the dry skin of the hand preserved the germs alive for somewhat more than an hour after contamination. In decomposing fæces, they remain viable for one to two days; in exceptional cases, for three to fifteen days.

Pathogenic Action.—There is every reason to believe, that the pathogenic effects of the cholera bacilli consist in the production in the digestive tract of ptomaines (cadaverin and putrescin) which cause the primary lesions, and also, after absorption, other toxic effects.

The germs most likely gain admission through the digestive tract and multiply there, as evinced by the intestinal lesions, the presence of the bacilli in almost pure cultures, in the dejecta, their absence in other parts of the system, and the improbability of transmission through the air.

Mode of Infection.—Water and food are doubtless the most common media for the transmission of the germs. The histories of cholera epidemics afford abundant evidence on this point. Of course, there are instances where the evidences are far from conclusive, but nevertheless suggestive, that the water supply was the principal source of disseminating the disease. To-day, evidence is still wanting as to the source of the first case of the disease in the recent Hamburg epidemic; it is believed, however, that the germs were brought from Baku, on the Black Sea, and found their way into the city water supply. This can be readily accounted for, when it is understood that the water supply is derived from the River Elbe, that the sewage of the city is poured into this stream, and that the ebb and flow of the North Sea are perceptible at the source of the supply, virtually permitting diluted sewage to be pumped into otherwise defective reservoirs. The epidemic was limited to Hamburg, almost sparing the neighboring cities of Waldeck and Altona, exposed to the same climatic conditions, and probably also of soil, but having their own separate water supplies. (Reiche, *Am. Jour. Med. Sciences*, Feb., 1893.)

But what is more, Posner informs us that the cases of

cholera which occurred at Altona, developed in those houses in a certain street which were supplied with water from Hamburg, but passed over those houses receiving water from the Altona water supply. (*Ber. Klin. Woch.*, 1892, No. 48.) Plate cultures of the Hamburg water supply failed to demonstrate the presence of cholera bacilli. But the general facts, as well as Krapelin's studies of the fauna of the Hamburg reservoirs, showing that they furnish conditions most favorable for the existence of vegetable and animal life, indicate that the water supply was the principal factor in disseminating the germs.

According to Reiche, mild attacks of summer diarrhœa were of frequent occurrence in the weeks preceding the outbreak, and these, whether due to an impure water supply or meteorological conditions, naturally favored individual predisposition. Mitra, in describing the cholera epidemic in Kashmir in 1892, says: "The population is crowded into 25,000 low, dirty houses, built irregularly on narrow lanes and alleys, which are used as latrines. There is no drainage, and the storm-water washes the filth and ordure into the Nalla Mur, and into the river from which the drinking water is obtained."

There are striking instances on record (see Simpson, *Ind. Med. Gazette*, May, 1887,) to show that the germs have been transmitted through the milk supply, which had been diluted with water from infected sources. Articles of food, as has been shown above, may be the carriers of the germs, the result of having been handled with infected fingers, washed with infected water, or conveyed by infected insects. Nurses and laundresses frequently infect themselves by means of their fingers carelessly introduced into the mouth. The possibility of transmission of the germs by means of clothing, linen, effects and merchandise should not be underrated.

The importation of the disease by means of infected persons plays, of course, the most important rolé in the distribution of the germs. The epidemic of 1884–5, in Spain, was brought to Allcante by the "Buenaventura," which landed passengers—among them a child sick with cholera.

The pilgrims to Mecca have been known for years to be carriers of the disease; the first cases of the epidemic at Havre, in 1892, came from the suburbs of Paris. (Gilbert.)

Influence of the Soil, Local and Seasonal Predisposition.—It is certainly true that a peculiar constitution of the soil, in many localities, favors the development of the germs, and there are localities which appear to prevent epidemic extensions; and this is even true of some parts in India. Pettenkoffer claims that a porous soil, more or less polluted with organic matter, and possessing a certain degree of moisture, is absolutely essential for the development and maturity of the cholera germ. If the soil is too wet, as at Lyons, it cannot mature; if too dry, as at Multan, the same result may be expected. He also points out that houses erected on ridges enjoy greater immunity than those situated in depressions; that low-lying districts are visited in preference to higher elevations, and that proper drainage has exerted a most beneficial influence in the prevention of the disease. These facts cannot be denied, and certainly show that, in addition to the specific germ, we have to deal with local predisposing factors.

It does not follow, however, that this influence depends *solely upon the soil*, for it is equally possible that the *water* may favor or prevent the development of the germs; the locality may not be supplied with wells, or if so, the arrangement of privies and drainage may prevent access of the germs into the water supply; nevertheless, it is fair to assume that the constitution of the soil, just as in typhoid fever, may favor or retard the development and final percolation of the germs into wells.

In addition to the influence of the soil and water supply, the *seasonal or climatic disposition* cannot be ignored. In Europe and in this country, most of the epidemics present the greatest intensity during the late summer and fall, and subside with the approach of cold weather, possibly to return the following summer. It has also been observed that, after the first showers of rain, succeeding a warm, dry season, the extension of the disease was greatest, whilst prolonged rains diminished their intensity. It is evident,

therefore, that the specific germs attain their greatest virulence when the temperature of the air, and consequently of the soil, is just suitable, and that a combination of a certain degree of heat and moisture constitute suitable environments for the cholera virus. The rise and fall of the ground water, which fluctuates with the rainfall, not only influences the proliferation of the germs, but also their transport into the well-water and the degree of impurities contained therein. The rise and fall of the ground water naturally influences the ground air, and, whilst the germs may be borne by ascending currents, in the light of their biological character, such a mode of infection seems doubtful.

Individual Predisposition.—What constitutes this mysterious factor in the production of the disease? Is it a weakness of the organism, a diminished power of resistance, or is it a peculiarity of the tissues, cells or fluids, which places them at a disadvantage in their struggle against the invasion and effects of these germs? Is it the addition or subtraction of a certain something in the blood or fluids, which furnishes a suitable pabulum for their growth? These unexplained questions cannot be ignored in the consideration of the contagiousness of certain bacteria, like those of cholera, typhoid fever, diphtheria, dysentery, etc.

All we know is, that infectious diseases differ more or less, like other diseases, in degree; that there are mild and malignant cases, and it is not improbable that immunity in certain cases is due to the inaptitude of the organism to feel the effects of the ptomaines evolved by the microbes; that germs of infectious diseases may exist within the body, and the disorder they give rise to may be very slight, or entirely absent. In brief, infectious disease does not exist merely because some noxious micro-organisms have taken their abode in the system; they exist because functional or structural troubles are brought about, through the agency of ptomaines.

Klemperer (*Berliner Klin. Wochensch.*, 1892, No. 39), with sub-cutaneous inoculations of the cultures of cholera bacilli, claims to have succeeded in conferring upon man immu-

nity to cholera, as indicated by the protective influence of the blood serum of the immune individual upon guinea-pigs, in a degree proportionate to the virulence of the protective inoculation. He was also able to demonstrate that some persons possess a natural immunity to cholera, much less in degree, however, than the immunity artificially conferred. Dr. E. O. Shakespeare, of Philadelphia, has announced a paper on this subject, to be read before the Association of American Physicians, in May next.

Clinical experience teaches that faulty nutrition, debility, digestive derangements, particularly gastric and intestinal catarrhs, alteration of the gastric juice from an acid to an alkaline or neutral reaction, debauches, improper food, especially raw, decayed or unripe fruits and vegetables, and excesses of all kind, favor the development of the disease. Mental anxiety and fear also help to depress the physical and mental elasticity, and correspondingly our power of resistance.

One attack of cholera affords, for a time at least, immunity; no age is exempt, although it attacks most frequently persons between the age of 15 and 30 years.

Ship Cholera.—One of the strongest arguments against Pettenkoffer's theory, that it requires a *suitable soil* for the development and maturity of cholera germs, is the occurrence of outbreaks on sailing vessels and steamers.

Koch, in 1872, reported eight instances; in 1873, the same number, and in 1874, twenty outbreaks of this kind.

In 1884, cholera broke out on the steamer "Matteo Bruzzo," from Genoa to Montevideo, and attacked forty persons. This steamer returned to Genoa without having been permitted to touch land. The steamer Moravia, which sailed from Hamburg August 16th, 1892, reported twenty-two deaths during the voyage from "gastro-intestinal disorders." Cholera was first recognized at Hamburg on Augvst 11th. The "Normania" and "Rugia" reached New York, from the same port, September 3d; each of these reported a number of deaths at sea from cholerine, and arrived with four cases on the "Normania" and five on the "Rugia." Later, the "Scandia," "Heligolann," and

"Bohemia," all from Hamburg, arrived and reported deaths at sea from "gastro-intestinal diseases."

The Incubation Period of Cholera is usually from one to two days; the maximum period scarcely exceeds seven days; and whilst we can readily admit that all cases attacked within seven days after leaving the port, imbibed the germs on the land, it is equally reasonable to assume that those attacked at a later interval, imbibed the germs on board, and that they must have attained their virulent character without the intervention of the soil.

The Prophylaxis of Cholera: Conflicting theories as to the etiology of the disease have unfortunately resulted in different views regarding preventive methods. Pettenkoffer and his adherents, as before stated, do not believe that the dejecta of cholera patients contain a matured pathogenic germ, and that they can be conveyed in the drinking water; and therefore regard it as wholly unnecessary to restrict intercourse or to disinfect the dejecta, clothing and effects of patients, or to boil the drinking water. They insist, however, upon proper drainage of the locality, prevention of soil pollution, and the removal of the "individual predisposition" by improving the general nutrition, avoidance of catching cold, allaying fear, and proper attention to the cutaneous function.

Koch and his followers, whilst fully appreciating the importance of other predisposing causes, believe the common bacillus to be the one factor, without which no case of cholera can occur; they believe that this germ is found sufficiently virulent in the dejecta of patients, and is capable, when introduced into the digestive tract of a susceptible individual, of producing the disease in question. This school looks upon the first cholera patient as the chief source of danger in spreading the disease, and with a view of preventing at the outset the introduction of the poison, they insist upon prompt recognition and proper isolation, and that no suspicious case should be permitted to enter our ports or cross our borders.

Under these circumstances, the safety of our own people demands the careful inspection and disinfection of all pas-

sengers and effects, prior to sailing from foreign ports, and this should be done by competent physicians, representing the Pan-American Governments. The vessels carrying passengers should be perfect in their sanitary appointments, and provided with pure drinking water.

Dr. Wilcox, in describing the cholera of 1892 in New York (*Am. Jour. Med. Sciences*, January, 1893) remarks;

"On August 19th, on information that the disease was suspiciously near the German frontier, the Department of State was requested to make inquiries through consuls to ascertain if cholera existed in Germany. On the 23d, having received reports from Bremen, Hamburg and Stettin, the two latter being unsatisfactory, the Hamburg-American Steamship Company was notified by the health officer to use great caution to disinfect baggage and clothing, and detain passengers at Hamburg for five days. How far these orders were carried out was ascertained on the arrival of the "Moravia" on the 30th, when it was learned that the immigrants had embarked immediately upon the arrival of the train, and that there had been 22 deaths among 24 patients, the first case occurring on the first day after leaving Hamburg. It is evident that cholera gained its entrance into New York harbor solely by the negligence of the Steamship Company.

The disease can be stamped out on shipboard in five days by competent medical officers, and should be done at sea. Under the direction of the health officer it was done in every case after the steamships came under his jurisdiction in New York harbor. The sick and dead were removed. The immigrants received baths, having been previously rubbed with a bountiful supply of green soap. A sail, suspended by the four corners, the water being constantly renewed, was an excellent, though an improvised bath-tub. The crew's quarters and the steerage were scrubbed and washed out with a 1:500 solution of corrosive sublimate. The fumigation with sulphur was carried out. The baggage and clothing were disinfected by sulphur, superheated steam, and, when injury would not be done, by corrosive sublimate solution. Soiled bedding and clothing were wrapped in sheets wetted in corrosive sublimate solution, and burned in the furnaces. Lastly, fresh water was supplied and only used after boiling. Proper regard for the lives of passengers demands that this work shall bedone at sea."

With proper quarantine regulations, and the hearty co-operation of State and National authorities, it would seem possible to prevent entrance of the germs by the coast. If, for any reason, the disease should gain a foothold, the difficulties of establishing a land *cordon sanitaire* would, of course, be great, as they are often broken through. The disease, however, shows a predilection for well-beaten routes of travel, and the State of California, apart from the marine quarantine, upon the approach of danger, should not fail to establish inspectors at our border railroad and highway stations, with a view of detaining and caring for all suspicious cases. This, of course, requires suitable equipments.

Let it be remembered that the recognition of the first case of cholera is of vital importance in preventive medicine. Every suspicious case should be treated with precautionary measures, until the diagnosis has been confirmed or rejected. The patient should be isolated, and the nurse instructed how to disinfect the dejecta and soiled effects, and to protect himself. Muriatic acid, 1 part to 5 parts of water, or 1 : 500 solution of corrosive sublimate, allowed to remain in contact with the dejecta for one hour, will prove most efficient in destroying the germs. A three per cent. solution of carbolic acid, superheated steam, dry heat 212°F., are proper disinfectants for clothing, linen, bedding and effects. The floors should be scrubbed and washed with the sublimate solution. Nurses should be warned of the danger of carrying the germs by means of the fingers to the mouth. In case of death, the body should be washed, if at all, with the sublimate solution, but preferably wrapped in sheets wetted with the same. Soiled bedding and clothing should be wrapped in sublimated sheets, and burned. No articles of food, or effects of any kind, should be removed from a quarantined house or station, except by permission of the health officer.

Upon the approach of cholera, the public should be instructed how to guard against the disease, by proper food, avoidance of fear, indiscretions in diet, debauches, and excesses of every description. None but the most wholesome food, properly cooked, should be consumed. The water and

milk should be boiled before drinking. The addition of one per cent. of citric acid or 1 : 1000 of muriatic acid to the water, to be kept in porcelain receptacles, has been recommended. The hands should be frequently scrubbed with soap and brush, especially before meals, and the system should be placed in the best possible condition to resist the disease. For my own part, I believe that immunization, by inoculations of cultures of cholera bacilli, will constitute, sooner or later, a most important individual prophylactic measure.

Apart from all this, proper drainage and sewerage, prevention of soil pollution, a good water-supply, cleanliness within and without the premises, disinfection of water-closets and privy-vaults, gutters and court-yards, in fine, suitable sanitary environments, cannot fail to have a most beneficial effect in the prevention of cholera, as well as in all other infectious diseases. The efficacy of these measures is often evident within a very few days.

Art. IV.—Mastoid Disease—With Report of a Case of Mastoid Abscess.*

By JOHNSON ELIOT, M. D., Washington, D. C.

Miss B., white, age 63 years, previous health good; was referred to me by Dr. Llewellyn Eliot. Early in January, 1892, pain occurred in the right ear, followed by profuse purulent discharge.

Seen February 1st, 1892. Ear painful, interfering with sleep; there was tenderness over the mastoid process, hearing nil, small perforation in the posterior inferior portion of the membranum tympani through which this discharge escaped. Under the use of peroxide of hydrogen and the insufflation of boracic acid, the discharge ceased, but the perforation did not close; although sedatives were used, the pain abated little; the hearing increased $\frac{1}{10}$.

On February 23d, a mass of granulations appeared at the perforation, and five small ones were removed; the dis-

*Read at a meeting of "The Medical and Surgical Society of the District of Columbia," held March 13th, 1893.