

subcutaneously is not incompatible with the use of the cold douche, wet sheet, and other measures required to abate the high temperature. The occurrence of sudden depression of the powers of life, the patient passing into collapse, is an unfortunate tendency in some of the cases, which may be attributed to the treatment used. The practitioner should be on his guard, not only to obviate this tendency by the timely use of stimulants, but to avoid reproach.

## MIASMATIC DISEASES.

### CHOLERA.

**Definition.**—*Cholera* is an acute infectious disease, endemic in some localities, epidemic elsewhere, and characterized by vomiting and purging of a peculiar rice-water-like fluid, and a condition of collapse and death, or of a reaction from collapse and the development of a typhoid state.\* It is known also as *epidemic cholera*, *Asiatic cholera*, *malignant cholera*, etc.

**Causes.**—The etiological factors concerned in the diffusion of cholera are very complex. Is there a cholera-germ? The facts thus far accumulated render it highly probable that cholera is propagated by a minute organism—according to Koch, a *bacillus*, the *comma bacillus*. Although some eminent bacteriologists refuse to accept this view, the weight of testimony is in its favor, and as the crucial test of cultivation, and the production of a cognate disease in animals, is not wanting, we can hardly refuse our assent, until, at least, another organism is finally proved to be the morbid agent. When the first epidemics of cholera started on their march around the world, they pursued a general direction from east to west, following the routes of commerce, and from one great center of population to another; but this course was not inevitable from the nature of the poison, and it is now known that the disease pursues no defined course, and, in fact, spreads in all directions, according to the freedom of communication. It is conveyed by caravans, by ships, in clothing, baggage, and other effects, by streams of water, by air, etc. It is not contagious, in the common acceptance of that term. Physicians and attendants in cholera hospitals are not more exposed than others, during the existence of the epidemic, unless a local source of infection occurs. The author had charge of the cholera hospital in Cincinnati during the epidemic of 1866, and not only visited the wards several times daily, but made a number of autopsies, and on several occasions was wounded, without

experiencing the first symptom of the disease. The assistant physicians and attendants were equally exempt. The dead bodies of cholera subjects apparently possess no infective property. The bacteria of decomposition destroy the disease-germs of cholera. The morbid material or germ is more certainly conveyed in the moist state, and some preparation or transformation must be undergone before it becomes active. As it leaves the person of the sick it does not appear to have toxic power, but acquires this subsequently. Hence cholera is not communicated directly from one person to another: an intermediate condition of preparation is necessary. Hence the importance of the superficial water-supply (the *ground-water* of Pettenkofer), and of certain geological formations. The character of the soil best adapted to the nurture of cholera-germs, because retentive of the surface-water, is alluvium, light and porous, resting on an impervious clay subsoil. Malarial regions are generally very favorable to the growth of cholera-germs. When the ground-water is low, the germs are produced in greater abundance than when it is high. Cholera is always spread rapidly when the drinking-water is supplied from the surface drainage, and hence is rich in organic matter. The records of cholera epidemics are full of most striking examples of this truth. The excretions of cholera patients, thrown on the ground, or into superficial privy-vaults, quickly reach the ground-water, multiply rapidly, and soon the sources of water-supply, the superficial wells and streams, become contaminated. Hence it is that one of the principal sources of cholera infection is the water-supply. When an epidemic influence prevails, not all exposed to the poison contract the disease; great differences in the individual susceptibility are found to exist. The hygienic influences affecting the individual are highly important. Excesses in venery, in spirit-drinking, late hours, and an irregular life generally, bad air, and moral depression and fear of the disease, exercise an unfavorable influence. Males are more apt to have cholera than females, and infants are less susceptible. The mortality is less among children than among adults, and is greatest between twenty and thirty. Although it is true that heat favors the spread of cholera, and that the greatest mortality is during the hot season, yet it does prevail during the winter; a notable example was afforded by the Russian epidemic of the winter of 1830-'31. The disposition to an attack of cholera seems greatest in the early morning. A hot, moist, and stagnant atmosphere is especially favorable to the development of the epidemic influence. A light rainfall, followed by a warm mist, the air being still, was the condition of the atmosphere when the cholera assumed its most severe phase in the Cincinnati epidemic.\* An ordinary epidemic, under the circumstances

\* A "norther," with rain, preceded a fearful outbreak of cholera among the United States troops (Eighth Infantry) at Lavacca, Texas. Reported by Dr. N. S. Jarvis, U. S. A., Fenner's "Southern Hospital Reports," vol. i, p. 436, *et seq.*, 1849.

of its introduction in one of our cities, is not likely to prevail longer than two months. July, August, and September are the months of greatest prevalence of the epidemic, as a rule. From the period of exposure and reception of the poison until the outbreak of the disease—the incubation—from two to four days usually elapse. But this is not a fixed and invariable period—it may extend to one or two weeks, but very rarely longer. Healthy persons, arriving in an infected city, are attacked in from three to four days. When the germs of disease are brought to a healthy city, about a week elapses before cases of the disease appear.

**Pathological Anatomy.**—If death has occurred in the asphyxia, the stomach contains more or less of the whey-like material of the cholera-discharges—a material alkaline in reaction, albuminous, and full of cast-off epithelium. Later, or during reactionary fever, the mucous membrane is congested, and marked by extravasations and ecchymoses. The small intestines usually contain a large quantity of the whey-like fluid, full of epithelium. The glands of Brunner, the solitary and agminated patches are thickened and very prominent. The villi of the mucous membrane, as well as the epithelium, are stripped off, leaving the basement membrane for the most part bare. The solitary glands of the large intestine are also infiltrated and swollen. Sometimes the colon is the seat of a diphtheritic process, but this is a change pertaining to the fever of reaction. The spleen is small, wrinkled, and firm during asphyxia, but in the secondary fever it enlarges and is softer. The biliary passages contain a quantity of cast-off epithelium, which probably obstructs the outflow of bile—for usually the gall-bladder is well distended with a rather thick, viscid bile. The liver is more or less advanced in fatty degeneration, but is not conspicuously altered, although, by reason of changes in the hepatic cells in spots, the organ may present a somewhat mottled, yellowish discoloration, mixed with brown. The changes in the kidneys are of the same nature as those of other mucous surfaces. The epithelium of the tubules is granular, cloudy, and is detached from the basement membrane, blocking the tubes, so that the whole organ has the appearance of the pale, smooth, white kidney. Here and there, however, there are spots of injection, and occasional patches of ecchymosis. The bladder is empty and contracted, or contains a very little milky urine. The peritoneum is dry, sticky, from the presence of a quantity of loose epithelium still adherent, and hence the membrane does not present the transparent and glistening appearance of health. The pleura presents the same conditions: its transparency is impaired, it is adhesive, and the epithelium is cast off in great quantity. The lungs are deeply congested, especially posteriorly; ecchymoses of the bronchial mucous membrane and infarctions of the lungs are occasionally encountered. The great venous trunks and the right cavities of the heart are dis-

tended with blood, while the left cavities are empty and contracted. The blood is dark, almost black in color, thick and viscid, feebly coagulable, and sometimes incoagulable. The pericardium is dry, and there are numerous ecchymoses on the visceral layer. The muscular tissue of the heart is not affected. There are but few changes in the brain. The author observed, in all of his autopsies, considerable hyperæmia and dilatation of the vessels of the medulla oblongata. The constancy of this lesion would seem to indicate a relationship between congestion of the medulla and the cramp.

**Symptoms.**—*First or Prodromal Stage.*—As there are two forms of disease from which cholera may proceed, although they are quite independent affections under other circumstances, they may be with propriety regarded as modes of manifestation of cholera-poisoning. These maladies are *diarrhœa* and *cholérine*. During every epidemic of cholera, a large proportion of cases set in by a diarrhœa, which if permitted to continue will develop into a typical attack of cholera. Others begin as a cholérine, with vomiting and purging like an ordinary cholera morbus, and if uncontrolled the case assumes the characteristics of cholera. Cholera-diarrhœa may arise from ordinary causes—from taking cold, errors of diet, etc. There is some chilliness, thirst is exacting, the tongue is pasty, and there is a bitter or mawkish taste. Some pain may be felt in the abdomen, but the stools pass with ease, are copious and watery, and cause a decided feeling of weakness. There may be no more than two or three stools in the course of the day, but the failure of strength is remarkable and quite out of proportion to the loss of material. Such a diarrhœa may in a day or two become very profuse, the stools whey-like, cramps in the legs, cold tongue, cold breath, toneless voice, suppression of urine come on, and the patient pass into cholera asphyxia. During a cholera epidemic there is danger that every case of diarrhœa may assume cholera characteristics. It has usually been observed that during a cholera epidemic there is a general prevalence of diarrhœa, or such a state of relaxation of the bowels that a laxative causes drastic effects. Cholérine behaves as an ordinary attack of cholera morbus, except that the discharges have less and less of the stomachal and fecal characters, that cramps are more apt to occur, and that the symptoms of cholera asphyxia readily come on. In many epidemics prodromes have been observed. The author has seen, in most cases, mental depression, fatigue of body, and chilliness precede the regular attack. On the other hand, a feeling of recklessness, or apathy and indifference, has been noticed. In all cases diarrhœa or cholérine has ushered in the attack. The characteristics of the diarrhœa have been copious, watery, rapidly becoming whey-like stools, passed easily, with force, and without pain. A majority of patients are attacked after midnight and toward morning. If there had been no diarrhœa the

day before, which is rather exceptional, the patient is waked with an urgent desire to go to stool, and he at once passes an ordinary diarrhœa stool of great volume, and the first is quickly followed by others, even more copious and assuming a lighter color. If diarrhœa has existed during the previous day, the first stool is of a whitish color.

*Second Stage.*—With the large evacuations which announce the onset of the regular cholera attack, there is a marked degree of chilliness, anxiety, and alarm, but with many an absolute indifference. The evacuations come with a rushing force and amount to quarts of grayish, or whitish, rice-water or whey-like fluid. The patient feels cold, weak, and dizzy, and is glad to throw himself on the bed after one or two of these evacuations. It is not long before vomiting sets in, if the attack did not begin as a choleric. In an hour or so the stomach becomes uneasy and vomiting begins—first, the contents of the stomach and some bilious matter, and then the peculiar rice-water discharges—an alkaline fluid containing flocculi, which subsiding are found to be composed of epithelium, ammoniaco-magnesian phosphate, blood-corpuscles, bacteria, and various minute organisms. Sometimes the quantity of blood-corpuscles present is sufficient to give the whey-like fluid, vomited and purged, a distinctly reddish hue. In every epidemic there are cases sinking rapidly without vomiting or purging, all the other phenomena being present. These are called *cholera sicca*, but incorrectly so, since in the intestines after death are found in great quantity the characteristic discharges. The vomiting is generally less frequent than the purging, and the quantity thrown up less. The vomit is thrown up with force and ejected a great distance. There is intense thirst, and great draughts of water are swallowed, to be quickly returned. The tongue is white, pasty, and cold. The countenance shrinks, has a leaden hue, and the eyes are staring, the nose pinched, and the breath cool. A good deal of præcordial anxiety is felt and breathing is oppressed, even difficult, the respiration sighing, or a troublesome hiccough comes on. Very soon cramps are felt in the calves of the legs, and although they occur in the arms, hands, masseters, muscles of the back and abdomen in many cases, they are more severe in the calves than elsewhere. The temperature rapidly falls. At first the pulse is a little accelerated, but it soon declines in volume and force, becoming extremely small, barely perceptible, or ceases at the wrist, while the action of the heart can hardly be recognized. The surface gets cold and is covered with a sticky perspiration; the skin loses its elasticity and wrinkles, so that the hands have the sodden look known as the “washerwoman’s hands”; the fingers, the face, and the nose and lips especially, are blue as well as cold; the eyes are sunken and are surrounded by livid, almost black rings; the tongue is now like ice and the breath is cold; the voice is weak, husky, and sepulchral, and the urine is suppressed entirely, or dimin-

ished to a few drops, which is often found to be albuminous. The temperature of the body descends to the level of the surrounding media—to 96°, 92°, even 80° sometimes. The minimum, according to the author’s observation, was 92° Fahr. Such is the *algid stage* of cholera, or *cholera asphyxia*. It is a remarkable circumstance that patients reduced to this low point, collapsed and barely living, the blood thick and hardly in motion, should yet preserve their faculties, and, when roused, return correct replies to the queries addressed them. The termination of this state is usually in death, but reaction may be established, introducing the *third stage*.

Death rarely occurs in less than twelve hours from the beginning of symptoms. The state of collapse may last from twelve to forty-eight hours and even then recovery ensue, but, of course, recovery is exceptional under such circumstances. Again, death may occur in three or four hours. When reaction takes place, the pulse returns at the wrist slowly, and at first doubtfully, the surface very gradually becomes warmer, the countenance assumes a more natural appearance and the cheeks acquire a faint flush, the tongue is less cold, there is less thirst, the respirations are deeper and easy, and the temperature rises. The vomiting and purging lessen materially, or cease altogether, but, as vomiting and purging cease in the final collapse, this latter condition should not be mistaken for the former. The secretion of urine and the substitution of normal fæces for the rice-water discharges, above all other symptoms, announce the beginning of convalescence. If albumen be present, as is usual, it gradually diminishes and disappears in three or four days. The return to health may occupy a few days only, but more frequently a week or more will be required. The reaction may not be complete. The stomach continues irritable, thirst is incessant, and indulgence in drinking speedily excites vomiting. The tongue continues coated, or peels off, leaving a dry and glazed surface. The epigastrium remains tender, and the blandest food excites pain and is apt to be rejected. The bowels do not act well. The stools are rather grayish and mixed with bilious-looking matters without having the appearance and odor of fæces. The urinary secretion increases in amount, but there is considerable albumen present. There is also much headache, and, while a condition of somnolence is tolerably constant, there is little genuine sleep, and the mind is clouded with illusions and hallucinations. This imperfect reaction may terminate in recovery, which is by no means frequent, or some acute, intercurrent disease may arise, or the patient may lapse into cholera typhoid. The reaction may pass beyond normal, and convalescence be delayed by fever, by continued irritability of the stomach, and irregularity of the bowels. The eyes are watery, the cheeks flushed, and the face is spotted; more or less headache, tinnitus aurium, and wakefulness is experienced. After some hours, or a day or two, these symptoms may

subside and convalescence be established, or they may pass on into the cholera typhoid. Under this designation of *cholera typhoid* is meant a typhoid state compounded of reactionary fever and uræmia. When health is restored, the albumen disappears in three or four days, but in protracted convalescence the albumen persists, varying in amount from traces to ten per cent. When the state of cholera typhoid is developed, a condition of great debility ensues; there are severe headache, deeply injected conjunctivæ, vertigo, and stupor. They lie in a condition of somnolence, muttering unintelligibly. The tongue is coated, sordes accumulate about the teeth; there are thirst, nausea, sometimes vomiting; the abdomen is distended, and gurgling can be induced by pressure over the ileo-cæcal valve; there is diarrhœa, the stools being greenish and liquid, or constipated, or these states may alternate. Eruptions, sometimes like roseola or like urticaria, or erythematous, appear on the hands, and spread thence over the body. Cramps are apt to occur, and there may be convulsions in children. In the fatal cases, stupor deepens into coma, the pulse fails, the discharges are involuntary, and death occurs in collapse. On the other hand, should recovery take place, the stupor and hebetude of mind clear up, the albumen disappears from the urine, the vomiting ceases, some appetite returns, and digestion is slowly resumed. So damaged have been the organs of digestion, and lowered the composition of the blood, that convalescence is tedious, some weeks being consumed in the work of restoration. Convalescence is often complicated by bed-sores, boils, or carbuncles, by diphtheritic exudation of the fauces or larynx, by bronchitis, pneumonia, parotiditis, etc.

**Course, Duration, and Termination.**—The course of cholera is quite varied: it includes a period of incubation, a prodromic stage, the first stage, or invasion; the second stage, or algid stage; the third stage, or reaction; and the fourth stage, or convalescence. The period of incubation is irregular, and varies from one day to a week. The prodromic period lasts from a few hours to a day or two. The average duration of fatal cases is about sixty hours, and of cases that recover, about nine days. Death does not often occur within the first twelve hours, but in the algid condition. The usual duration of the typhoid stage is from two to nine days, but the stage of reaction, which precedes the typhoid, may inaugurate speedy convalescence, and terminate by the fifth or sixth day. The mortality from cholera in all countries is singularly uniform, the average of various epidemics being about fifty per cent. In some epidemics the mortality is as high as eighty per cent.; in others, as low as twenty or thirty per cent. The last epidemic in this country was much less formidable, and the disease seemed milder than former ones. In fact, each visitation since the first in 1832 has manifested less virulence than the preceding one. The cholera-germ seems to be naturalized to the Mississippi Valley,

for every year since the last great epidemic numerous cases occurred in all respects like those during the spread of epidemics. The mortality is generally greater at the beginning of an epidemic than at its close. Of the large number brought under the cholera influence during an epidemic prevalence of the disease, but few comparatively are attacked. In many the germs received into the intestines excite no disturbance; in others, there is produced merely a cholera-diarrhœa; in still others, a fully developed cholera-seizure follows. The prognosis is influenced by age, habits of life, and hygienic surroundings. Infancy, old age, a debilitated constitution, evil habits, especially alcoholic excess, and living amid the most active sources of infection, greatly increase the danger of an attack. In an attack of cholera the prognosis must rest on the condition of the individual at the time of the seizure, and on the severity of the attack, the prompt development of the algid state being especially of evil import. The signs of evil import during the stage of reaction are imperfect reaction, confusion of mind, suppression of urine, and involuntary discharges. If reaction is well established, and instead of convalescence cholera typhoid comes on, the condition must be regarded as unfavorable, although recovery is not impossible.

**Treatment.**—It is important to recognize diarrhœa and cholera as portions of the morbid complexus. No case of diarrhœa is undeserving of attention during the existence of a cholera influence. The great remedy is opium; its importance is testified to by the fact that this agent, in some form, enters into all the cholera remedies, secret and published. As the cholera-discharges are distinctly alkaline, and as inward osmosis can only be properly set up by the administration of an acid, this physical fact should be recognized in the prescriptions. Experience is in accord with theory in respect to the value of an acid. The following combinations for the cholera-diarrhœa the author has found very effective:  $\mathcal{R}$ . Acid. sulphuric. aromat., tinct. opii deodorat.,  $\text{ãã}$   $\mathfrak{z}$  j.  $\mathcal{M}$ . Sig. Ten to thirty drops in water every hour or two.  $\mathcal{R}$ . Acid. sulphuric. dilut.  $\mathfrak{z}$  ss., tinct. opii camphorat.  $\mathfrak{z}$  jss.  $\mathcal{M}$ . Sig. A teaspoonful, well diluted, every half-hour to every two hours. Paregoric, fortified by tincture of opium, is an efficient remedy. Many prefer acetate of lead and opium in pill-form, or in solution. A favorite combination is spirits of chloroform, tincture of rhubarb, tincture of cinnamon, and tincture of opium. One of the most successful remedies for the preliminary diarrhœa is the proprietary medicine chlorodyne, which has been largely used in the East Indies. According to Brown-Séquard, who bases his practice on experience acquired in the West India Islands, cholera can certainly be prevented by giving sufficient morphine in time. If the attack begin by cholera, there is no remedy so efficacious as the hypodermatic injection of morphine and atropine ( $\frac{1}{4}$  grain of morphine and  $\frac{1}{120}$  grain of atropine). Indeed, it may be affirmed that the subcutaneous injection

of morphine is the most efficient treatment of both forms of preliminary disturbance and of the first stage of the attack proper. Besides the medicinal remedies for this stage of the disease, the utmost quiet must be enjoined. The food taken should consist of boiled milk, a soft-boiled egg, some beef or mutton broth, or a moderate quantity of steak or roasted beef. If the symptoms be threatening, the aliment should not include any solids. As thirst is excessive, the patient should be allowed ice *ad libitum*, which he should be encouraged to swallow frequently in small quantities. Effervescent drinks are extremely grateful and very useful when the vomiting begins. Fermented drinks, as beer and champagne, are objectionable, but carbonic-acid water and effervescing powders are, on the other hand, very serviceable. Recognizing the fact of the alkalinity of the discharges, we should give an acid reaction to the effervescing powder by increasing the relative proportion of acid. Mustard to the epigastrium, or a flying-blister will aid in the arrest of vomiting. The subcutaneous injection of morphine is still more efficient. The author must here strongly insist on the futility and danger of deep vesication so often practiced in cholera, for he has seen an inflammation of all the tissues of the abdominal wall, extending to the peritoneum, produced by blisters to the abdomen in the algid stage. Other remedies for the vomiting are carbolic acid, which often acts very admirably, chlorodyne, hydrocyanic acid, tincture of camphor, chloroform, nitrite of amyl, chloral, etc. Of all the remedies for this stage, the author has had the best results from the hypodermatic injection of chloral—of which a scruple may be injected every hour or two, dissolved in a sufficient quantity of water. It allays the cramps, and brings about reaction. It seems to act most efficiently when administered with morphine, or in alternation with the latter remedy. Good effects have followed the injection of atropine in the algid stage, to excite the heart to action, and to restore warmth to the surface. Amyl nitrite has been used by inhalation to obtain the same effect, and apparently with advantage. When the heart is failing and the surface becoming cold, there is a strong temptation to the free use of stimulants, and the stomach is kept full of brandy, camphor, ether, ammonia, and other stimulants. As these articles can not be absorbed, they serve to keep up vomiting. As the circulation declines, a little brandy will be useful, but any considerable quantity should not be given. Whisky can be thrown under the skin. The intravenous injection of milk has proved successful in the hands of Hodder, in the collapse of cholera, and the intravenous administration of salines has, in apparently desperate cases, brought on reaction, but which, unfortunately, is not always maintained. In this direction must be looked for the most successful management of the algid stage of cholera in future epidemics. During reaction the stomach must be handled very cautiously, lest vomiting be excited. The digestive powers are so fee-

ble that it is useless to give any food except a little hot milk or a little weak broth. The vomiting and diarrhœa which are so troublesome at this time are probably best relieved by carbolic acid and bismuth (℞ Acid. carbolic. gr. viij, bismuthi subnitrat. ʒ ij, mucil. acaciæ, aquæ lauro-cerasi, āā ʒ j. M. Sig. A teaspoonful every hour or two). If there are fever and headache, bromide of potassa will give relief. As the cholera typhoid is a condition of uræmia, efforts should be directed to restore the urinary secretion, and the treatment ought to be conducted according to the principles already laid down. As it is probable that the poison of cholera is contained in the discharges, these should be disinfected at once by a strong solution of the chloride of zinc. The linen about a patient, experience has shown, is peculiarly dangerous. When the loss is not important, disinfection by burning should be practiced; otherwise the material should be thrown into boiling water, and should not be handled until thoroughly boiled. Articles of clothing should be hung up in an atmosphere of sulphurous acid for a number of days. During the existence of an epidemic, the hours should be regular and all excesses avoided. The mistake made by changing from a full to a very restricted diet has cost many lives. The ordinary fruits and vegetables of the season should be taken in moderation. Everything indigestible should be avoided. Calmness favors health, while fear invites disease. Attention to the first indications of disease may save an attack. Questions of public hygiene are not embraced within the scope of this work.

#### DIPHTHERIA.

**Definition.**—*Diphtheria* is an acute, specific, contagious disease, beginning by an infection of the throat, and characterized by a local exudation, and glandular enlargements, systemic poisoning, and having for its sequelæ various paralyses.

**Causes.**—As diphtheria is a communicable and an inoculable disease, it is propagated by a specific poison, the form of which is not known, although suspected to exist as a minute organism. The simultaneous discovery by Hueter and Oertel of a minute organism of the bacteria group, in the exudation, the mucous membrane, neighboring vessels and lymphatics, and in the blood, at once attracted attention to this parasite as the infecting principle. Virchow's discovery of the presence of micrococci colonies in ulcerative endocarditis and elsewhere furnishes strong support to this theory of diphtheria. On the other hand, the filtration experiments of Burdon-Sanderson have cast serious doubts on the immediate agency of micrococci; they seem rather to enact a secondary rôle, but, according to either position, they are necessary to the diphtheritic process. Diphtheria prevails as an epidemic; under some circumstances it is endemic, and it also occurs sporadically.