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How To Prevent Cholera

BY

R. F. LOGAN, M. D.

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As every physician is, to some extent, a guardian of the public health, it occurs to me that a few practical remarks touching a few hygienic measures may not be out of place, for though our people may need no instructions in the principles of public hygiene, they are sometimes prone to violate them.

Cholera is a specific disease, caused by a poison obsorbed into the blood, from the food we eat, the water we drink and the air we breathe. During the prevalence of epidemic cholera, all persons are exposed to its influence, and absorb the poison to a greater or less extent. One who has taken the precautions to preserve his health will usually resist the power of the poison; on the contrary, those who have neglected these wise precautions will generally suffer the consequences of their folly.

It is a fact well attested by clinical observations, that during the season of cholera infection, many persons who escape cholera, suffer from disdisorders of the stomach and bowels, and it is unquestionably true that the causes which give rise to these derangements of the digestive organs, may, and do often, act as predisposing causes of epidemic cholera.

The ordinary causes of diseases cannot give rise to epidemic cholera, yet these causes may aggravate any case of the latter disease, or by impairing the health of an individual may indirectly induce an attack from which he might otherwise have escaped.

In an epidemic of this disease we have two causes of it in operation: 1st, a specific poison which can be avoided only to a limited extent; 2d, those secondary causes which prepare the system to receive the poison, or which impair the normal action of the excretory organs—the skin, kidneys and bowels—to such an extent that the poison is retained in the system, or which so depress the vital powers that the system speedily succumbs to the epidemic influence.

From the best evidence in possession of the medical profession, we infer that the agencies which engender the cholera poison result from the putrefaction of organic matter. These putrefactive changes occurring under certain conditions of heat, moisture, and probably other circumstances unknown, generate the morbid materials which enter our systems and produce cholera; and although this disease in its epidemic form usually travels from East to West, originating near the delta of the river Ganges, spreading thence in all directions over Asia, Europe and the Western hemisphere, there is abundant evidence to prove that the same conditions that originate the poison in Asia may produce the same destructive agent in other countries.

At any rate it is highly probable the decomposing animal and vegetable matter may be the material upon which the cholera poison may act like so much leaven, bearing the fruits of disease fifty or an hundred fold.

It follows then, as a practical deduction from the above facts, that the first rule of public hygiene is to prevent the putrefaction of organic matter in the open air or in such other places as may create the cholera poison, or increase its violence. Every housekeeper should

see that no offal is thrown behind his kitchen, wood house or into the streets or down the open privies which adorn the majority of our back yards in close proximity to dwellings. *All such matter should be burned or buried. No one should trust to disinfectants;* though they do much good and should be used freely by every one, there is no disinfectant that can altogether prevent decomposition. The contents of old pits should be covered with two or three feet of earth (dry clay is the best) and not hauled away to enrich somebody's potato patch; and the same remark applies with equal force to stable manure, for the excrement of lower animals is quite as injurious as that cast off from the human body.

In this matter we should not rely exclusively upon the delicacy of our olfactory nerves; for be it remembered, that unpleasant odors, though generally injurious, are not necessarily so, and though disagreeable odors may cause disease, or predispose to cholera, the specific virus of this disease is too subtle to be recognized by human senses, or to be detected by any means yet devised by human genius.

In considering the predisposing causes of cholera, and especially those which are to a great extent under our control, we are lead naturally to the question of diet.

People ought certainly to be posted in a matter apparently so simple, but the fact is that persons vary so much in their habits and circumstances of life, that only very general rules can be given. The question is often asked physicians if certain articles of food are healthy. The answer depends altogether upon the individual, the time these articles are eaten, the state of his health, and other circumstances too numerous to be mentioned. Should vegetables and fruit be eaten during the prevalence of cholera? This question may be answered differently by different physicians. My opinion is that fresh vegetables and ripe fruit do not excite this disease, if the person is in good health at the time they are eaten. On the contrary, I believe that the organic acids and other elements contained in vegetables and fruit exert a powerful influence in preserving the health. I think that the custom of many persons in excluding such articles from the table is not to be commended. Indeed I think that the severity of cholera is often increased, and that many cases of the disease are brought on by observing a system of starvation which many persons are pleased to term "a careful diet." Vegetables are excluded because they fret the bowels, meat is excluded because it over-loads the liver, milk is excluded because it is heating, and an embargo is laid on the fruit because people say that it is unhealthy. The rule which I would advise persons to observe in this respect, is to vary their diet according to their appetites, and state of health.

As a general law our appetites, unless depraved by bad habits, guide us in the choice of food, and that sense of satiety which every healthy person enjoys after a good dinner ought to dictate the quantity to be consumed. If one feels hungry an hour after leaving the table he has not eaten enough; if one *feels* his dinner he has eaten too much, for no one ought to experience any sensation in his stomach during the process of digestion.

In advising this course of conduct I must remark, as I have already intimated, that it applies to people in *health* and to *fresh* vegetables and to *ripe* fruit. There can be no question that *wilted* vegetables, that is vegetables beginning to decompose, and unripe fruit is unhealthy at any time, and during the prevalence of cholera highly dangerous to those who partake of them.

There are persons, however, who

in health cannot eat with impunity certain articles of food, which to other persons are wholesome, for the human stomach is by no means a chemical laboratory, though some who pretend to be chemists persuade us to believe so.

Of course whatever is found by experience to disagree with any person should be excluded from his diet table; but because a few things disagree with a few persons we cannot conclude that such food is unwholesome and thereby condemn it. The personal experience of every individual must decide such questions, and here, as in every department of life, the intelligent people have greatly the advantage of those who are ignorant.

People who are not well should restrict their diet to the simplest food. I do not refer to those only who are confined to the bed, or to those only who suffer great pain, or to those only who are vomiting and purging and cramping, but to those also whose symptoms indicate any derangement of the digestive organs.

Cholera, in the majority of cases, is preceded by a painless diarrhœa, which is too slight to impair the appetite or to attract much attention. A little inattention to diet at this time may precipitate an attack which quickly proves fatal. Looseness of the bowels, or any uneasy sensation in the stomach shows that the digestive power is impaired, and it would be folly to tax the stomach with food, which, under ordinary circumstances, would be wholesome and nutritious, now becomes an irritant poison.

It must be remembered also that the inordinate use of proper diet even by people in good health is to be condemned. It is the abuse of vegetables and fruit, I suspect, that has given rise to the common impression that such articles of diet are unwholesome, and thereby has lead some people to adopt a system of diet, during cholera times, which, in my judgment, is little if any better than eating to excess. Nothing is more common or more natural than to attribute diarrhœa to the eating of fruit, when in fact there may be other causes of the attack, more potent than the harmless fruit. Excessive heat, sudden changes of temperature, and the custom women have of clothing children with flannel during the summer months are causes of diseases in comparison with which the succulent fruits which nature provides for her unwise children is but a mole-hill to a mountain.

If I were not afraid of the consequences I would prepare for an invasion of the culinary department of our households, but I must decline the contest, for though I may sustain a war of words with men, I have a great horror of hot water and broomsticks. Our women folks give the best reasons possible for sticking to old ways of cooking—simply because their mothers and grandmothers cooked that way in the good old times of mud roads and stage coaches.

Of course cooking is the previous question and is not debatable. In this manner the Cubans have decided to continue to plow with sticks, and with this inexorable logic numbers of good people fortify themselves against all modern innovations upon the sacred methods of antiquity.

I may be permitted, however, to remark, that strict inspection should be made of all fresh meat and any that is tainted in the slightest degree thrown to the dogs—(preferably with poison on it) for animal matter that is just beginning to decompose is more dangerous than meat completely putrefied.

I am aware that the advice of physicians, who deduce hygienic rules from the general experience of the profession, is often disregarded by persons who give illustrations which apparently contradict the

common testimony of medical men, and the common sense of sensible people. Neighbor A., for instance, is a dissipated man, keeps irregular hours, indulges to excess at the table, lives in filth and is well and hearty. Mr. B. is a prudent man, keeps his premises clean, and takes all precaution to preserve his health and the health of his family, but he has lost two children with the cholera. Hence some people conclude that sanitary means are useless, and resolve to trust to luck. With such persons I will not dispute. Such exceptions to general rules can usually be explained, and if not they do not disprove them.

People of vigorous health may, in spite of adverse circumstances, escape cholera; while those less vigorous may take the disease in spite of all precautions. No man has a right to regard himself exempt from the prevailing influence of a subtle poison, or to think he can outrage the laws of health and escape the disease.

To those who console themselves that cholera is a visitation of Providence, and with imagined sanctity resolve to submit themselves to His will, instead of using the means for protecting themselves against the disease, I have little to say. Persons who presume to read the tables of law which are known only to the mind of Diety, are surely "wise above what is written." Such belief is nearer akin to superstition than to religion, and such conduct, though becoming enough for the self-poised piety of the deciples of Mohammet, is certainly unworthy the intelligence of Christian people.

Cholera is a disease that can be prevented; or at least its severity greatly mitigated by proper means. Every man owes it to his family, his neighbors, and to the community in which he lives to post himself in the general principles of public hygiene, and to enforce them to the extent of his knowledge and ability.

I have, in preceding paragraphs, discussed the causes of cholera, urged the importance of due attention to the laws of hygiene, given some general advice in regard to diet, and timidly alluded to a few defects in the culinary department. With the permission of the cooks I will now return to the kitchen.

Let me say first, however, that recently I have seen one case of acute diarrhœa brought on by drinking milk that had turned sour, and another caused by eating meat that was slightly tainted—that is by eating organic matter in the incipient stage of decomposition; and if any one will observe closely, he will find that many cases of disturbed digestion, ordinarily attributed to the consumption of fruit, result from just such causes as I have mentioned above.

Why are vegetables cooked? The greater quantity of vegetable matter that we eat consists of starch. The human stomach cannot digest starch, and in order that this substance may be taken into the system it must be converted into sugar. This is done by the action of the salivary secretions, and by the further action of the pancreatic fluid, after the starch enters the upper bowels. Starch consists of microscopic cells, whose contents are surrounded by a dense membrane. The saliva and the intestinal secretions cannot act upon the contents of these cells until this membrane is ruptured and the contents brought into contact with the digestive fluids. This is partly and imperfectly accomplished by the act of chewing, but more thoroughly and uniformly done by the action of heat; and this is the philosophy of cooking vegetables. Besides a well cooked vegetable "makes the mouth water"—excites a free flow of saliva—and thus by a wise law of nature, the secretion required to digest the food, is excited by the smell of the "savory dish." Men are not aware, perhaps, that they swallow unconsciously at least a quart of saliva during the three meals, and about as much more during the intervals in the twenty-four hours; and this secretion is necessary for healthy digestion. Many men rob the stomach of this secretion by wasting it on tobacco, and when dyspepsia follows they vainly attempt to cure themselves by torturing their livers with calomel.

It will be readily seen, that uncooked vegetables are more difficult to digest than those subjected to that useful process. I would caution persons therefore against excessive indulgence in the use of such food, and I will especially mention cucumbers, as likely to excite intestinal irritation. The pealings of fruit and vegetables are altogether indigestible and should never be swallowed.

Why do we cook meat before eating it? The chief nutritive ingredient of animal diet is albumen. This substance is contained in the tissue which surrounds the muscular fibres. A certain degree of heat breaks down this tissue, dissolves the albumen and develops a peculiar aroma which stimulates the appetite and excites a free flow of gastric juice, for animal food is digested by the fluids secreted by the stomach. A long continued heat on the contrary, hardens the muscular tissue, solidifies the albumen, renders the meat insipid, difficult of digestion, and, to a delicate stomach, unfit for use.

If, however, I were to tell a cook that her beef was not properly roasted, I should expect soon to be better prepared for the table than the most of her meat.

If I should intimate that rare beef was better and healthier than when cooked *done* she would call me a cannibal. If I expressed the opinion that broiled meat was more easily digested than fried meat, she

would reply that her father lived to be eighty years old.

If I should venture to suggest any innovation in the baking apparatus, she would proudly inform me that she knew it all. I should be discomforted, cast down, and perhaps badly scalded; so I will now direct our thoughts into channels more accessible than the cook's affections.

DISINFECTION.

Upon no subject ought the people generally to be more thoroughly posted than the use of disinfectants. I am not sure, but that the importance attached to these substances by many persons, has given them undue prominence in the newspapers, for should we believe everything that is written about disinfectants, we should justly wonder why cholera ever breaks out anywhere, or scourges any community of intelligent people. As much as has been said in the papers on this subject, and though many good suggestions have been made, I have never seen, in any popular article, this question presented in such a manner, that non-professional persons could be guided by any principles into a discriminating use of these agents.

Upon what principles are disinfectants used? They are used to prevent putrefactive changes in organic matter, or to destroy the noxious compounds already formed, or to imprison them so to speak, that they may not wander forth in search of victims. To be effectual, however, disinfectants must do more than this; *they must also destroy those peculiar poisons upon which* such diseases as cholera depend.

In strict language, those agents alone which effect this result should be called disinfectants. But the word *disinfectant* in common parlance, is used generically, and includes four classes of agents, viz:

1st. Those which absorb or restrain noxious compounds—absorbents.

2. Those which destroy noxious matter—deodorizers.

3. Those which prevent putrefaction—antiseptics.

4. Those which destroy the *materies morbi* of zymotic diseases—true disinfectants, or antizymotics.

If I were preparing an article to be read before our County Medical Association I should treat this subject in the above order, but as this article is intended for the perusal of the people, I will present the subject of disinfection in a light, which though less scientific, I hope will be of more practical utility.

As the noxious compounds generated by putrefactive decomposition, and the poisons of diseases, especially cholera, exist in the air, in fluids and adhere to solid bodies, the resources of our art must supply us with disinfectants which will attack impurities in each of the above elements. I will therefore treat this subject in the following divisions:

1. Disinfection of air.
2. Disinfection of liquids.
3. Disinfection of solids.

How can foul air be purified? The most powerful means is free ventilation. I will lay it down as a cardinal law of sanitary science, *that no disinfectant can be substituted for the free circulation of fresh air in a room where the sick are confined.*

The external air cannot be disinfected, except by a thunder storm, and the purification of air in houses presents itself under two different circumstances. 1st. The disinfection of vacant rooms and houses. 2. The disinfection of sick rooms. The best plan to disinfect an unoccupied house is to burn it, but the expense attending this method is an objection to its enforcement. The following plan is recommended: First, scrub all the wood work and windows with hot water and soap,

then flood the floors with boiling water; after it dries, close the house and fumigate it with nitrous acid; afterwards whitewash it and fumigate it with sulphurous acid; then scrub the floors and other wood work with a solution of carbolic acid (a pint of the acid to two gallons of hot water.) Let all the windows and doors stand open for ten days when it may be again occupied. Nitrous acid can be generated by placing strips of thin copper plate in glass jars containing nitric acid. Sulphurous acid is prepared by simply burning sulphur in the room. The method above recommended is as effectual as any, the agents can be prepared by anybody at small expense, and it commends itself for its simplicity and general applicability.

Many agents are employed to disinfect the air of sick rooms, but owing to their irritating properties they cannot be used of sufficient strength to be of any great benefit; yet they ought to be resorted to whenever practicable.

Of these agents *Ozone* is probably the best. This element, developed in the air by electricity, is the natural disinfectant of the atmosphere, and its office in the economy of nature is probably to destroy the products of organic decomposition. It is usually absent from the atmosphere, or its quantity diminished, during the prevalence of epidemic cholera, and some have attributed cholera to this cause, but we think upon insufficient data. Its quantity is notably diminished in the atmosphere of cities, and this is doubtless one great cause why pentilential diseases prevail in the centres of trade to a greater extent than in rural districts. Ozone can be developed in a sick room by moistening powdered permomganate of Potassa with Sulphuric acid. It may be prepared in saucers and set in the windows, mantle, or elsewhere about the room, as convenience may suggest.

Chlorine Gas is another popular disinfectant, and though less elegant and more irritating than Ozone, it may be used with great advantage. It can be quickly prepared as follows:

[From Bartholow.]

Take 2 tablespoonsful of common salt,
2 tablespoonsful of red lead,
½ wine glassful of sulphuric acid.
1 quart of rain water.

Mix the salt and lead thoroughly with the water; then add the acid gradually. Chlorine is disengaged, absorbed by the water, from which it slowly escapes; a bottle of this mixture may be kept in a room and the stopper removed from time to time as circumstances may require.

Chlorine, however, should not be used in white-washed rooms, because the Chlorine speedily combines with the lime forming chloride of calcium, which absorbs moisture from the air and keeps the walls continually damp. Should Chlorine be needed in larger quantities, it can be prepared by taking

[Bartholow.]

4 lbs of common salt,
1 lb of binoxide of manganese,
2 lbs of sulphuric acid,
2 lbs of rain water.

Mix and apply heat gently; Chlorine is disengaged and escapes into the air. The preparation called chloride of lime (it is not) used so frequently in sick rooms is of very little value. As a disinfectant its power is feeble, and it emits an odor but little better than that which it is intended to correct. It is often scattered about premises, with the effect of keeping everything that it touches constantly damp, a condition remarkably favorable to the deposit and development of morbific germs. If Chlorine is to be used let some other and better method be adopted. Common lime is much better than the so-called chloride, especially for cellars.

Sulphurous Acid is a more power-

ful disinfectant than either Chlorine or Ozone, but it is too irritating to the throat and lungs to be used among the sick. The same remark applies to *Nitrous Acid*, which is also poisonous even when too much diluted to interfere with respiration. We must always consider the comfort of patients in using these agents, and not do like a friend of mine, who, to kill the Colorado bugs, sprinkled his potato vines with a solution of salt, and succeeded beyond his most sanguine expectations.

Many other substances are useful for disinfecting air in sick rooms, but I have mentioned enough. I have endeavored to select those which are efficient, easily procured, cheap and which can be prepared by any one of ordinary intelligence. If these are thoroughly applied all will be accomplished that can be done to destroy the noxious compounds which poison the air.

The agents which are employed to disinfect liquids are more numerous and more efficient than those used to purify the air. The latter possess feebler disinfectant power, and are valuable chiefly as deodorizers—for the destruction of noxious compounds already formed. The former are antiseptics, and some of them true disinfectants. The water we drink in this county, at least a great deal of it, contains many impurities: 1st, dead organic matter held in suspension; 2d, organic germs; 3d, saline impurities; 4th, the products of organic decomposition—organic chemical compounds the most deleterious of all; 5th, when cholera prevails, the specific poison of that disease. The last of course is usually absent, but every precaution should be taken, in cholera times, to keep the water from becoming contaminated with it.

Drinking water should not be left in a room where there is one sick with cholera, for it will absorb the poison from the air. Choleraic discharges should be disinfected and disposed of at once, for the poison from them will diffuse itself through the air, and infect not only water, but clothing, bedding, furniture and the house itself. Dead organic matter, not in a state of decomposition, suspended in water, is comparatively inert, and can be separated from the water by filtering it through charcoal, sand or gravel. The charcoal, however, should be renewed frequently, as it soon becomes saturated with impurities and if used too long may do more harm than good.

Organic germs can, to a great extent, be destroyed by boiling the water, but this process, by expelling the free oxygen and carbonic acid from the water renders it flat and unpalatable. Still it is the best thing that can be done to destroy the organic germs, and its agreeable taste may be partly restored by pouring it from a height of two or three feet through a sieve, or by churning it for five or ten minutes in an ordinary churn.

Inorganic chemical compounds or saline impurities abound in all the well and spring waters in this county. But practically this is a matter of less importance, since the potable water we use in this county has little, if any, agency in the causation of cholera.

Organic chemical compounds, the products of organic decomposition exist in water to a greater or less extent according to the locality of well or spring. Wells dug deep on elevated points, above out-houses, stables, hog pens and cow lots will contain a small quantity, perhaps only a trace, of these impurities; while on the contrary, wells dug in low places and springs which issue from the soil below, and in close proximity to such masses of decomposing organic matter, must in the

nature of the case be charged with these products, and thereby become injurious to health. In ordinary seasons, they powerfully predispose the system to, or excite such diseases as typhoid fever, diarrhœa and dysentery, and during the prevalence of cholera often precipitate an attack of that disease. The best agent to destroy these noxious *organic* compounds is the peroxide of hydrogen, but this substance is too expensive for general use. The permanganate of potassa answers the purpose very well, but this salt imparts such an unpleasant taste to the water that it cannot be employed. Therefore the abandonment of the use of such water is the proper course to pursue.

No liquids require to be more thoroughly disinfected that the discharges of the sick, and especially those sick of cholera, for beyond any reasonable doubt the rice-water discharges from the stomach and bowels of cholera patients can, and often do propagate the disease. From the great number of agents that have been used for this purpose I will mention the following, viz: Permanganate of potassa, chloride of zinc, nitrate of lead, the sulphates of iron, zinc and copper and carbolic acid, iodine and bromine. Of this list I will especially recommend the sulphates of iron, zinc and copper and carbolic acid. Authors tell us that the sulphates act better when combined. The following is a good combination for general use:

Take 4 lbs. Sulphate of Iron (copperas),
1 lb. Sulphate of Zinc (white vitrol),
1 lb Sulphate of Copper (blue stone),
1 pint of Commercial Carbolic Acid,
2 gallons of Water

Disssolve the sulphates in the water and add the acid afterwards. Five or six tablespoonsful of this mixture will disinfect an ordinary discharge from a cholera patient.

For the disinfection of privies I would also recommend the above mixture, which, in the formula given will disinfect about one hundred gallons of ordinary fecal matter. It should be used about every ten days. A simple solution of copperas is much cheaper and a good substitute for the more expensive mixture. Carbolic acid ought always to be used, either with the sulphates or after them, and as an additional security, charcoal or lime or both mixed together, may be used after the liquid disinfectants.

In considering the disinfection of solids, the first great law is to keep the ground *clean* and *dry*. The cholera poison may be developed by the action of heat upon decomposing organic matter, combined with moisture. To keep the premises dry is therefore almost as imperative as to keep them clean. Swamps and flat places, where water accumulates should be filled up with dry earth, so that the miasm arising from them may not polute the air. The brief history of the sanitary condition of Louisville, recently published in the *Courier-Journal* by Prof. T. S. Bell, is a striking illustration of the power of miasm arising from swamps and stagnant pools of water to favor the production of cholera, as well as the power of sanitary science to remove the evil, and to improve the health of a city, one known as "the graveyard of the West."

A good disinfectant for solids, such as buildings, fences, stables, &c., is lime used in white-washing, and the intense glare of this substance may be obviated by adding to it a little lamp-black, (for particulars see John Bell, of color). This substance may also be used inside of houses, and to increase its efficiency the house may be fumigated with sulphurous acid, which combines with the lime and forms the sulphite of lime, itself an antiseptic. The wood-work and windows of houses should be frequently scrubbed with hot water and soap, and those that have cholera patients in them,

should, in addition, be washed with a solution of carbolic acid (one pint to the gallon). Clothing and bedding soiled with choleraic discharges, as a rule, had better be burned. If preserved they should be boiled for at least two hours in a solution of permanganate of potassa of the strength of two ounces to five gallons of water, and afterwards soaked and rinsed in a solution of sulphate of zinc, (1 lb. to 5 gallons of water). Furniture of sick rooms should be washed first with water, then with a solution of carbolic acid, and then set out doors for several hours.

Of all known agents *heat*, above a temperature of 212°, is the most powerful disinfectant. This is a true disinfectant; it destroys noxious compounds already formed, it prevents putrefaction, and it destroys the poisons that cause disease. It therefore accomplishes everything that can be accomplished by this class of agents and should be resorted to whenever practicable. Carbolic acid is another true disinfectant, and should be freely used whenever it is impracticable to employ the more powerful agent. The sulphates of iron, copper and zinc, chloride of zinc, nitrate of lead, iodine, bromine and the mineral acids are antiseptic, and rank subordinate, as disinfectants, to heat and and carbolic acid, though for the purposes designated in this paper, they are quite efficient.

Chlorine, ozone, sulphurous acid, and nitrous acid, though to a minor degree disinfectant and antiseptic, are the most powerful deodorizers, and for the purpose of purifying the air are the most efficient agents yet discovered.

In regard to public disinfection I have little to say. We have no organized sanitary system by which much can be done in that direction. Beyond proper attention to cleanliness, the removal and burial of all dead animal and vegetable matter that may accumulate in the streets, and the condemnation of private nuisances, our city Council has but little authority. I am glad to bear witness to the fact that these measures have been carried out by the proper officers as faithfully as circumstances will permit. Our sanitary condition, however, still remains quite imperfect; but this is to be charged more to the negligence of private individuals than to the Board of Trustees, who have neither the authority nor the money to correct it. If our citizens generally will use disinfectants freely, keep their premises *clean* and *dry*, and take such other precautions as their intelligence may suggest, or as may be pointed out by their physicians, we may reasonably hope that our town may escape the ravages of cholera. If these means are neglected, posterity may learn lessons of wisdom from our folly.

IS CHOLERA CONTAGIOUS?

It can be carried from one person to another, upon clothing, bedding, merchandise and other articles in common use. All medical writers agree upon this point, though some who admit that it is *portable* deny that it is contagious. The observations of the ablest recent writers on this subject fully demonstrate that the discharges from the stomach and bowels of cholera patients may excite the disease when introduced into the bodies of other persons.

But is it infectious, or contagious as generally understood by this term? After a careful examination of this question, I must express the opinion that it is. It certainly is not contagious to the same extent that small-pox or measles is, but, that a person may contract it by infection, is, I think, by the recent testimony of medical research very clearly established. Can the difference in the degree of activity of the contagion of different diseases be explained? I think so.

Specific diseases depend upon the operation of two distinct causes. 1st. There must be a specific poison taken into the body, which, if intense or absorbed in large quantities, may cause the disease without any previous predisposition. 2d. a certain condition of the body, upon which the virus of ordinary intensity can operate; a soil, so to speak, properly prepared in which the germs of disease can grow, mature and multiply. Experience proves that the human body is always, (or nearly so) in a proper condition to receive and develop the virus of small-pox; though the severity of this disease is greatly modified by the condition of the system. Some epidemics of it are much more than others, and when the contagious matter is transplanted to a soil unprepared to receive it—as in the practice of inoculation—the small-pox is so greatly mitigated as to be robbed of its dangerous character.

The development of cholera unquestionably depends upon a specific poison, nor can this disease be excited unless this peculiar virus be present. Experience proves that the human system is not, under ordinary circumstances, in a suitable condition to develop the disease, but generally it must be brought under the influences of those predisposing causes, which have been mentioned, such as the inhalation of miasm arising from decomposing organic matter, before the specific cause of the disease can excite an attack of it.

If this proposition be true it removes the weight of objections to the infectious nature of cholera, which has been urged against it, by those who have compiled volumes of illustrations which apparently proved cholera to be non-contagious. The instances cited really prove nothing, for though a thousand persons be exposed to the exciting cause of the disease, none of them can take it unless their systems have been prepared to develop the poison. The conditions required to develop the disease are not present and hence they escape it.

On the contrary, a thousand cases cited to prove the contagious nature of cholera may prove nothing, since all such cases may have been brought on by the prevailing epidemic influence; but if it is proved that cholera can be transported in clothing, and on the person, from one to another, and if it is further proved that the choleraic discharges can excite the disease, that is, that the virus of cholera is communicable by the ordinary means of human intercourse, and by direct contact with the discharges which contain it, does it do violence to reason or analogy, to assume that the poison which excites the disease, may diffuse itself through the air and thereby become infectious? Moreover, when it is remembered that the original exciting cause of cholera pervades the atmosphere, and that the poison contained in the matter ejected from the stomach and bowels of patients sick with this disease is doubtless identical with this original poison, can any reasonable mind doubt the infectious nature of cholera? Moreover, when a thousand clinical facts accumulate to point to this origin of the disease, and to this origin alone, is not the proof convincing, if not conclusive?

In expressing my opinion of this subject I have given no illustrations, since the question is to be determined by facts and not by illustrations. A just conclusion must be drawn from a knowledge of pathological processes as applied to demonstrable facts, and not from cases piled mountain high by the advocates on each side of this question. I may venture to say, however, that a majority of recent writers, who have made cholera a special subject of investigation, will sustain the opinions herein expressed.

However, whether cholera be infectious or not, due caution should be exercised by those who take care of cholera patients. All clothing and bedding soiled with discharges should be at once removed, and thrown into a tub of boiling water properly disinfected. The discharges from the stomach and bowels should be at once disinfected as heretofore recommended. Nurses should keep themselves clean, and when persons leave the house and mingle with others, they should wash themselves, and, if possible, change their apparel. *Choleraic discharges should never be left standing in the room or about the premises*, but after being disinfected they should be buried as far from the spring, well or cistern as circumstances will permit.

I will close this number with the following quotation from AITKEN'S SCIENCE AND PRACTICE OF MEDICINE: "The experience of 1865 and 1866 confirms all previous experience as to the propagation of cholera, so well summed up by Mr. Simon in his official memorandum of July 1866. In it he assured the public, that cholera is so little contagious, in the sense in which smallpox and typhus fever are commonly called contagious, that, if proper precautions are taken where it is present, there is scarcely any risk that the disease will spread to persons who nurse and otherwise closely attend upon the sick. But he admits, it is not less true, that all matters which the patient discharges from his stomach and bowels are infective, that the patient's power of infecting other persons, is due entirely or almost entirely, to these discharges; that these, however, are comparatively non-effective when first discharged, but afterwards, while undergoing decomposition, acquire their maximum of infective power; that, if cast away without previous disinfection, they impart their own infective quality to other excremental matter: that if they get access, even in the smallest quantity to wells or other sources of drinking water, they may infect very large volumes of water; that the infective influence of choleraic discharges attaches to whatever bedding, clothing, towels and like things have been imbued with them; and that thus *even a single case of cholera may exert a terrible power over large masses of population*, if local circumstances co-operate."

Clinical observations demonstrate that the cholera poison can be generated by the action of heat and moisture upon decomposing organic matter. This miasm is probably not identical with malaria which produces intermittent and bilious fevers, as some able writers believe, though in many particulars they are governed by the same laws. The most important of these laws, in a practical point of view, is *that the mortality is inversely as the altitude.*

"This law of altitude," says Dr. Watson—"so important and so practically valuable—is but an expression of the result of many concurrent circumstances. The material poison of cholera will be likely to gravitate as the marsh poison gravitates with which it has many points of analogy, to the lowest part of the atmosphere; where the high barometrical pressure is the greatest, and the vaporous diffusion therefore the least; where unwholesome exhalations from the soil and from water are the most abundant; where the dispersing and diluting influence of the winds is least felt. Indeed the air may be completely stagnant, while on the neighboring heights a brisk breeze is blowing. The lower regions of the atmosphere are the hotter also as well as the moister; and under the agency of a high temperature the organic impurities with which the air is charged runs more readily into decomposition.

The inverse law of altitude is therefore an intelligible law." Such being the law it behooves every one who contemplate building houses, to erect them on high points; and it is a wise precaution for every one to occupy the upper stories for sleeping apartments whenever practicable. This point is especially urged by Prof. T. S. Bell, of Louisville, whose advice on this subject is well sustained by his large experience and close observations, in the numerous exidences of cholera which have visited Louisville during the last half century.

Another law, scarcely less important, is *that the mortality of the disease is inversely as the distance from the source of the miasm*, and as a practical application of this law, every one should erect houses as far from flat, marshy or swamyy localities as circumstances will permit him; and further, if practicable, to fill up all such places with dry earth, and thereby abolish the source of the infection.

And now, on the home stretch, I propose a few words in regard to the treatment of cholera, or rather to the general management of such patients in the absence of medical attendants. I will preface my remarks on this part of my subject, by advising persons to secure the services of a physician as soon as possible; not only when the patient is stricken down with the more violent symptons of cholera proper —vomiting, purging and cramping —*but more especially during that premonitory stage of diarrhœa which ushers in nine cases out of ten of genuine cholera.* In this stage proper treatment may save many valuable lives, and the life of a human being is too precious to be entrusted to those who are unacquainted with the pathology of disease, or the action of remedies. Yet there are times when a physician cannot be consulted, and the people ought to have such general information as to lead them into an intelligent use of medicines, or at least to restrain them from doing harm.

I am almost prepared to say that the antecedent diarrhœa of cholera in a majority of cases, is improperly treated by non-professional persons. It cannot be otherwise. The treatment of every disease depends upon circumstances which such persons are unacquainted with, or being acquainted with, do not know what relations they bear to each other. Besides every case of disease is peculiar to itself, and must be treated according to the indications pointed out by its peculiar symptoms.

Dr. Flint, in his "*Practice of Medicine*," tells us that in his practice, diarrhœa preceded the cholera in thirty-four out of forty-five cases. Dr. MacLaughlin, one of the sanitary inspectors of the city of London, reports to the board of health of that city, that of 3,902 cases of cholera, the premonitory diarrhœa was not absent in a single case! "Of one hundred and forty-two cases treated in hospital in Paris, by Michel Levy, the premonitory diarrhœa was wanting in only six." Of nine hundred and seventy-four cholera cases, treated in the different Parisian hospitals in 1853, the antecedent diarrhœa existed in seven hundred and forty cases. I quote the following language from Dr. Watson, the Prince of medical authors:

"The epidemic cholera made its attack in two different modes. In one it seized upon the patient suddenly, and without warning. This was comparatively rare. Much more commonly the specific symptoms were preceded, for some little time, even for several days, perhaps, by diarrhœa. And this I take to be the most important practical fact that was ascertained during its prevalence among us. When the disease was once fairly formed, medicine had very little power over it; but in the preliminary stage of

diarrhœa it was easily manageable. Unfortunately, people are inclined to regard a loose state of the bowels as salutary; and to make no complaint of it, and to do nothing for it; or, in other cases, they conceive it to proceed from some peccant matter within, which requires to be carried off, and they take purgative medicine to get rid of it. *Both of these are serious and often fatal mistakes.* Mere neglect of the diarrhœa frequently permitted it to run into well marked and uncontrollable cholera; and the employment of purgatives hastened or insured that catastrophe."

* * * * "Certain practitioners maintain that the disease is to be remedied by introducing into the system a large quantity of neutral salts, which is to liquify and redden the blood, and to restore the functions of respirations. But of this practice, it is said in a sorry, but rue jest, that, however, it might be with pigs or herrings, *salting* a patient in cholera is not always the same thing as *curing* him." (In the latter part of this quotation I have sabstituted the present for the past tense as it occurs in Watson's Practice.) The duration of this premonitory diarrhœa varies from a few hours to several days, and as a general rule, the shorter the stage of diarrhœa the more severe are the more specific symptoms of cholera, and conversely, the longer the diarrhœa continues the more hope there is of a patient's recovery from the graver disease.

What is the proper treatment of this premonitory diarrhœa? With few exceptions, the voice of all medical writers is against the use of purgative, and it seems to me, that the dictates of reason will, in this respect, sustain the almost unanimous experience of our profession.

It is true the bowels ought to be active, that is, they ought to perform their functions, which is to expel certain excrementitious matter from the body. But looseness of the bowels, is no evidence that they are active. On the contrary it is proof that they are in an unhealthy condition; and being in an unhealthy condition, they cannot perform their functions, and the excrementitious substances which should be cast off by the bowels are retained in the blood, and assist in putting the system in a condition favorable to an attack of cholera. Besides the bowels are unable to absorb material designated to nourish the body, and thus the system is weakened and disease invited. *The premonitory diarrhœa should be checked as soon as possible.* This can be done by using *opiates, arsmatics and astringents.* Opium undoubtedly stands at the head of the list, and when given in some of its common forms, such as laudanum or black drop, combined with a little spirits of camphor, tincture of pepper, essence of ginger, or French brandy, in my opinion, it is better than any of the mixtures gotten up by enterprising druggists for the cure of the disease. Opium is the efficient agent in all the preparations recommended for cholera, that I have ever seen published in the newspaper. Many of these mixtures are very good if properly used; for here as elsewhere in the treatment of disease, as much depends upon the time, manner, and quantity of a remedy to be given, as upon the remedy itself. The prescription published in the SENTINEL of June 19, purporting to be adopted by the college of Physicians of Philadelphia, is a most excellent combination—as good as any I have ever seen published. Barnum's prepation published in the same paper at the same time is also a good one. Jenkin's mixture, so extensively used by the citizens of Louisville in the summer of 1866, is also an excellent and efficient preparation, but it must be cautiously given to children as it contains a considerable

quantity of chloroform. If every one will supply himself with a half pint of French brandy, one ounce of laudanum, two ounces of spirits of camphor, and a bottle of Brown's essence of Jamaica ginger, he will be tolerably well armed for emergencies, and if these agents do not check the diarrhœa, he should lose no time in summoning a physician. An ounce of brandy, twenty-five drops of laudanum, half teaspoonful of spirits of camphor, and a teaspoonful of ginger taken in a wineglass of water is a dose for an adult. Whilst I have mentioned these remedies, and pointed out some indications for their use, I must offer my protest against the practice of many persons in prescribing for themselves. Doctors seldom trust themselves in their own persons or their families, and surely the general public cannot claim any greater degree of coolness or judgement than members of the profession. And I cannot be accused of personal motives in condemning this habit, because it is the universal testimony of physicians, that those who do the least prescribing in their own families, have the least doctors bills to pay.

I have dwelt at some length upon the premonitory diarrhœa of cholera and its treatment, because practically, (so far as the public is concerned at least) this is the treatment of cholera. Little can be done after the graver symptoms occur. Before proceeding to this point, however, let me remind the reader that my remarks are made in reference to *choleraic* diarrhœa, and must not be considered as applicable to other kinds of diarrhœa, some of which require very different modes of treatment, from that above recommended; and I will further observe that the remedies mentioned must be conjoined with a mild diet, and rest in the recumbent position, for without these means all the "cholera drops" in America will avail but little.

The treatment of cholera proper is very simple. The mortality in this disease is about forty per cent, varying according to the nature of the epidemic, and the circumstances of the patient; and as a rule not modified much by any method of treatment yet devised. Stimulants, opiates and calomel have been the sheet anchors in its treatment and I don't know that we have improved on it much since these remedies were first resorted to in 1832. The difficulty is that almost everything we put into a patients stomach is soon thrown off, and little of the remedy really enters his system. The improved method of introducing remedies under the skin will, it is hoped, prove to be a valuable expedient in the treatment of cholera, and the results of this mode of treatment, so far as the meagre reports enable us to judge, encourage us to give it a full and fair trial, whenever the disease again breaks out among us.

I have been asked if cholera patients should be allowed cold water. Water is one of the very best remedies that you can give them. In this disease, death results from draining away of the watery parts of the blood, until this fluid becomes so thick that it cannot circulate through the capillary blood vessels of the lungs, and of the general system. Now it is a cardinal rule in practical medicine to restore lost constituents of the body by the most available means. Water, therefore, should be administered to the patient freely, and yet judiciously. If you let him drink as much as his craving thirst demands, he will overload his stomach and at once throw it up. Give him small quantities of water—say half a glassful—at short intervals and he may retain part of it. which, not only quenches his thirst, but by supplying a lost constituent of the blood,

may save his life and restore him to health. Water may be made more refreshing by adding a little sulphuric acid to it; or lemonade may be used instead of plain water.

And now my task is done. I have endeavored to lay before the people such principles of public hygiene, as would guide them into an intelligent use of those preventive means by which they can stay the progress, or mitigate the violence of a remorseless scourge. In endeavoring to give information to the public I have tried to be on the side of the whole truth, instead of having part of the truth on my side. If I have expressed any opinions which are untenable I will cheerfully recant them.

These papers are before the public for approval or condemnation, and whatever errors they may contain, I hope may not detract from the good intentions of the writer, in laying before the readers some of the more important facts connected with the production and prevention of cholera. A fair criticism will not offend the writer, and unfair criticism can do the papers no harm.

THE AGENCY OF WATER
IN
CAUSATION OF CHOLERA.

The relation of impure water to the production of cholera has recently excited some interest, and the importance of the subject demands a fuller exposition of the views generally maintained by the medical profession upon this subject, than has heretofore been given to the public.

If we bear in mind the principles already laid down in regard to the causation of this disease, we see at once that no kind of water, unless charged with the cholera poison, can excite cholera. But, it is evident that waters impregnated with deleterious impurities, especially animal excretions, and the products of organic decomposition, will, if used for drinking purposes, induce such a state of predisposition in the system, as to invite an attack of cholera, if the exciting cause of the disease be present.

Again an attack of cholera may be precipitated, in the person of one whose system has been exposed to the exciting cause of the disease, when there is no predisposition by drinking waters charged with impurities. In the causation of cholera therefore, impure water may, by containing the specific poison of the disease act as an exciting cause of cholera; or by containing impurities deleterious to health, act as a predisposing cause; or when the exciting cause—the specific virus—has been absorbed into the system, it may act as a determining cause.

That no kind of water, can protect the system from cholera, is evident from the fact, that the disease has frequently prevailed in localities when the purest of natural waters has been supplied to inhabitants for drinking purpose. From the observations of Budd, Pettenkofer, Gunther and others it has been positively determined that "cholera can do its very worst, when the drinking water can play no possible part in its dissemination." It has been maintained by many that cholera prevails more generally and more severely in limestone regions, than in countries where free stone water is used exclusively, but no facts have yet been adduced to sustain the assertion. We may lay it down as a principle, that limestone water, of ordinary purity, has little, if any, relation to the prevalence or severity of cholera epidemics. It may also be stated as a law, that no kind of drinking water can produce cholera, unless the virus which excites the disease be contained in it.

Dr. T. S. Bell, of Louisville, has recently asserted that "there is not a single fact that shows that drinking water, of any kind, ever produced a case of cholera, or had any agency in its production." In the strict construction of his language this proposition may be true, and his further declaration that "there is not in the entire domain of nature a single instance, in which two causes are used for one *specific* effect," may be accepted as sound philosophy. In a strict logical use of language, water which contains the cholera poison, does not itself produce the disease, but only acts as the medium through which the virus is conveyed into the system. The same may be said of water that produces any other disease; it is not the water, strictly speaking, but the impurities it contains; but this is not the signification usually attached to language in common parlance, and, practically speaking, impure water is the agent which causes diseases. This is the sense in which it is generally used by medical writers and

understood by physicians and by the people. If by the word *cause* in the above quotation, Dr. Bell, means the sum of all the conditions necessary for the development of cholera, and includes, as I presume it does, the conditions of the body acted upon, and the specific agent acting upon it, then he is unquestionable correct. If by the "production" of cholera he means as I presume he does, the development of the disease by the agency of this specific poison, then of course no kind of drinking water can have any agency in its production. But Dr. Bell will not deny that impure water frequently induces conditions of the system, in consequence of which, the exciting cause of cholera produce the disease in persons, who otherwise might have escaped it; nor will he deny that the use of impure water for drinking purposes, may precipitate an attack of cholera, in a person who has been exposed to the specific poison of the disease.

Impure water, then, whilst it is not an essential element in the production of cholera has, indirectly, an agency in its causation. And what is more reasonable and natural? Cholera, whatever may be its specific cause, is a disease whose chief force is expended on the digestive organs, especially the stomach and bowels; impure waters of all kinds are especially prone to induce disease of these organs especially dyspepsia, diarrhœa and dysentery, and can any one doubt that, an agent which so frequently and so seriously impairs the functions of the digestive organs, often acts as a predisposing and determining cause of cholera? such in my opinion, is the relation which impure water bears to the production of cholera, and such I assert is the view generally entertained by the medical profession on this important question. The following language from AITKEN'S SCIENCE AND PRACTICE OF MEDICINE, will sustain the opinions herein expressed. "That impure water has a powerful influence over the intensity of cholera outbreaks is now unquestionably established by the observations of Drs. Acland, Sutherland, William Budd, Parkes and the late Dr. Snow, and by the specific inquiries of the Registrar General and Mr. Simon. Yet still it is found that impure water is not a necessary element in the generation of the cholera poison. * * * The localized attacks at Treydon Bois, in 1865, in the east of London and in Southampton, in 1866, all point unequivocally to impure water. With the *general outbreak* at Southampton, however, impure water had nothing to do."

The comparative purity of the water of springs, wells and cisterns, depends on so many circumstances that no general rule can be given. It is simply a question of words not of facts, and can lead only to dispute, not to a discussion. Some wells yield waters purer than cisterns and *vice versa*. The purity of each depends on the locality, the mode of construction, the quantity of water which runs into it, the amount used out of it, the care that is taken to exclude impurities, the depth, temperature and other conditions too numerous to mention. This is the whole truth about a question of little practical importance, which has recently lead to such an unprofitable dispute.

I am satisfied that impure water has a powerful influence over the severity of cholera epidemics; but I believe that the water we drink in this county has no more to do with the production of that disease than the harmless vegetables and fruit which a beneficent Providence provides for our wants and comforts.

Is Cholera of Malarious Origin?

The affirmative of this question has been ably advocated by Dr. T. S. Bell, of Louisville, and undoubtly this gentleman has brought forward many important facts to sustain his opinion. Dr. Bell, perhaps, knows more about the history and phenomena of cholera, in all its minute details, than any living man. He has maintained his position with such an array of facts, by such a vigor of thought and by such a strength of expression as almost to annihilate all opposition to his cherished theory. That the specific poison of cholera has many points of analogy with paludal malaria, the specific poison of chills and fevers is a well demonstrated fact; and beyond question the poison which produces cholera can be generated by the action of solar heat upon decomposing organic matter combined with moisture.

The word *malaria* literally means *foul air*, and if by the term we are to include all noxious poisons which pollute the atmosphere, then I believe that cholera can be produced by malaria in the strictest sense of the word.

This disease sometimes breaks out in secluded places where it is impossible to trace its origin to contagion; where local causes have been discovered, and with their abolishment the disease has disappeared. Medical researches have established the fact, I think, that cholera cannot prevail in any locality unless local conditions co-operate in its production; and this is almost equivolent to saying that this disease is the product of local causes, since a cause which requires so many local circumstances to render it operative can scarcely be considsidered a cause at all.

The more I study the phenomena of diseases, in the light of modern pathology, the more I am disposed to discard the vague notions in regard to diseases which formerly prevailed, and the more I find myself drifting to the conclusion, that all diseases, not propagated by contagion *exclusively*, result from the concurrence of local causes; and though this doctrine may now meet with strong opposition, I feel assured that, eventually it will be established as one of the cardinal principles in the science of pathology. A specific disease must depend upon one cause; and if any local agent must co-operate with the specific cause of cholera for its production, then we have two causes producing one specific effect which, to my mind, is unintelligible. But since the supposed "epidemic constitution of the atmosphere" is merely hypothetical—a vague expression to conceal ignorance—and since these local conditions required to engender the cholera poison is a demonstrated fact. I must look to these local conditions alone for the production of cholera.

And yet it seems to be clearly established that cholera is contagious; nor is there anything contradictory or unphilosophic in the theory that this disease may be the product of purely local causes, and yet be contagious. In this respect it has a perfect analogue in typhus fever which often arises from spontaneous generation and then spreads by infection. But cholera is not developed by contagion *exclusively*; local conditions are essential to its production, and it is found that these local conditions are just those which generate all sorts of poisons which contaminate the atmosphere and which are comprehended under the generic term, malaria. The ambiguous use of this word—malaria—has, I have no doubt, lead to a great deal of confusion and apparent difference of opinion among medical men, who hold essentially to the same views on this subject. I shall use the word in its generic meaning, and to distinguish the poison of cholera from the malaria which produces chills and fever I

shall call the latter *paludal* malaria. In the generic sense of the word I believe that cholera is a disease of strictly malarious origin; that it can be produced only in localities where the conditions exist, necessary for the generation of the peculiar poison upon which the disease depends. And while I believe that cholera is, to a limited extent, contagious, I cannot believe, as some do, that a disease so slightly infectious, can be spread all over the world by means of contagion alone.

I am therefore strongly tempted to believe that the accounts so frequently given in medical books, of cholera *marching* from India through Persia, Arabia, up the waters of the Danube through central Europe, northwards into Russia, southwards into Africa, westwards into England and France and finally across the Atlantic ocean to America, is more the result of imagination than sound logical deductions, and decidedly more graphic than accurate

The fact, that local conditions must co-operate in the production of cholera, a principle which seems to be clearly established by the researches of Drs. Barton, Carpenter, Pettenksfer, Snow and others, is, in my judgment, quite sufficient to demolish all such "cunningly devised fables" as many writers indulge in—writers who in fact accept as true, principles utterly at variance with their graphic descriptions of the marchings and countermarchings of a plague submissively obedient to local authorities! Can any proposition be more self-evidently absurd?

Such is my belief in regard to the production of cholera: 1, that the disease is caused by a specific poison, which can produce no other disease, and that cholera can be produced by no other cause. 2, that this poison is generated by the action of heat upon decomposing organic matter combined with moisture, hastened or delayed perhaps by other agencies unknown; that this poison may be confined to the vicinity in which it is generated, causing sporadic cholera; 3, that this poison, under suitable conditions, can be increased by its own multiplication; that cholera can be propagated by contagion; and that, when these two modes of its production are combined, its virulence is greatly increased constituting what is known as epidemic cholera.

The relations which cholera poison bears to paludal malaria are very intimate and have lead some physicians to look upon them as identical. In many respects they manifest the same properties and are governed by the same law; they exist together in the greatest quantity, and act with the greatest violence in the same localities; they are probably derived from the same sources and can be destroyed by the same agents; the same preventive means which protect the system against the deleterious influence of one will, to a great extent, ward off the destructive power of the other; and these facts will suffice for practical purposes.

There are, however, some facts which, it seems to me, militate against the theory that these two poisons are of the same nature. In the first place I think the contagious nature of cholera poison has been clearly demonstrated, and no one, I believe, ever maintained that paludal fevers are infectious. In the second place, if we may believe the testimony of credible witnesses, cholera has prevailed in localities where no case of peludal fever was ever produced by local causes, and where the local conditions necessary for the development of peludal malaria do not exist.

Some parts of Scotland, for instance, where malarious fevers are unknown, have experienced severe visitations of cholera. It may be in past ages things were different in

Scotland to what they are now; that then malaria was generated there, and that the present generation of Highlanders have inherited the *latency* of this prolific poison from the surviving memories of their ancesters. If this don't explain it, I am forced to the conclusion that some other agent is the specific cause of cholora.

The negro race is singularly exempt from the influence of paludal malaria, and yet negroes seem to be peculiarly prone to attacks of cholera, and in many localities in the Southern States, during the present epidemic they have been the chief, almost exclusive sufferers from this disease.

A cause to be a specific and only cause must always produce its specific effects, for a cause sometimes active and sometimes inoperative is an absurbity. If any agent can determine paludal malaria to produce fever at one time and cholera at another, or different effects at different times, then we have two causes producing one specific effect, which is a contradiction, since "there is not in the entire domain of nature a single instance in which two causes are used for one specific effect." Many circumstances may determine a cause to produce its specific effect, but when any agent can determine a cause to produce different effects, then these effects cease to be specific. We must therefore conclude, either that cholera is not a specific disease, and may be the product of many concurrent causes, or that the specific cause of this disease is not paladal malaria. The most reasonable deductions which it seems to me the facts in the case enable us to make are, that the poison which produces cholera is a malaria, developed under circumstances similar to those which engender paludal malaria, but different from the latter in many of its essential properties; that paludal malaria is a most powerful predisposing and determining cause of cholera, increasing the severity of the disease when it prevails as an epidemic, and when it prevails sporadically, enabling it it to sieze such persons as are or have been exposed to the pernicious influence of this poision.

Paludal malaria, according to the intensity of its action, or to the amount absorbed into the system and other circumstances, does produce fevers of different grades of severity; but I cannot see how we can attribute cholera to its agency unless we look upon this disease as a mere sympton of paludal poisoning, and regard malarious fevers, yellow-fever, cholera, &c., as depending upon the same pathological changes in the system—a theory which it seems to me ignores many of the most important and distinctive phenomena of these different diseases, especially of cholera. Therefore I think that, unless we degrade cholera to the level of neuralgia or tooth-ache, we must consider the poison of cholera as peculiar to itself, generated under circumstances different from the development of paludal malaria; that cholera is disease specific in its nature, and that its symptoms result from pathological changes essentially different from those produced by paludal malaria. The fact is that, if marsh malaria can produce all the diseases which is claimed for it, then none of these diseases are of a specific nature, and they can result from other causes; and yet those who maintain that this poison produces cholera contend, with equal vehemence, that cholera is a specific disease, which, to my mind, is a puzzling inconsistency. It seems to me that the facts, which have been observed in regard to cholera, lead us to believe that the malaria which produces this disease is of pythogenic rather than paludal origin.

APPENDIX.

On page 17 will be found the following language: "In this disease (cholera) death results from the draing away of the watery parts of the blood, until this fluid becomes so thick that it cannot circulate through the capillary blood vessels of the lungs and of the general system." In a practical sense, perhaps this is true, though it is not scientfically correct. Indeed a closer study of the phenomena of cholera has lead me to believe that the above statement, though sustained by good authority, implies a pathological error.

In this disease the blood does not fail to circulate through the capillary blood vessels of the lungs and of the general system, in consequence of its insipissation, nor as the result of weakening of the heart's action, but because of the spasm of the muscular coats of the arteries both in the lungs and throughout the body. The draining away of the watery parts of the blood, and the thickening of that fluid are secondary effects of this vascular tetanus, so to speak, which is produced by the poison circulating in the blood and acting directly upon the nerve centres. This vascular contraction is the result of impaired function of the vaso-motor nerves, and not irritation—a sort of rigor mortis beginning before death. The characteristic coldness of cholera is likewise, probably, the result of paralysis of the vaso-moter nerves and of other nerves that govern the function of nutrition, in consequence of which the vital action of the parts ceases, and animal heat is not developed. I am inclined to believe that the purging and vomiting in cholera are caused by this vascular spasm, which, beginning at the extremities and in the skin, forces the blood into the internal organs and its watery constituents through the extensive and delicate mucous membranes of the alimentary canal. If this be the case the kidneys will be engorged (as stated by Aitken) and we will probably find albumen in the urine, a question which has not, I believe, been elucidated, and yet it is one which, it appears to me, possesses great interest both in theory and practice; for by this means we might be able to determine a case of cholera from an aggravated attack of cholera morbus. The latter disease evidently depends upon some morbid endosmotic change in the absorbing membranes of the stomach and bowels, by which the current of the fluids flows from the blood into the bowels, instead of from the alimentary canal into the blood as in health; it is a disease of the stomach and bowels and draws the blood towards the centre, leaving the external parts simply exsanguine, whose functions are speedily fully restored as soon as the cause is removed. Cholera, on the other hand, is a disease primarily of the nerve centres, whose function is impaired by a specific poison circulating in the blood; the vaso-motor and other nerves of nutrition become paralysed and a vascular tetanus results; by this spasm the blood is forced into the internal organs and its watery ingredients into the stomach and bowels; it is a disease of centric origin, reflected externally, it commences as death of the extremities and gradually extends inwardly towards the vital parts until every spark of vitality is extinguished. To cure cholera is, practically speaking, to restore dead parts to life; and if this can ever be done, it will not be any remedy that will relax the vascular spasm sim-

ply, nor restrain the discharges from the bowels, but by the action of a remedy that will restore the functions of the ganglionic system of nerves.

These indications, in my judgment, can best be fulfilled by the use of the salts of morphia, atropia, and quinia. In this connection, I will mention an interesting case—not strictly speaking of cholera—but of nerve poisoning, which I believe would have terminated fatally but for the timely administration of quinine. A negro woman, aged forty-five, of good health and robust appearance was attacked with a painless diarrhœa, and, when the ordinary domestic remedies failed to relieve it, I was sent for: I gave her opium in the evening about 4 o'clock. Saw her next morning—no improvement, discharges getting larger, more frequent, and somewhat painful. The peculiar weakness of her pulse and a heavy white fur on a pale flabby tongue suggested the use of quinine. I left some powders composed of quinine and morphine. That evening I was sent for in haste to see her; found her hands and feet cold and shrunken; she had four or five large watery discharges since I saw her in the morning; no nausea or vomiting. Her face presented no shriveled appearance, but there was a peculiar distressed expression, which I never saw in cholera morbus or diarrhoea. She complained of no pain, but a sense of severe suffocation and of distention in the regions of the heart and stomach. She was moaning as it in great pain but complained only of the distention and "tightness;" pulse 120 and remarkably weak. Here were symptoms evidently of nerve poisoning, of vascular spasm, of centric congestion, which, to be relieved, must be done promptly. She had taken only one of the powders I left in the morning. I at once gave five grains of quinine and one-half grain of morphine; put up other powders of 2 grains of quinine to be taken every two hours, with directions to send for me during the night if she got worse. I found her next morning relieved of the distressing symptoms. and by continuing the quinine for a week she made a good recovery. No doubt could exist in my mind as to the cause of this attack. She lived in an old one story frame house; about fifty or sixty yards to the windward from the house was a large pond, which had recently been drained. This pond received all the refuse, and animal excretions from a stable and cow lot close by it. It contained, in an area about sixty feet in diameter, at least eighteen inches deep, a mass of putrescent mud, animal and vegetable matter undergoing decomposition, and kept continually moist by the rains which about that time were falling almost daily. This mass, exposed to a July sun, aided by the efluvia exhaled from a hog pen adjoining it, was, to my mind, the source of the poison, which produced the symptoms I have described; and goes far, I think, to establish the proposition I have advocated in this paper, that cholera is produced by malaria of pythogenic origin; for though I cannot claim that this was a typical case of cholera, I entertain no doubt that these symptoms were caused by the choleraic poison, and was characterized by the same morbid changes in the nervous and vascular systems that distinguish cases of a graver nature. In fact such cases are better ones for clinical study than those that terminate speedily in death.