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CHOLERA OF 1873.

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Author!

W. R. SEVIER, M. D.,

JONESBORO, TENNESSEE.

[REVISED.]



For sale by Ogden Brothers, Booksellers, Binders and Printers, Knoxville, Tenn.

CHOLERA OF 1873

BY W. R. SEVIER, M. D.

JOHNSBORO, TENNESSEE.

FROM THE LIBRARY OF THE OBSERVATORY, WASHINGTON, 1873

TO CAPT. JOSEPH JAQUES,

MAYOR OF THE CITY OF KNOXVILLE, TENN.

In appreciation not of the integrity, capacity and energy which have secured him success and eminence among business men; nor of those minor, but not less distinctive virtues which, in the esteem of the world, generally constitute the graces of personal character; BUT ALONE OF HIS UNIFORM, LARGE-HEARTED AND OPEN-HANDED BENEFICENCE TO THE POOR is this little 'brochure' dedicated, with an expression of the hope, confidently entertained, that in the practical application of the principles and truths which it contains will be found great relief from the scourge of which it treats.

W. R. S.

Jonesboro, Tenn., March 1878.



CHOLERA OF 1873.

BY W. R. SEVIER, M. D.

JONESBORO, TENNESSEE.

[FROM LANCET AND OBSERVER, DECEMBER, 1875.]

[REVISED.]

[NOTE.—Jonesboro is an old town, the oldest indeed in the State. It is situated directly on the line of the East Tennessee, Virginia & Georgia Railroad; nestling among stately hills, and enjoying an altitude of 1,734 feet above the ocean level. The supply of water is abundant—derived from springs and wells. A creek of considerable size courses rapidly through the southern part of the town, having its origin about a half mile outside the Corporation limits. The town and suburban population does not exceed 1,500. The health of the locality had been excellent, for some two or three years, prior to the advent of Cholera.]

No record of the whole number of cases which occurred during the epidemic at Jonesboro, Tennessee, was kept. I can only furnish the number of deaths, race, sex, and approximately ages, as follows: 15 whites; 15 colored; 16 males; 14 females; under one year, 2; one year and under ten, 1; ten years and under twenty, 3; twenty and under thirty, 5; thirty and under forty, 2; forty and under fifty, 3; fifty and under sixty, 10; sixty and under seventy, 1; seventy and under eighty, 2; eighty and under ninety, 1. Total, 30.

The first case was that of a refugee from the town of Greeneville, on the line of railroad, twenty-five miles west of us, on the 29th of June. This case was of violent character, but recovered. The patient was assiduously and tenderly nursed by one of our kindhearted citizens. The next case, on the 4th of July, was also that of a refugee from the same town. He

was kindly cared for by the same individual, who took him to his house—an humble but healthily located dwelling—where he slept over night in the family room. He was next morning transferred to another building, some two hundred yards distant, where he stayed until his recovery. The symptoms were rather obstinate, but exhibited no malignancy. The next person, and the first among our resident population attacked, was the wife of the individual who had demeaned himself so magnanimously toward “the stranger within our gates.” She died on the fourth day of her illness. Four colored railroad hands, belonging to the gravel train, but having their homes here, next exhibited the features of the disease. Two of these died within a few hours after the attack: a third, living one mile from town, recovered, but his mother, living in the same house, a feeble woman, contracted the disease and died. The fourth died of a fever, consequent on the cholera, some two or three weeks afterward. The disease now rapidly assumed the character of a malignant epidemic. The major part of our population thereupon incontinently betook themselves to various places of retreat; whilst the services of my intelligent associate, E. L. Deaderick, M. D., and myself were wholly engrossed by our business in town, to the exclusion of country practice.

The periods marked by the greatest fatality, were respectively the 29th and 30th of July and the 1st of August. The estimated mortality, up to this period, was forty to fifty per cent. of the whole number attacked.

The general plan of treatment had been based on the use of mercurials, opiates, quinine, brandy, sinapisms, etc. The results were anything but satisfactory. True, many gratifying, and in some instances surprising recoveries took place; but, on the other hand, a number of deaths occurred which, I am now sure, would not have occurred under the treatment subsequently employed. An anxious desire, stimulated by the appalling mortality referred to, to comprehend more clearly and satisfactorily the true pathology of the disease, led to a more diligent examination at the bedside, to a more correct grouping and analysis of symptoms, and, finally, to a result, in theory and treatment, eminently satisfactory and successful. The disease known as Asiatic cholera is essentially *toxicæmia* or blood-poisoning, and

the facts and considerations supporting the theory are as follows :

1. Some patients, when first visited, were found to be in a dying condition, whilst inquiry revealed the fact, in individual cases, that the patient had suffered but little purging, perhaps but one or two discharges, and no vomiting at all. The most rapidly fatal case we had, was that of a negro man belonging to the grave-digging force. He died in a little more than four hours after the attack. In his case there was neither vomiting nor purging. A near relative of the writer died in Greeneville, after eleven or twelve hours' illness, I have been informed, who suffered but two discharges from the bowels, and no vomiting.

2. Cases occurred where death ensued twelve or fourteen hours after all discharges had ceased, notwithstanding the best directed and most diligent efforts at stimulation and alimentation.

3. The mental lethargy, depressed condition of the heart and arteries, feeble respiration, suppressed functions of skin, liver, and kidneys, are not singly, but collectively, of value as symptoms of this poisoned condition of the blood

4. The separation of the constituent elements of the blood, coupled with the rigid cramping of the voluntary muscles, point to the same fact.

5. The almost uniform effect of remedies of conceded disinfectant and depurative virtues was the prompt amelioration of symptoms.

Believing such to be the correct theory in regard to the nature of the disease, I expressed the opinion that "chlorine, in some one of its multitudinous combinations," would be found the effective remedy. The reasoning and facts were submitted to my friend, Dr. Deaderick, who readily and cordially cooperated with me in the practical application of the theory and the remedy. The first case selected was that of an unfortunate "nymph du pave," who had been pulseless for several hours. A strong solution of chlorate of potash was injected hypodermically over each breast, and one and a half to two grains prescribed internally every half hour to hour. Twenty-four hours afterwards, she was found to be still living, but still destitute of pulse. She was next placed on tr. sesq. chlor. ferri, ten to fifteen drops every half hour to hour; and twenty-four hours afterward, she was found to be still alive, but still pulse

less. She was then placed on sol. perchloride of iron, but no appreciable advantage was discovered. She died, having been more than sixty hours utterly pulseless. A recovery might, perhaps, have been obtained in this case but for a miscarriage, which occurred a few hours after the attack,

The litmus test, applied the day before, to the ejections and dejections of a lady dying of cholera, revealed the strong alkalinity of these discharges. In view of this fact, and that the general features of a well-developed case of cholera indicated it, I ordered the following formula :

R Tr. Sesq. Clor. Ferri, ℥vi.
 Hydrochloric Acid, . ℥i.
 Tr. Opii, ℥i. M.

Fifteen to thirty drops, in a wineglassful of water, every half hour to hour, so long as diarrhea continues.

Caution.—Mercurials must not be employed while using this mixture. Give from glass tumbler or teacup. Use no spoon or metallic vessel in administering the medicine.

When but little or no vomiting or purging existed, but other features marking the malignant type of the disease, parties were advised to give, as above, until well-marked and unmistakable evidences of reaction appeared.

The diet, in connection with this plan of treatment, is regarded as a matter of some importance. I prefer rich animal broths, beef tea, essence of beef, chicken broth, etc., to rich milk; for the reason that the latter will form curds with the mixture, which, if not irritating and indigestible, will, at least, engross a large share of the mixture in their formation. The broths I advise to be liberally employed, particularly in that class of cases where the discharges are very profuse.

Of forty-five or fifty cases, and many of them of extreme character, occurring after the formula was adopted, we lost but two, both old brain cases. One laboring under copious serous discharges from the ear, associated with locomotor ataxia; and the other under hemiplegia of right side, of many months standing.

The dose suggested may, I am satisfied, in cases requiring it, be safely doubled, tripled, or even quadrupled. A negro woman, suffering from an attack of cholera, took a tablespoonful undiluted. No ill effect nor even inconvenience was sus-

tained, beyond copious and loud eructations of gas from the stomach. A gentleman gave to his child, nine years old, a tea-spoonful. The cholera was, in each case, promptly arrested, a second dose not having been required by either. The security from ill effects, in such cases, is doubtless due to the alkalinity referred to.

Shortly after the benefits of the remedial means employed became manifest, persons living in this, and in other infected localities, were advised to employ the Tinct. Sesq. Chlor. Ferri., in doses of 10 to 15 drops every 4 or 6 hours, as a prophylactic. It is not known that any one, who had conformed to the suggestion, was attacked. Those adopting this course were advised that they might employ a liberal diet consisting of a fair admixture of animal and vegetable food, avoiding only such articles as had been observed to disturb the functions of health during the non-existence of epidemic influences. A single drop of muriatic acid supper-added to each dose might, perhaps, if possible, enhance the protective powers of this agent.

Muriatic acid is doubtless the active element in both the prophylactic and remedial means suggested; but in view of the necessity, which generally exists at such times for the use of agents combining other virtues, I prefer the tincture.

GENERAL OBSERVATIONS.

Much has been said and written of cholera—its diagnostic and prognostic features—which our observation of this epidemic failed to verify.

The "quick pulse" and "cold skin, covered with a clammy sweat," were of such unusual occurrence as to be undeserving the importance of symptoms. The skin was, indeed, in nearly all instances, of icy coldness, but generally dry; whilst the pulse, except in force and volume, as often as otherwise, exhibited no departure from its normal standard.

The "contracted pupil"* was not observed in any case, except as the result of narcotism.

The "painless diarrhea" constituted, generally, the initial stage of the disease; and vomiting and purging, with "rice-water" discharges, were characteristics of the malady in a more active and advanced stage of development. There were, however, exceptions in which the last-mentioned symptoms were not promi-

*Barclay.

ment, and a single case in which they were entirely wanting. Death but rarely results, I believe, from exhaustive discharges. There occur many cases of cholera-morbus in which they are far more profuse, and yet recovery readily takes place. The most rapidly fatal cases will, I conceive, generally be found to be of that character where they do not exist; for the reason that such discharges are purely eliminative—the efforts and channel through which nature seeks to relieve herself of the poison. The excretory functions are all suppressed, and in this emergency, should the only remaining outlet through the medium of the bowels be closed, the pent up poisons will only act with more deadly certainty and vigor. In the case referred to, in which vomiting and purging were entirely absent, there was not the slightest swelling of the abdomen or other evidence of retained profluvia.

Suppression of urine was a very constant feature of the disease, as it existed among, us; but I think undue prognostic value is attached by some authors to this symptom. I drew from a male patient, on the fourth day after I had been called in consultation, something over an ounce, the first discharged in about five days. Dr. Deaderick drew from a female patient, on the fifth day, about half an ounce, the first voided within that period; yet both patients recovered without any untoward symptom. The catheter was introduced, in each case, simply for the purpose of ascertaining the condition of this important function.

Important questions here naturally arise touching the probable existence of uremic poisoning in this class of cases.

The general symptoms of uræmia, as an idiopathic affection, so far as the nervous system is concerned, do not correspond; but I am not prepared to say that in combination with other morbid influences it may not, in some cases, give to us a modified form of the disease. I do not think, however, that such is the case: and the most plausible explanation we can perhaps offer for the non-existence of the disease is the greatly impoverished and altered condition of the blood in some cases, and, in others, the vicarious discharge of urea by the bowels. In such cases as are characterized by profuse vomiting and purging, this explanation will suffice; and in that class of cases where these

features are absent, death generally ensues too soon to be ascribable, in any measure, to the operation of this cause.*

The confident assurances given to us by eminent authors that cholera makes its attacks only "in the still watches of the night," were negatived to such extent that we may literally and truthfully say, "day and night were alike" to it. Nor was it more regardful of topical features; its visitations not more frequent nor more ruthless to dwellings by the water's side than to those occupying more elevated and airy situations.

Opium and brandy were, in some instances found serviceable during the initial stage of the disease. This is principally and particularly true of the latter; its "*modus operandi*" being doubtless the same as in the bites of venomous serpents. But whilst this is true, it must also be said that narcotism and intoxication were alike found to be conditions which co-operated powerfully with the original morbid cause in the rapid destruction of life. Opium in full and repeated doses is, I conceive, under any circumstances, to be avoided as a practice fraught with hazard, and not unfrequently followed by irretrievably mischievous results.

Quinine, astringents, pungent tinctures, antispasmodics, etc., were found to be of little, if any, benefit in any case.

Whilst it is perhaps true that no circumstances of local or general filth, as ordinarily defined, are capable of giving rise to such epidemics of this disease as have from time to time scourged the world, they are nevertheless to be regarded in the light of co-operative agencies predisposing to the disease by undermining the health and thus increasing its mortality; for we hold it as an axiom that those laboring under enfeebled or deranged health suffer more than the vigorous and robust in this, as in all other epidemics. All such sources of local or general filth serve, moreover, in a measure, however small, to swell the volume of poisoned atmosphere, which, like a tidal wave, engulfs towns, cities, countries and continents in its desolating flood. Therefore, "cleanliness next to godliness" is a fit motto for general observance by municipalities, families, and individuals.

What is the nature of the peculiar morbid principle pro-

*To assume that because of suppression there is necessarily uræmia, and that where death ensues in this class of cases it is necessarily from this cause, is a sort of "*ergo propter hoc*" reasoning, to be credited cautiously in the light of facts we have presented.

ducing cholera? Whence does it emanate, and in what manner does it operate to produce the symptoms witnessed in the disease? These questions have constituted the theme of elaborate and profound discussion for more than fifty years past; and yet that prince of authors, Watson, characterizes all that has been written as the "endless and perplexing" literature of the disease! At the risk of being classed with the contributors of this sort of material I shall, diffidently and deferentially, submit some facts and some reflections which may not be deemed altogether unimportant.

In a report to the American Public Health Association on the subject of this epidemic, I employ the following language: "If it be true, as physiologists assert, that hydrochloric acid exists, naturally, in the stomach of every healthy person, we need not task ourselves very greatly to comprehend the design of the Great Creator in placing it there. It was, by virtue of its antiseptic power, to prevent the decomposition of our food before its appropriation by the assimilative organs."

With the view of testing the solvent power of the acid, I instituted a series of experiments, the grand result of which was a demonstration of the truth that fresh beef, after having been digested in water containing thirty-three per cent. of the acid, for four and a half hours, at 100° Fahrenheit and subsequently allowed to remain in the cold mixture for twenty days longer, showed no solvent effect from the acid whatever. *The beef, however, when removed was remarkably firm—free from any taint and in a perfect state of preservation.*

The known virtues of chlorine as a disinfectant, and those of its compounds, chloride of sodium, chlorate of potash, bichloride of mercury, chloride of zinc, etc., as antiseptics, give collateral support to this opinion, touching the true office of this agent as it exists in the secretions of the stomach:

These experiments appear to negative the opinion so uniformly expressed by authors respecting the office of this important agent. That its solvent virtues may be enhanced by the presence of pepsin, as suggested in a communication from my eminent friend, Dr. J. W. Draper, or by the alleged presence of acetic, or other acids, constituting the so-called "gastric juice," I am not prepared to deny; but, in the absence of any proof of this fact, I am compelled to recognize its prominent and princi-

pal virtues, as demonstrated by experiments, to be those of an antiseptic.

If I am correct in my opinion touching this property and office of hydrochloric acid in the stomach, it will readily be seen that its influence and importance are far greater than have heretofore been ascribed to it. As a familiar, but very striking, illustration of its office and influence, in preventing decomposition, I refer to the results which succeed a surfeit—particularly of animal food. *A diarrhea emitting a highly putrescent odor* generally ensues. Here the amount of food has simply been in excess of the amount of acid present, and decomposition necessarily follows. One or two doses of muriatic acid or of the hyperchlorinated tincture of iron will generally suffice to correct the evil. But the field of its operation is not restricted to the stomach. It has been found equally efficient in correcting the influence of cholera and other poisons after they have entered the circulation.

It will, therefore, be readily understood why the existence of atmospheric poisons, as during the epidemic prevalence of cholera, creates, so to speak, a double demand for hydrochloric acid in the stomach. If the supply of this agent is sufficient to repress the septic tendencies of our food, and to correct the poisons which are continually entering the circulation through the medium of the lungs, no detriment to health will follow. But if the supply is insufficient to meet this increased demand, the food will undergo decomposition in the stomach, septic poisons will be generated, and we shall thus, figuratively, have a "fire in both front and rear;" causes without and within operating to produce the same result.

In view of these facts, we can more fully understand why, at such periods, certain articles of diet have been known to provoke attacks of cholera. The exciting cause may be a highly poisoned condition of the atmosphere, or it may be a piece of putrid pork in the stomach of the patient.

It will be correctly inferred that I regard the cholera poison as the product of animal decomposition.

That I may not appear to over estimate the potency of this class of poisons, I instance the well known results which sometimes succeed dissection wounds. Here a quantity of matter, inappreciable it may be to the naked eye, and held perhaps

on the point of a needle, is capable of producing the most violent constitutional symptoms, and often death.

Before adverting to the effects of certain classes of morbid agencies, in support of this opinion, I wish to express my individual regret that authors have found occasion to devote so little space to a consideration of the diseases produced by them; for the causes are by no means uncommon, and the results are of the most alarming character. For the two fold purpose, therefore, of exhibiting the importance of this defect, as well as the influence of a class of poisons closely related to, if not identical with, those producing cholera, I instance:

1. The effects resulting from eating putrid meats, sausages, etc.

Among other symptoms enumerated by Apjohn,[†] are absence of fever, vomiting and purging, an extremely cold skin, a small pulse, and a *suspended condition of the secretions*.

2. The disease occasionally resulting from eating cheese, boiled custard, etc.

I have had access to no author besides the one just quoted, who devotes even a passing notice to this class of cases. Fortunately, however, my experience in the treatment of these affections furnishes the desired information. In 1864 or 1865, a malady suddenly made its appearance in Cincinnati, characterized by an absence of fever, vomiting and purging, violent cramping of the voluntary muscles, a cold skin, feeble pulse, and general and extreme prostration of the vital energies, etc. I do no injustice to my intelligent professional friends, in that city, when I say that much difficulty was experienced and much care exercised before we were able to determine whether the disease was or was not a genuine form of cholera. It was ascertained, however, the next day, that the cases all owed their existence to a cheese sold at the "Lower Market," on the day previous. All who partook of it were similarly affected.

I witnessed in this town, (Jonesboro, Tenn.,) a few years since, the poisonous effects of the custard. The husband, wife, two children, two guests and servant all prostrated, from the same cause at the same time. The disease was characterized by a cold skin, feeble pulse, extreme prostration, violent vomiting and purging, serous discharges, cramping of the voluntary

[†]Tweedie's Cyclop. Prac. Med., art.—Toxicology.

muscles, etc. The attack occurred, in each case in from one to two hours after the food was eaten.*

In the case of the putrid meats there exist causes, which to the senses at least, appear capable of producing the results observed. These odors, however, are, I think, accidental, not necessary concomitants; as no such offensive qualities pertained to either the cheese or the custard. Both were free from any perceptible impurity or defect, unless it was a degree of insipidity which attached to the latter.

The effects of the cheese were repeated at Warm Springs, North Carolina, a few years since; one or two deaths resulting. They have also been experienced at various other points, characterized, uniformly, so far as I have been able to learn, by the same general train of symptoms.

The instances of poisoning from custard have, perhaps, been of more frequent occurrence, and for the purpose of illustrating the parallelism of results from the palatable and the impalpable poisons, I shall briefly refer to a few of them.

W. N. Vance, M. D., the physician in attendance, reports extensive poisoning as having occurred at Flat Lick, Va., many years since; the occasion being a bridal festivity. Owing to his remoteness from the scene of suffering, full forty eight hours elapsed after the attack before any of the symptoms fell under his observation. At the end of this period the patients, generally, exhibited the symptoms of gastro enteritis, or enteric fever. This was true of all excepting, perhaps, a young man named Bishop, whom he, in passing, found lying by the roadside, on the bank of a creek, whither he had gone to slake his thirst.

*Before discussing this subject at greater length, I feel that it is important, in a medico-legal point of view, to disabuse the public mind of some errors which incidents of this character almost invariably give rise to. The sudden occurrence of the disease and the violent character of the symptoms, naturally, create the suspicion of evil intent on the part of some suspected person.

The poisons, which I am now considering, do not owe their existence to malice, nor are they the class of poisons which might be created by boiling certain articles in copper or brass vessels,—nor yet do they derive their existence or power from any flavoring extract, employed to render the custard palatable. They are the products of fermentative action, and are the creations of chemical influences which we do not clearly understand. This article of diet, after it is prepared, should be kept at a very low temperature, and never be used after it has become in the least degree sour, or even inspid. I have seen it in the latter condition, when an occasional bubble of gas, arising to the surface, was the only evidence of the mischief transpiring beneath; but, as demonstrated in the cases recited, intensely poisonous.

He was in a dying condition, and no time was lost in administering to him, or in making inquiries touching the primary symptoms of the case. His body is spoken of as presenting an uniform purplish color. This man, probably, died in the initial stage of the disease.

C. P. Gordon, M. D., reports a similar instance of poisoning from the same cause at Dalton, Ga., the occasion, like that which gave rise to the cases treated by Dr. Vance, being a nuptial celebration. These cases were ushered in by a cold skin, feeble pulse, vomiting, purging, serous discharges, great prostration, cramping of the bowels, &c. The secondary stage was characterized by gastro enteritic complications—two deaths resulting.

Through the courtesy of J. S. Wellford, M. D. I am furnished with the details of many cases occurring at Richmond, Charlottesville, Rapid Ann and Louisa Court House, Va., as well as at other points in North Carolina and Georgia.* Respecting the cases which fell under his care, Dr. Wellford says: "In May 1874 I was called on to attend a family, in which, after partaking of a Sunday dinner, in the course of a few hours, nearly every member had been suddenly taken violently ill with vomiting, purging, intense pain in the bowels and with marked prostration, accompanied by violent cramps in the arms and legs. The evacuations were at first fecal, but afterwards became serous."

W. G. Rogers, M. D., of Charlottesville, Virginia, reports a case highly interesting as exhibiting the power of the poison in a concentrated state. The custard was prepared on the 8th of May 1875, was said to be "sour and turned" on the evening of the 9th, having been kept without ice. On the morning of the 11th a portion of it was given to a mulatto child, aged two years. The child was taken ill, in half an hour, and died with all the symptoms of cholera in ten hours after the attack. Dr. Rogers' son, a lad of some ten years of age, took some of the custard on the 10th, and is reported as having "had symptoms of violent cholera morbus, which passed off in about twenty-four hours, leaving him debilitated for several days."

*Special Report on poisoning by Custards and Ice Creams by J. S. Wellford, M. D. Prof'r. Mat. Med. and Ther. Medical College of Virginia. Read before the Medical Society of Virginia. Published in Virginia Medical Monthly, January, 1878.

J. W. Sehorn, M. D., of Johnson City, Tennessee, reports, a typical case of the disease, as it recently occurred in that vicinity. The patient, a young man, ate a single glass of the custard. He suffered prolonged coldness, reaction not appearing for twenty-four hours, vomiting, purging, great prostration, feeble pulse, violent cramping of the stomach and bowels, watery discharges, and entire suppression of the function of both the liver and kidneys.

I might adduce many others of like character, but these cases suffice for the purposes in view, and are fairly illustrative of the effects observed from this kind of poison. Except in the case of the lad and negro child this article was in each instance, prepared the day before, and kept at a temperature not sufficiently low to prevent fermentative action. The cases were all attributable to such a condition of the custard.

The antecedent painless diarrhea, which properly constitutes the primary stage of cholera, is absent from this class of cases. In the epidemic it denotes the gradual contamination of the blood from the prolonged operation of the poison. Those cases which succeed a slight, or brief exposure to the miasm will generally be found to occur without this precursory symptom. It is the continued inhalation of the toxic agent, I think, that develops this effect. Two ladies, residents of this town, sought refuge in the mountains during the prevalence of the cholera. They were both attacked in a few hours after their return. The irruption was sudden and violent, and without any stage of premonition, but yielded kindly to the usual means employed. In the class of poisons of which I have been speaking the morbid influences do not exist in any such state, and hence no opportunity is offered for the gradual poisoning of the blood. After one or two stools, which will be found in part fecal, the dejections will generally exhibit the characteristic cholera appearance. Violent vomiting and purging are more speedily provoked by the presence of the palpable poison, and by such means the offending matter is eliminated from the system before its full toxic effects are experienced. To this fact is owing too the less frequently fatal results than are found to attend cholera.

The gastro-enteritic complications, observed by Dr. Vance and by Dr. Gordon, to occur secondarily in the cases treated by them, respectively, were not present in those which fell under

the care of Dr. Wellford, Dr. Sehorn or myself; a difference attributable doubtless to the greater and less degrees of concentration of the poison. So too of cholera. This feature did not, except in two or three instances, attend the epidemic as it appeared in this locality. But so often has it been observed to mark the history of the disease, as it prevailed at other times and in other localities, that it has been classed, by many authors, as a separate, distinct and most dangerous stage of the malady. Such was the case in regard to the epidemic as it prevailed at Moscow, St. Petersburg, Sunderland and elsewhere. These symptoms, therefore, which have been observed in cases of accidental poisoning are in strict harmony with those occurring in cholera.

Suppression of urine is a feature generally attending well developed cases of cholera, in which the cold stage is protracted. But such condition, so far as our observation has served us, is found only to pertain to this stage. As reaction is developed the lost function is wholly or partially restored. Were the operation of causes more prolonged, and were this algid state more protracted in these cases we should have this symptom more constantly and more conspicuously present. In the case related by Dr. Sehorn, such was found to be the fact. Reaction was not fully developed until twenty four hours after the attack, and not a drop of urine was voided during that period.

But it may be asked:—Do such agencies assume a miasmatic form? It is not necessary, we conceive to discuss this question. Death, decay and exhalation succeed both animal and vegetable life; and the mere presence in the atmosphere, of effluvia from the putrid carcass, is evidence sufficient that other, and perhaps more volatile as well as more poisonous matter, is, in like manner, evolved and assumes an aeriform state.

Chemically considered what is the nature of this subtle, undefined and powerful poison? We do not know; nor are we likely to possess such knowledge until the science of Chemistry shall have attained to a higher degree of perfection than it has yet reached. In the light of the brilliant and substantial achievements in this department I have, however, the faith to believe that we shall ultimately, and perhaps at no distant day, be made as fully and accurately acquainted with the nature of this and all other atmospheric poisons, as we now are with the constituent elements of any substance in the organic or inorganic

world. When such knowledge shall be ours the means, prophylactic and remedial, employed in the management of diseases produced by epidemic causes, will be made to rest on principles as immutable as those which govern the relations and movements of bodies. Until then we shall have to be content with our observation of phenomena and results.

Acidity is the common product of both animal and vegetable decomposition. The ill results to health which were observed in the instances of accidental poisoning mentioned were due to a fermented condition of the articles enumerated. The custard given to the negro child, and which proved so rapidly fatal in its effects, was perceptibly sour twenty-four hours after it was prepared.

Ammonia is, also, a constant and an abundant product of animal decomposition.

It appears probable that the active principle of this poison consists of some unknown acid in combination with ammonia. That affinities, however, are not fully satisfied, appears evident from the fact that the custard is sour when in a highly poisonous state, and that its toxic properties appear to be intensified in a ratio with its acidity. We are in the line of legitimate inference, if not of necessary conclusion, I think, in assuming such to be the relation of these respective agencies in the decomposing mass; for it is difficult to conceive how they could co-exist, in a condition of immediate contact, without such result. But regarding it as not improbable that some portion of the poisonous acid may escape, could it assume and maintain a gaseous state? The mere exhalation in this state proves, in part, an answer to the question, whilst the facts proven by the simple analysis of rain water teach us that nitric acid exists in the atmosphere. The same, perhaps, is true of some other acids. We know of no law or principle, governing in the one case, which does not apply, with equal force and pertinency, in the other. But that it, for any considerable length of time, does so exist we think more than questionable.

Ozone is said to exist uniformly and everywhere in the healthful atmosphere. Its presence, in sufficiency, implies the absence of the cholera miasm, whilst the presence of the latter as distinctly indicates the absence of the former. Is not the same true of its relations to ammonia? Is it not alike destructive to each? It is also said of this agent that it not only

destroys animal effluvia instantly, but that it, in like manner, arrests the process of putrefaction. It therefore, not only destroys the ammonia in the atmosphere, but restrains, entirely, the forces which generate it most abundantly. In view of the wonderful power of this agent, and of its reputed absence, during the epidemic prevalence of cholera, may we not fairly predicate of these facts a redundancy of ammonia on such occasions? This fact admitted, the combination of these influences in the atmosphere, by reason of their close admixture, is again suggested as a necessary result. *Thus it appears probable that the poisonous acid, evolved from decomposing substances, reaches the same combination at last; and hence that the toxic principle existing in a morsel of putrid meat—a bit of decomposing cheese or a glass of fermenting custard is chemically the same invisible and destructive poison constituting the cholera miasm.* But we are again asked could this product of affinities exist as an atmospheric influence? The same general law which governs the existence of an acid, or a compound, in a solution in which other substances are also present, will, I apprehend, determine the answer to this question. If no superior, conflicting or divellent forces are encountered it may assume and maintain such condition. It is true of some compounds—and especially those of ammonia—that they are highly volatile; and this may be so, in an eminent degree, of the hypothetical one in question.

Such are our views touching the origin and character of the cholera poison. The symptoms produced by the epidemic influence and by the palpable poison, respectively, exhibit a similitude at once striking and complete. The features are identical, with such exceptions as have been mentioned and explained. Can we, in the light of these co-incident phenomena, ascribe the causative influences to any other than a common origin or the effects produced to any other than a common cause? Had these cases occurred during the epidemic they would undoubtedly have all been classed as cholera, nor would the correctness of the diagnosis have been questioned. "Like agencies will produce like results" is an axiom not less true, "*ceteris paribus,*" in medicine than it is in physics. If decomposed, or decomposing animal matter, 'en-masse,' will produce the results observed from eating such substances, the same poisons in an aeriform or miasmatic condition, will accomplish the same effect. The atmospheric poison, by reason of a condition of greater tenuity is slower

in its operation ; but the symptoms when fully developed are, as has been observed, identical with those created by the palpable influence.

I have instanced the effects of the articles enumerated, respectively, not because I suppose that they, alone, are capable of producing the results observed, but because they constitute, mainly in some shape or other, our supply of animal food, and hence the opportunity is more frequently offered for observing their effects when in a decomposing state. It is probable that nearly all animal substances, in like condition, yield, in greater or less amount, the same toxical principle.

Should the suggestion made respecting the probably combined relation of the cholera poison and ammonia, in a miasmatic form, ever attain to the dignity of an established truth we shall then have an easy explanation of the virtues of the remedial means indicated, in the acknowledged disinfectant quality of chlorine, and in the well known and powerful affinity existing between this element and ammonia.

I need not, in view of the opinions expressed, stop to inquire whence emanate these toxical agencies. Their sources of supply are almost infinite, and are co-extensive with the boundaries of animal life, embracing the decomposing filth of cities, towns, and crowded communities, of armies, battle-fields, and cemeteries ; in short, wherever a human being dwells, or an animal dies, causes exist, however insignificant, to augment the poisonous influences. Under what electric, thermometric, barometric, or other influence or condition these agencies are aggregated and condensed, I can not say ; nor am I able to say how far such causes may operate to determine the presence or absence of ozone from the atmosphere.

We deduce from what has been said, the following conclusions :

1. The cholera miasm is the product of animal decomposition ; and hence the forces producing this poison are, continually, more or less active.
2. That its existence, as an epidemic influence, is due, altogether, to the absence, or to a deficiency of ozone in the atmosphere. When this element is present, in sufficiency, it does not, and cannot exist.
3. That the effect upon the system will depend on the

amount of muriatic acid in the stomach. If the supply of this agent is sufficient to meet the demand as heretofore suggested, no detriment to health, from this poison, will follow any amount or degree of exposure.

It will thus be observed that these two great corrective agencies, although operating in different spheres, are beneficently ordained and arranged for the preservation and protection of life and health: The one operating to repress and correct poisons in the atmosphere, whilst the office of the other is, in like manner, to repress and correct poisons in the stomach and blood. Thus related in their properties, and co-operative in their offices, it follows, as an unavoidable corollary from the premises, that the absence of one necessitates, for the purposes of health, the constant and full presence of the other.

I have nothing to add to the views expressed concerning the pathology of the disease in the body of the report. No single feature of such toxic condition, we believe, is absent; whilst we are unable to explain their existence on any other hypothesis. In a healthful condition, the blood is the "*fons et origo*" of life, furnishing appropriate nourishment and stimulus to all the organs of the body; in a poisoned condition it is a stream of death, coursing rapidly through the system, impairing, perverting, and suppressing their functions.

The arguments, "*a priori*" and "*a posteriori*," furnished by the preventive and curative treatment employed, fully sustain the value of the agent designated, and give indirect but strong proof of the correctness of the opinion expressed touching the principal office of muriatic acid in the stomach.

No circumstances of local or general filth were observed to influence or control the presence or character of the epidemic in any manner. A rigid surveillance was kept up by the municipal authorities for at least a month prior to the advent of the disease. Thorough renovation or entire removal was the order, and the town, for once at least within the memory of the "oldest inhabitant," was perfectly clean. Nor was defective drainage or imperfect ventilation observed to exist in connection with any residence visited by the disease.

The exhalations from the lungs, as well as those from the discharges seem capable, under certain circumstances, of reproducing the disease. But the same difficulty in deciding how far it is infectious was experienced here that has general-

ly been encountered elsewhere. The whole atmosphere, during the epidemic prevalence of cholera, is in a poisoned condition, and we cannot, therefore, satisfactorily determine, at all times, in individual cases, whether the results are due to general, or to special influences. It must be the same morbid principle operating to produce the disease in each case. We can conceive of the poison passing through the the system and being again evolved in the same chemical condition that it was before entering; but the great number of cases occurring simultaneously, in some epidemics of cholera, suggest unavoidably, that the poison is endowed with almost infinite diffusibility, and that each atom is possessed of a power equal to that which so often produces fatal results in dissection wounds, or that it is capable of reproducing itself, as suggested by Liebig. I leave the settlement of this question to those more competent to decide. The effect upon the party exposed to such exhalations will be determined by conditions heretofore stated.

A very general belief occupies the public mind that persons using limestone water are peculiarly addicted to the disease. I am not inclined to attach very much importance to this opinion; but it must be admitted that during the recent and perhaps other visitations of the disease, its virulence was marked in the regions of limestone formation. Indeed, I am not aware that it prevailed outside of such formation during the epidemic of 1873. If it were possible for the lime existing in the water to displace the hydrogen, and give us chloride of lime instead of muriatic acid in the stomach, the opinion would at once appear plausible. But the possibility and probability of such displacement and combination in the alleged presence of acetic and other acids, are questions which I leave to the solution of the practical chemist.

Some additional facts were observed which perhaps may be worthy of note as bearing on the theory offered concerning the pathology of the disease.

I had, on several occasions, particularly late in the afternoon after visiting my patients, found myself laboring under muscular debility, or an inability to control muscular movement, I hardly know which, to such degree that I unconsciously sought support by placing my hand on any railing or fencing that chanced to stand by the way. The feeling was that of intoxication. My associate, Dr. Deaderick, experienced the same symptoms. Rev. Mr. McCorkle, who had been faithful in his ministrations to the sick at Greeneville, and Rev. Mr. Lockwood, who had been alike faithful and constant in his holy ministrations at this place, both experienced a like effect of the poison. I visited

the last-mentioned gentleman, who complained that he "could not walk straight." There was no other symptom of ill health. The same experience was related by others during the prevalence of the epidemic.

I should in conclusion mention, in addition to the two cases alluded to in the body of my report, some two or three other cases connected with the question of contagion. Dr. Matoney, of Greeneville, visited Nashville during the epidemic prevalence of cholera at the latter place. The distance between the two points, by direct line, is about 275 miles. There was no cholera in the intervening country. On his return he was attacked and recovered. Mr. Piper, a near neighbor, next suffered and died. His remains were carried ten miles distant into the country for interment. Mr. Stevens, living in the vicinity, attended the burial, contracted the disease and died. Mr. Miller was present when Mr. S. was attacked, went for the physician, returned to his home, some four or five miles distant, was violently seized on the next day, or day following, and, after a critical illness of four or five days duration, recovered.

No other case occurred in the neighborhood where Stevens died, but some two or three were developed in the vicinity of Miller's residence. These were, however, on the line of railroad, and only thirteen miles from Greeneville.

In connection with the first appearance of the pestilence at Greeneville, should be mentioned the fact that a few days prior to that event a public privy, containing some six or seven pits, with the accumulated filth of more than thirty years was cleaned. This was carted through the streets, in open vessels, to the north side of the town, where it was deposited on the land of the contractor. From this point to a creek, coursing through the southern part of the town, was a gentle declivity, a distance of more than half a mile. The drainage was in the very direction whence the filth was removed, and was obstructed almost the entire distance by vegetation and other causes. The whole slope presented fairly to the action of the sun's rays. The circumstances I regard in the light of contributive influences only.

I beg leave to say that whatever diversity of opinion may exist in regard to the views expressed concerning the origin and character of the disease, there can exist none respecting the efficacy of the treatment suggested, after it shall have been subjected to a faithful trial. The effects of lime-water in a case of poisoning by oxalic acid are not more prompt, nor more distinctly marked.*

*NOTE.—This paper is a more elaborate expression of the views set forth in a communication to American Public Health Association, and published in their Transactions for 1873. Afterwards to Commissioners appointed by act of Congress on the subject of the epidemic. (Vide Cholera Epidemic in the United States in 1873, page 202.) And subsequently by Cincinnati "Lancet and Observer."

ADDENDA.

Taylor (Taylor on Poisons, 3d edition,) is quoted by Prof. Wellford as saying, in regard to the cases of custard poisoning instanced by the latter, that: "The facts are more consistent with the effects produced by malignant cholera." This is certainly, we think, true; but the poison in each case existed in a *palpable*, not in a *miasmatic* form, as appears to have been supposed by him. I am not aware that epidemic cholera visited any one of the localities referred to by Dr. Wellford. Boiled custard, it should be stated, is made of milk, eggs, sugar and such flavoring extracts as the taste may suggest. Ice cream contains, generally, the same ingredients, and is capable, under the same conditions, of producing the same results.

APPENDIX

Two factors on Johnson in addition to those listed above are
not in accord with the above in certain respects. In the first place,
the fact that the above mentioned in the above is not in accord with
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At the June Session 1878, of the Washington County Medical Society, the following resolution was unanimously passed :

"Your committee appointed, at the May meeting of the Washington County Medical Society, to draft resolutions relative to Dr. Sevier's report on Cholera, would submit the following :

Resolved: That it is the sense of this Society, that the report of W. R. Sevier, M. D., on Cholera of 1873, is a valuable contribution to Medical Literature, and that this Society heartily endorses the theory of Cholera, as set forth in said report, together with the treatment recommended therein.

A. S. N. DEBSON, M. D.

J. W. SEHORN M. D.

D. J. GIBSON, M. D.

S. E. LYON, M. D.

E. L. DEADERICK, M. D.

Committee.

E. L. DEADERICK, *Sec'y.*

W. W. BOVELL, *Presdt.*

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