Presented respectfully to the Coll. of Physicians Edinburgh by the Author

A TREATISE

ON THE

CAUSE, NATURE, SEAT

AND

TREATMENT

OF

CHOLERA.

BY JAMES SHAW, C.E.L.L.

London :
SIMPKIN, MARSHALL & CO
JAMES AND JOSEPH THOMSON, MANCHESTER.

JOHN SWINDELLS, PRINTER, MARKET-STREET, MANCHESTER.

PREFACE.

As it has become the conviction of my mind that what is herein contained is the truth as regards that dreadful malady known as ASIATIC CHOLERA, and which at the present time threatens the health of the Public; and as its conclusions are the results of observations of natural phenomena, and of careful analysis of the symptoms, pathology, and progressive effects of the disease, I have ventured to lay it before the Profession. And should it happen to be found not to contain the whole truth, but only a step in the ladder, my labour will not be lost.

28, *York Street, Cheetham, Manchester,*
November 24*th*, 1848.

ON THE

NATURE AND TREATMENT

OF

CHOLERA.

Symptoms.—In the *first stage* are observed a sense of fulness, or oppression in the precordial region, more or less nausea, general symptoms of indigestion, flatulent griping pains in the bowels, with diarrhœa. These symptoms are sometimes very slight, at others continue longer, and are more severe; when they remain unchecked, the system becomes less and less able to maintain the temperature of the body: from the functions of its organism becoming weakened and disordered, until the *Second, collapsed, or real cholera stage commences;* when it will be found at all times that the temperature of the body is sunk in proportion to the severity of the disease. In this stage vomiting and purging become incessant; the stools are sometimes watery, and clear, at others flaky; at others like rice-water, &c. and occasionally assume other appearances, and have not the usual feculent odour. The matter vomited is generally like the evacuations by the bowels. Tenesmus is great, and the stools generally copious, with a sense of considerable heat about the stomach, great thirst, and a desire for cold water. There is vertigo and tinnitus, which increase with the disease, though the intellect remains unimpaired. With the diminution of heat, cramp commences; generally in the extremities, the toes or

fingers, muscles of the calves of the legs, extending to the arms, and muscles of the body. The urine is scanty from the first, and speedily entirely suppressed. The respiration is weak, and the voice whispering. The tongue is cold, and shrunk in substance; and the pulse, which has from the commencement, every symptom of weakness, and irregularity becomes rapidly imperceptible. The surface of the body is shrunk, and exhibits appearance as if of a congested condition of the blood, which appearance generally commences in the extremities; and the patient is constantly restless, writhing and tossing about in constant agony. General loss of temperature pervades the system, and the surface of the body is covered with a cold moisture. Great prostration generally exists from the commencement.

The symptoms in some degree vary in different cases, but those enumerated above are generally observed.

The symptoms of the *third stage* are those of reaction from the condition of the second. Those who have seen the most of them, compare them to the symptoms observed in typhus fever.

They cannot but consist of evidences of local, and in some degree, general excitement; and it is impossible that it can be otherwise than of an asthenic character.

Cause.—"The vital principle is only known to us by the phenomena it produces through the peculiar form of its instruments; that is, through the organs in which it resides. The vital principle governs the chemical powers of the living body." (Liebig.)

Nervous tissue is the seat of the vital principle, and when altered in condition, vital manifestations are also changed. When the nervous system is deficient in tone or energy, vital force—irritability,—is also deficient.

Considerable diseased manifestations of the nervous system can exist without any change being detected in the structure or substance of the nerves.

"The blood contains the elements of all organic substances; and all organic substances are formed from the blood." (Liebig.)

Nervous tissue is renewed from the blood, and when the blood is in an abnormal condition, cannot be maintained in a normal state.

The nervous system can be primarily affected by causes of disease, and afterwards suffer continuity of disease from secondary causes, as from the condition of the blood.

Oxygen is necessary to the transformation and renewal of the tissues of the body; "at every moment of his life man is taking oxygen into his system, by means of the organs of respiration; no pause is observable while life continues." (Liebig.)

All manifestations of disease are more or less governed by climate and endemial influences; and these are influenced by geographical position, temperature, and geological relations, cultivation of the soil, and relative elevation above the level of the sea; all of which tend to govern the condition of the atmosphere, which in its turn, is all important to health. But climate is not wholly governed by these circumstances, but in some measure subservient to astronomical, and electric influences, resulting in complete changes in the usual character of the atmosphere, which, from being usually dry, bracing, and healthy, becomes moist, heavy, oppressive, and unhealthy; hence it is, that by long continuance of this condition, diseases endemically benignant become malignant. The climate of England, particularly of this part of it, has, of late, suffered much change; the seasons have been unusally wet, cold, and irregular, and the atmosphere loaded with moisture; and animal and vegetable life generally has suffered much thereby.

Vital existence is dependent for continuity on the continued transformation, and renewal of the tissues of the body; and these changes are dependent on a number of vital processes in harmonious operation, among the principal of which are,—a supply of matter—food—for the purposes of nutrition, digestion, or assimilation of the same, circulation of the blood, respiration, absorption, secretion, &c. &c.

A certain amount of heat in the body is necessary to a state of health; and the temperature of the body is determined by the amount of oxygen used therein.

"In the animal organism, two processes of oxidation are going on; one in the lungs, the other in the capillaries. By means of the former in spite of the degree of cooling, and of increased evaporation which takes place there, the constant temperature of the lungs is kept up; while the heat of the body is supplied by the latter." (Liebig.)

In a cool dry atmosphere, in an elevated situation, more oxygen is appropriated by the system, than in a moist warm atmosphere, in a low confined situation. The former invigorates the nervous system, causes a more speedy transformation of the tissues, quickens the circulation of the blood, and vital motions generally, raises the natural temperature of the body, creates a greater demand for food to supply the place of waste, therefore improves the appetite, and strengthens and invigorates the body generally; the latter enfeebles nervous energy, disables the system from appropriating a sufficiency of oxygen, consequently there is not the requisite transformation and renewal of the tissues, causing little waste, and demanding small supply, therefore loss of appetite, sluggish circulation of the blood, diminished natural temperature of the body, and diseased secretions are the results; and from the moisture disolving floating particles of putrid animal and vegetable matter, in the place of purifying, and decarbonizing the blood, imperfectly performs that process, and rather tends to disorder and decompose it.

When, therefore, we find our own atmosphere generally, assimilated to the latter condition, loaded with moisture from the continued heavy rains, and, from the still calm winds, every facility existing for becoming impregnated with animal and vegetable effluvia, and exhalations from the earth, we need not be surprised to find diseases assuming an asthenic character, and a malignant type, resembling diseases of foreign, and acknowledged unhealthy climes, since our own and they have long been becoming analogous in character.

The diseases of this country are usually of a sthenic character; and require for their cure or removal local and general abstraction of blood, purgatives, &c., or that treatment known as antiphlogistic.

The diseases here usually sthenic, have, for the last three years, manifested considerable change; and for the last year, from the causes before mentioned, have become decidedly asthenic and malignant in character, requiring an entirely opposite treatment,—as of tonics, stimulants, &c., &c.

From this we are inevitably led to the conclusion, that all parties, rich, poor, young, or old,—although manifesting no real disease, are more or less dispossessed, at the present time, of the constitutional capability, peculiar to inhabitants of this country, of resisting the action of the causes of disease. Accordingly we see persons, in apparent good health, with an unabused constitution, and from causes which at another time would produce little or no effect, who complain of being somewhat indisposed, feeling no apprehension of danger, yet suddenly sinking to rise no more.

It is also manifest, that with this condition of vitality, pervading the whole of us, those of us whose systems are diseased and broken up from other causes, must fall easy victims on the presentation of any exciting cause of malignant disease.

For the last two or three months diminished vital energy has here manifested itself, first, in an epidemic dysentery, then, in neuralgic affections of the face, very painful, affecting the teeth, and producing spongy gums, and attended with loss of appetite, and general debility. And in an uneasy nauseating sensation in the stomach, and bowels; in many instances attended with vomiting; in some, with temporary diarrhœa. Latterly, the dysentery has again appeared, and there are now (middle of November,) many cases of it. This is approaching the premonitory condition of cholera.

"The peculiar influence which produces Asiatic cholera is connected with the atmosphere as well as the earth; an experi-

enced Indian practitioner can often foretell its attack from the state of the weather."

"When the spasmodic cholera appeared in November, 1818, at Madras, Mooyakeddeen, Physician to the late Nabob of Arcot, informed me that so far back as 1790, being as long as he could recollect, he had seen the same disease every year during the winter monsoon, and that he saw no difference in it that year from any other, except in the increased number of cases. In other words this disease is endemial every winter among the natives of the Coromandel coast, as the biliary cholera is in July and August in England." (Dr. Hood, of Brighton.)

If Asiatic cholera is endemial anywhere, and if it appears regularly there at certain seasons, two premises will originate therein :—first, the climate, nature and cultivation of the soil, &c., must conduce to it ; and secondly, the change of season, and consequent change in the atmosphere, must become peculiarly suited to its production. Out of these, several questions arise. Does the climate, &c. induce such a condition of the body, as on change of temperature, and atmosphere—season—it will take on such a disease ? Or does the season, &c. cause the production of a peculiar malaria or effluvia capable of exciting the disease in certain conditions of the body, the result of climate ? Or a malaria or effluvia so potent as to excite the disease in any body ?

As regards the exciting cause here, the experience of all medical men who witnessed the disease in England, in 1832, is directly opposed to the latter view ; as are, also, the results of autopsy in all cases examined. The disease was found to attack almost exclusively diseased or weak constitutions. As regards the exciting cause in India, every body equally exposed to it, are not affected by it, it must, therefore, observe conditions in producing effect. An abnormal condition of the body, or parts of it, can exist to a certain extent without noticeable manifestation of disease.

That the cause of cholera is peculiar, isolated instances of exposure to its influence confirm.

"In October, 1818, the East India Company's ship, the Warren Hastings, lay at anchor in Languo Roads, crew one hundred strong, and the wind on shore. In the night the wind changed to a land breeze, and in an hour and a half, seven of the men who slept on deck, were seized with cholera. Mr. Horsley ordered them and the whole crew below, and the ports to be closed. No new case occurred." "A light infantry battalion, returning from the Deccan War to Bombay, was severely attacked by the epidemic at its bivouac, a havilder stated to the commandant, that there was no cholera a few hundred yards further on beyond the nullah, the regiment, carrying the sick along with it, marched beyond the morbific boundary, and the plague was staid; not a new case occurred at that time in the corps." (Dr. Hood.)

The former of these instances exhibits the cause as being conveyed in the atmosphere, from the shore out to sea; and also, "that that cause could not be electricity, or the deck of the ship could not have shut it out." (Dr. Hood.) The latter, as being confined to a particular locality, as if an exhalation from the earth, or something on its surface in that place.

Particular disease is known to arise from particular causes, originating in the ascertained conditions of the substance from which it emanates. Amongst other instances, Dr. Copland says the inhabitants of a place where hemp is grown, are annually affected with dysentery, caused by the decaying vegetable matter, the result of soaking the plant in water previous to detaching the fibres. If, therefore, these people can be annually afflicted with dysentery, and the dysentery be immediately the result of the cause aforesaid, which is purposely created, and could be avoided; and if cholera is endemial every year on the Coromandel coast, at a particular season, changing only in grades of severity, it is evident, in the former by analogy, and in the latter by fact, that the conditions necessary to the production of the peculiar cause of cholera, must be there and then existent.

In India the decomposition of the rich and luxuriant vegetation, of the innumerable insects, and of other animal matter, from the heavy falls of rain, and temperature of the climate, is known to generate malaria at a particular season; and cholera is observed to occur immediately in connection with the falls, and this decomposition.

"Carbonic acid, water, and ammonia, (a compound of hydrogen and nitrogen,) are the final products of decay of animal and vegetable matter, in an isolated condition, they usually exist in a gaseous form. Hence, on their formation they must escape into the atmosphere." (Liebig.)

It is known that the salts of sea water are found on the leaves of plants 20 or 30 miles from the sea; and that plants derive their alkalies from salts held in solution from the same source, and brought down with the rain over the whole land; it requires no stretch of imagination therefore, to allow of this malaria—formed in such prodigious quantity—being conveyed at times in the atmosphere to inconceivable distances. Hence, it would explain the possibility of ships crossing its tract at sea, and the crews being seized with disease.

Whatever combination of the constituent principles of animal and vegetable decayed matter, or of combinations of these with the gaseous exhalations of the earth, may be the cause of the disease, it exerts its influence on the nervous system. And it is impossible that a hot dry atmosphere, such as India, where a rich and extensive vegetative process is in operation, purifying the atmosphere, by an abundant absorption of carbon, and emission of oxygen, can change to a wet cool one, in which this vegetative purifying process has ceased, to give place to a process of putrefaction, suddenly filling the lower, and therefore breathable stratum of air with the noxious effluvia arising therefrom, without causing a corresponding depression of vitality, and deficient power of resisting its effects, in the bodies of those subjected to its influence. Hence it is, that when it has existed for a time, those of them most susceptible of this temporary depression of

the vital powers of the system, are suddenly overpowered by its effects, and manifest the disease.

The cause of the disease here is contained in the atmosphere. It suddenly attacks different localities, and as suddenly leaves them. It is well known that it attacks persons more frequently in the night, than in the day. The higher strata of air descend at night, the atmosphere on the surface of the earth becomes more dense, and contains a far greater amount of deleterious compounds than in the day. (De Saussure.)

It may be argued that a moist cool season here is not necessary to the developement of the disease; but it must be borne in mind that the same effects may be produced on the system by opposite extreme conditions of the atmosphere, though somewhat different in degree of manifestation. If it be said the disease can exist in a hot dry atmosphere;—this condition is peculiarly favourable to the developement of our own English cholera. The present state of our climate is unfavourable to the production of English cholera. I have but seen one case these two years—about six weeks since. We have had diarrhœa, fever, and dysentery, but no cholera. If it be said malignant cholera occurs in places exhibiting no remarkable change in the atmosphere, the cause must have been generated somewhere: and in proof of its effect on the nervous system, in places where it exists, the first persons attacked are those of weak or diseased constitutions; and it does not attack the more healthy, until it has existed there for sometime, and their vital powers of resistance are weakened by its previous effects. Yet it cannot be denied that our atmosphere, at the present time, holds a considerable amount of deleterious compounds, which is unusual to its customary rarer, and dryer state; and if so, there is reason to believe its capability of materially aiding to produce the malignant choleric condition of the body. As an illustration of this, and that a modification of the atmosphere may modify the character of the disease—Sydenham relates of the cholera which prevailed in London in 1670, that when it ceased, dysentery prevailed in its stead. We have had,

and have dysentery, and cholera is in the country. During three weeks, a month or two back, whilst dysentery first prevailed here, the weather became dry and clear, and it was remarkable that dysentery ceased—that is, no new cases occurred that I could hear of during that time; but it again became wet, in a few days I had several cases. It then became cold, dry, and frosty,—dysentery ceased, and many pulmonary cases occurred. It has become wet again, and the atmosphere is loaded with moisture, again we have dysentery.

It is impossible but that in large towns such as Manchester, many causes of impurity of the atmosphere must exist; and although when commerce is brisk, the various artisans are in receipt of means for comfortable existence; yet, there exists at all times, from various causes, a great number of indigent persons, who crowd together, and are the first to generate and extend disease. A large amount of carbonacious matter, of various compounds from chemic, dye-works, mills, &c. and from accumulations of excrementitious matter, must be held in the atmosphere at the present time, by means of its continued moisture, calmness, and density; all of which, are more or less pernicious to health.

"It is worthy of observation that the ammonia of snow and rain-water possesses an offensive smell of perspiration and animal excrements,—a fact which leaves no doubt respecting its origin." (Liebig.) Very much has been done, and is now doing by the Corporation to obviate this condition. Within the last few years Manchester has much improved.

It is said the cause is electricity; but among other instances which might be stated, it has been shewn in the case of the Warren Hastings, the cause was prevented from taking further effect by placing the deck of the ship between the men and the wind. Electricity could not be thus shut out.

That the electric condition of the body, when affected with cholera, may be disturbed, is not only possible but probable, since the conditions of its structure are so changed; but if so,

that the electric disturbance is not the cause, but effect, is evident, from the fact that chemical action extricates electricity; moisture and heat are peculiarly favourable to electrical manifestations, &c. so also, are they to chemical action.

"By dissolving a metal in an acid we produce an electrical current; this current if passed through a wire, converts the wire into a magnet, by means of which many effects may be produced. The cause of these phenomena is magnetism; the cause of the magnetic phenomena is to be found in the electric current; and the ultimate cause of the electric current is found to be a chemical change, a chemical action." (Liebig.) It is possible disease rarely occurs without more or less disturbance in the electric conditions of the body—disease is chemical action; though chemical action alone will not cure disease.

It is known how heat is generated in the body; and when the conditions for the production of heat therein are changed, from any cause, the temperature of the body will be changed in proportion. In cholera the change tends to diminution; and when this diminution of heat proceeds beyond a certain extent, the phenomena of life can be no longer maintained. One of the peculiar, and most prominent symptoms of cholera—spasm—is frequently a result of cold—in bathing, for example. In this case the phenomena of life are in a great measure arrested in the part, and as will be hereafter particularly explained how, cramp is the result. In conjunction with these considerations, and when it is shewn, as I shall hereafter do, when speaking of the treatment, that almost all the symptoms of cholera, in its worst form—the collapsed state,—may be, for a time, removed, simply by restoring artificially the temperature of the body, it will require little observation to perceive the possibility of generating the peculiar cause of cholera on our own shores.

It will therefore be seen that external cold, in hastening the sinking temperature of the body—the result of other causes—has much to do in the production of many of the phenomena of the disease, And on this principle—the lower stratum of air being colder, and more impregnated with deleterious compounds

during the night, it is explained why cholera is more apt to attack persons in the night than in the day, when the atmosphere is both warmer and purer.

Pathology ;—and modus operandi of cause.—I shall state the morbid appearances as observed by Dr. Macintosh. Out of 291 deaths, 280 were minutely examined ; and what is stated by him as being observed, may be strictly relied upon. The blood was dark, coloured, and had lost much of its fluidity ; and it was contained in the arteries and veins, in the most minute capillary, as well as in the larger vessels ; it had the same dark colour in both sets of vessels ; some of them containing a smaller quantity, others being enormously distended. The capillaries and large veins on the surface of the body contained as much blood after death as during life. The surface of the body retained the same dark appearance as it presented during life, and the muscles were of a dark-red colour. Some thought the blood oily. In the act of death, or immediately afterwards, in all other diseases, the blood leaves the capillaries, recedes from the surface, and collects in the heart and large veins near it ; the arterial system is generally quite empty.

In the head.—Great vascularity was observed on the surface of the brain, and in the membranes ; not only were the capillaries injected, but the trunks of both arteries and veins were filled with blood, the vertebrals, carotids, and circle of Willis, as well as the vena galeni, and the longitudinal and lateral sinuses. In the sinuses the blood was often coagulated, sometimes containing a fibrinous clot. Ecchymotic patches were frequently observed on the surface of the hemispheres, produced by an effusion of blood from between the arachnoid and pia mater. The vessels of the pia mater, the velum interpositum, the plexus choroides, and the lining membrane of the ventricles were injected. The surface of the fourth ventricle, in general so white, was seen vascular, occasionally slightly stained with blood. The ventricles were found to contain a considerable, sometimes a large quantity of serum. The cortical substance was darker than usual ; and the brain generally was exceedingly vascular—and the vessels dis-

tended. In above 150 cases, the spinal marrow and its membranes were minutely examined. In all there was a considerable quantity of serum, the membranes highly injected, the rachidian veins gorged with dark coloured blood, and the substance of the spinal marrow in a few cases appeared a little softer in texture than natural.

In the thorax.—The lungs were found gorged with dark viscid, oily-looking blood; pleura minutely injected; and ecchymotic spots of the form and size of petechiæ were frequently seen on the pleura costalis and pulmonalis. Occasionally there were seen one or perhaps two small portions of the lung indurated, and stained of a dark-red colour, presenting all the characters of pulmonary apoplexy; but more frequently observed in those who died of consecutive fever. The bronchial membrane was injected, the tubes occasionally gorged with mucous, of various degrees of tenacity and tinges of colour.

The surface of the heart, and large vessels, very vascular, presenting many ecchymotic spots, more particularly on the acute margin of the right ventricle, and the aorta. In many instances, these were found to extend deep into the subjacent tissue. On making sections to display the cavities of the heart, the left ventricle was almost invariably found in a state of hypertrophy, with diminution of the cavity and generally empty. In the right auricle and ventricle, there was found a fibrinous clot, sometimes white, like coagulable lymph, at others stained with blood, consisting partly of lymph and coagulated blood of a dark colour. These masses of lymph were found to extend to the vessels communicating with the lungs. A false membrane was found in the inner surface of the aorta; sometimes not of recent date, but in many cases just forming.

The neck shewed the same injection of the vessels, on dissection. The pneumogastric nerve was frequently seen stained of a dark-red colour, through its whole course. The nerve was frequently tinged of a bright-purple colour in its substance; sometimes enlarged where it crosses the subclavian artery on the right side.

The phrenics, as they passed over the pericardium were similarly injected. Near the semilunar ganglia, there was minute injection of the splanchnics, and ecchymotic specks like petechiæ.

Abdominal Organs.—The stomach was in general contracted, sometimes remarkably so, and several times (in several cases,) divided, by contraction in the centre into two cavities. The intestines contained more or less of the matter similar to that vomited during life. Unless the patient lingered long in the second stage, no bile was observed in the bowels. The mucous membrane of the stomach was occasionally, but not always vascular ; sometimes quite white, but always much softer than natural, and in many cases thickened and quite pulpy, so as to be easily removed with the handle of the scalpel. The mucous membrane of the intestines was generally more vascular than that of the stomach, sometimes more minutely injected than if size and vermilion had been thrown into the vessels. Occasionally there was ecchymos s, and frequently softening of the mucous membrane, sometimes ulceration, particularly in the ileum and colon. In many cases, we found the colon, and sometimes ileum thickened, the mucous membrane soft, dark-coloured, and disorganised, as in some of the worst forms of dysentery. Almost every woman we opened, under a certain age, had the catamenia. The liver was frequently diseased, and not of recent date. Occasionally very vascular, and generally a sufficient quantity of bile in the pori. In two instances only was there the engorgement described by India writers.

The gall-bladder was always filled, with dark coloured and somewhat viscid bile, the organ itself vascular. The passage of the bile, not obstructed. The kidneys were generally diseased, and the vessels injected.

The bladder was always contracted, so as to be as small and dense as a virgin-uterus.

The appearances observed in those who died in the *third stage*, were marks of inflammation in the membranes, sometimes in the substance of the brain. The vessels generally remained

injected, and the ecchymotic patches between the arachnoid and pia mater, and in the ventricles, were observed. Inflammatory disorganisation, and sometimes white or red softening were observed; but some brains were quite sound. Bronchitis, Pleuritis, pneumonia, and pericarditis were frequently observed. Traces of peritoneal inflammation were observed in the abdomen. The mucous membranes of the stomach, bowels, lungs, and kidneys, about the same as in second stage. Feculent and bilious matter was always met with in the intestinal tube, and frequently urine in the bladder; sometimes the bladder was much destended. The gall bladder, instead of bile, contained a serous fluid of a yellowish or greenish tinge. If the person lived some days in the third stage, the state of the blood, and its distribution, more and more resembled the appearances seen after death from other diseases.

"A cubic inch of sulphuretted hydrogen introduced into the lungs would cause instant death. It decomposes the blood which is not again capable of being restored." (Liebig.) The blood in cholera is not in this sense decomposed,—cholera cases do recover.

"No one will seriously deny the share which the nervous apparatus has in the respiratory process; for no change of condition can occur in the body without the nerves; they are essential to all vital motion. Under their influence, the viscera produce those compounds, which, while they protect the organism from the action of the oxygen of the atmosphere, give rise to animal heat; *and when the nerves cease to perform their functions the whole process of the action of oxygen must assume another form.* When the pons Varolii is cut through in the dog, or when a stunning blow is inflicted on the back of the head, the animal continues to respire for some time, often more rapidly than in the normal state; the frequency of the pulse at first rather increases than diminishes, yet the animal cools as rapidly as if sudden death had occurred. Exactly similar observations have been made on the cutting of the spinal cord, and of the par vagum. The respiratory motions continue for a time, but the

oxygen does not meet with those substances with which, in the normal state, it would have combined; because the paralyzed viscera will no longer furnish them." (Liebig.)

This is observed in cholera, the very source of action of the organism—the ganglionic nervous system—being deprived of the power of propagating irritability necessary to enable them to perform their functions, those substances in a normal state, the result of their various actions, according to the degree of loss of vital energy, are imperfectly, or not at all, formed. A train of consequences follow, arising from, and connected with each other, and all depending upon the primary disorder of the ganglionic nervous system. Loss of heat—as in the stunned nervous energy in the dog—is an early and conspicuous symptom of cholera; and many of its phenomena are dependent thereon. "From the first moment that the functions of the lungs or of the skin is interrupted or disturbed, compounds, rich in carbon, appear in the urine, which acquires a brown colour, over the whole surface of the body oxygen is absorbed, and combines with all the substances which offer no resistance." (Liebig.)

The pathological appearances in the two stages are replete with information; in every respect tending, in conjunction with the symptoms, to develop the nature and character of the disease.

In the collapsed—or real cholera—stage, the only lesion, the result of action, properly so called, is found in the mucous membrane of the stomach and intestinal tube; and this is caused whilst the system is capable of opposing some vital resistance, in the first stage. All else—in the brain, and its membranes, the vessels filled with blood; in the vessels of the nerves, muscles, &c. of the neck, the same; of the viscera of the thorax, the same; of the abdomen, the same; of the surface of the body, the same; and throughout the whole system, the same; and this blood of a semifluid character, and of the same dark-colour in both arteries and veins—is, in conjunction with the symptoms, indicative of the circulation being carried on with gradually diminished energy—of the imperfect performance and eventual non

performance of the functions of the lungs, and skin, though the person continues to breathe, and the blood to circulate—of the consequent loss of heat in the body during life, and change in the condition of the blood—of the blood being of the same colour in both sets of vessels—of its remaining uncoagulated, partly from its altered condition, but principally because it is kept in motion in the body (as may be seen out of the body, any day in a butcher's tub,) until, and after it has lost its caloric—and of its being arrested in its progress wherever it happened to be, and as it was every where, it remained every where, by the vital force all over the system being exhausted.

In death from other diseases, the irritability—vital force of parts of the body continues in action for some time after respiration entirely ceases—the beard, for instance, will grow after death.

The appearances found in those who die in the third stage, indicate simply reaction from, and the natural consequences of such a preceding condition.

Is the disease contagious?—"A Stag may be hunted to death; but this cannot occur without the metamorphosis of all the living parts of its muscular system, and its flesh becomes uneatable. The condition of metamorphosis into which it has been brought by an enormous consumption of both force, and oxygen, continues when all phenomena of motion have ceased. In the living tissues, all the resistance offered by the vital force to external agencies of change is entirely destroyed." (Liebig.)

In the collapsed stage, no peculiar morbific matter is generated, it cannot, therefore, be contagious. Death is the result, not of asphyxia from the condition of the blood, although it is impossible but that the condition of the blood takes a considerable part in hastening the effect of the cause of death; but death is the result of exhausted irritability—vital force—and the body, whilst living, runs into rapid decomposition—as in the Hunted Stag—though the phenomena attendant thereon are somewhat different in the two cases. In apoplexy of the brain, or lungs, nervous energy is oppressed, not destroyed; remove the cause of

oppression, and nervous energy manifests its existence; but in cholera the restoration of nervous energy demands a primary consideration. Cholera differs from the cold stage of an intermittent; the latter retaining a sufficient rallying power in the system, and reaction, by force of it, occurs; but in the former all such power is wanting, and the little remaining, is thrown out of regular action; and speedily exhausted by the great irregular expenditure of force by muscular contraction—cramp—equivalent to the expenditure of force, by running, in the hunted stag.

The third stage, according to the degree of febrile action the system acquires, I believe, may become infectious—that is, may excite disease, which, in an epidemic state of the atmosphere, might become cholera, because the fever must be of a putrid or malignant character.

Nature, and Seat of Cholera.—This is not the place to discuss at length, the seat of irritability; a decision on that point, is essential to a decision on the nature and seat of the disease; I shall state as much only as is necessary to the purpose. There will be no intention or attempt here to define the essence of life.

The sensiferous nerves do not convey irritability—cases are on record where sensibility was lost, and motion retained. "The first case sent to me was that of a mother, who had lost sensibility on the left side, and motion on the right; she could hold her child by means of her left hand, and while she looked upon it she nursed it carefully, but the moment her attention was drawn from it, the hand relaxed, and the child was in danger of falling; there was no sensibility in the arm to inform her of the necessity of keeping it in the proper attitude, her only information was afforded by the eye, and it was only when she looked upon the child that she possessed complete governance over the muscles of that arm. It was noticed likewise, that she had no sensation of sucking when the infant was applied to the left breast." (Sir Charles Bell.)

It will be observed that this case is peculiarly illustrative of the existence of irritability—vital force—entirely independent of either the sensiferous or motiferous nerves; not simply as regards

muscular motion, but other processes of vitality, as is evident from the existence of secretion—she had milk in, and suckled her child on, both breasts, yet had lost sensibility on one side, and motion on the other.

"Nervous energy is found to be in general at once intercepted by tying the nerve by which it is naturally conducted. And if a respiratory nerve, in direct contact with a motiferous nerve, be so tied, or vice versa, the stimulus of sympathy and passion is intercepted, while that of volition is unobstructed, or the reverse." (Dr. Fletcher.)

If, therefore, motiferous nerves convey only a stimulus to action, and that action consists in the exercise of a property already resident in the structure to which the stimulus is conveyed, however that property has been acquired, it is clear the motiferous nerve does not propagate action, but excite it only.

And if it is found that the heart or other muscle of the body, retains the power of action after removal from the body, for a considerable time—the heart contracting as if in connection with the nerves in the body, without other stimulus than that retained in its own substance, and the muscle contracting on the application of extraneous stimuli, it must be, either that the property is peculiar to them, or that something entering into the composition of their structure has the power to propagate it. If the property is peculiar to them, it ought not to be exhausted, but continue; if not peculiar, but propagated therein, it ought, after a time, to be exhausted,—since it is cut off from its principal source, and when the limited means of propagation are worked up—accordingly, in time, it is exhausted.

Circumstances govern its manifestations for a longer or shorter time—the abstraction of stimuli, of heat, for instance.—This is particularly exemplified by Harvey:—"An experiment being made on a dove, after the heart had ceased its motion, and the auricles had also given over their motion for a short space, I made my finger wet with saliva, and being warm, detained it awhile on the heart. From this fomentation, as if it had received life and strength anew, the heart and its auricles began to be

moved, and also to contract and relax itself, and seemed as if it were recalled back again from death." (Exercit: Anatom: Cap. IV.)

In cold blooded animals, where heat is not important, this property is exhibited more particularly, as independent of the cerebro—spinal system; and, to a certain extent, of any common centre.—I took the heart out of a gold-fish, and laid it on a deal slab, and its systole and diastole continued an hour and three quarters, when it ceased. Several times, during the last half hour, it seemed to lose the power of contraction, but renewed it on being moistened with a little water.

On the application of powerful stimulus—electricity—irritability is shewn not to be wholly exhausted, contraction is again manifested. But it can be exhausted, and by continuing the electric stimulus, is so. This is represented as being the case by Sir Charles Bell—"And in exciting these powers, (property) far from renewing them, it exhausts them altogether." This shews that vital force does not consist in electricity. And during the action of the heart while on the slab, for an hour and three quarters, no blood whatever was expelled from the heart, and of course, none entered it; irritability, therefore, cannot consist in the stimulus of the blood, or the heart's action must have ceased on removal from the body.

From a similar fish I took the muscle which governs the action of the jaws, and which, therefore, possesses considerable irritability; having laid it on the same slab, I allowed it to remain for two hours without touching it, and afterwards occasionally exciting its surface with the point of a pair of pocket-case scissors, I found it retained the power of contraction, on being touched, for an hour and a half longer.

From another, I took the similar muscle, and laid it on the same slab; but continued from the first to excite the contraction of its fibres, in all its parts, with the point of the scissors—it lost the power of contraction in a very short time.

The result of these experiments is, that the organ possesses no irritability per se, but that it by some means retains it to a

limited extent, which, being expended, and being cut off from its main source, cannot be renewed.

A motiferous or sensiferous nerve being divided, immediately cuts off motion or sensibility in the part to which it is distributed.

This shews them to be conductors only, and not propagators. But it is different with the ganglionic nerves : the cineritious and white part being minutely interwoven, renders them to a certain extent independent of any common centre ; and enables them, after separation, to that extent to propagate the property peculiar to them to the organ so separated, and in the substance of which they ramify. "Every point of every nerve contains white and grey matter intimately interwoven together, and may be considered therefore as a centre of nervous energy to itself." (Bichât.)

"And it is to be remembered that there is no point of any organised tissue which does not contain ganglionic nervous matter, such matter being essential to its organism ; and, consequently, there is no point which is not possessed of the property in question—irritability. It is true there must be spaces in the ganglionic nervous matter occasioned by one or other of those peculiar aggregations of matter which go to form respectively the cellular, dermoid, mucous, serous, fibrous, vascular, osseous, cartilaginous, or muscular tissues, wherever an organized tissue presents itself ; but the spaces thus occupied are so infinitely minute as to be perceived only by the minds eye." (Dr. Fletcher.)

If then, organic tissue ceases to manifest those functions on separation from the cerebro—spinal nerves, which are manifested therein when in connection with them ; and if organic tissue possesses no irritability per se, and yet manifests irritability after removal from the body, and is so minutely intersected by ganglionic nervous matter, which, in construction, is calculated, to some extent, to be independent in the propagation of its peculiar property of any other source, it is easy to conceive the seat of irritability.

The ganglionic nervous system is the seat of irritability—vital force.

In cholera therefore, the irritability of the system being so enfeebled—consequent upon the morbid condition of the ganglionic nervous system—the result of causes before mentioned—the system is, in its various organism, incapable of forming the usual substances requisite for opposing the necessary vital resistance to the action of surrounding agents, at all times tending to their decomposition. The consequence is, irregular and deficient action in the organism generally. The action of the heart, lungs, and capillary circulation is affected immediately; and the vital actions generally are imperfectly performed; the temperature of the body, and the secretions become changed with the character of the blood, which suffers immediate change from the impeded functions of the lungs and capillaries.

The system is known to concentrate all its powers to resist destruction—"Since the phenomena of motion in the animal body are dependent on the change of matter, the increase of the change of matter in any part is followed by an increase of all motions." (Liebig.) From the action of some acrid matter in the secretions, prejudicial to vital existence, and the result of the altered action of the organism, and condition of the blood, on the mucous membrane of the intestinal tube, irritation, excitement, and increased action ensues therein, diarrhœa is the result, and the offensive matter is expelled. This is an increased demand upon the already enfeebled irritability of the system, and its effects are an increased and more extended disorder of the vital functions; the excitement reaches the stomach, and vomiting ensues, the heat of the body is diminished, and absorption is impeded, in consequence of which, the results of change of matter are not removed, forming another source of irritation, manifested in the muscular tissue by spasm—"Should there be formed in diseased parts, in consequence of the change of matter, from the elements of the blood or of the tissues, new products;—should the surrounding parts be unable to convey these products to other parts, where they may undergo transformation, then these new products will suffer, at the place where they have been formed, a process of decomposition analogous to fermentation or putrefac-

tion. When substances in a state of putrefaction, are laid upon fresh wounds, vomiting, debility and at length death are occasioned." (Liebig.) From the spasm the circulation becomes more impeded, and the blood becomes more changed in character, manifested by the discoloured appearance of the skin; and from being nearly arrested in its progress, the serum—and in some instances with it, the coloured part, forming the resemblance to bottoms of port wine, &c.—is squozen out into the intestines—and wherever there is an outlet, hence, the catamenia was always found—and is both vomited and evacuated by the bowels, hence, the watery evacuations. The functions of the organism, and vital processes generally, are almost suspended, the temperature of the body completely falls, and absorption generally is stayed, becoming a source of general irritation, and general excitement, spasm—cramp—is the result—appearing as if the whole irritability of the system had been let loose from under all restraint or government, each muscle or some part of it, suddenly starting into action without the rest, refusing, as it were, to remain in a state of repose, or to obey their customary stimulus, volition. The muscular system is now in extraordinary action, and expending a great amount of vital force, the system generally being greatly deficient therein for ordinary action, and its source being deprived of the power of propagation, combined with the now general functional disorder of the system, and of the vital fluids, affording no possible chance of a renewal, speedily terminates in complete exhaustion and death.

What, therefore, is Cholera?

It is an abnormal condition, of an asthenic character, of the Ganglionic Nervous System, of which condition, the cerebro—spinal system in some measure partakes—disabling it from propagating to the organic, muscular, and other apparatus of the body, the customary irritability necessary to the performance of the functions of life.

And its effects and manifestations are:—An impeded circulation, with suspension of the functions of the lungs, and skin, and of the secretions; total loss of animal heat, muscular irrita-

tion, spasm, and frequent vomiting and evacuations of the serum of the blood; speedily terminating in suspension of vital motion, exhausted vitality, and death.

The name best indicating its true pathological origin, would be—Cholera Asthenia.

Treatment in the First Stage.—As the body is deficient in vital force, and the functions of the lungs and skin are in a state of transition to irregularity and all the consequences thereof in progress, to administer anything, having for its effect the unloading or cleansing out of the bowels, supposing them to contain hardened fecal, or acrid irritant matter, would be to hasten on the direful effects of a further depression of vitality. If, therefore, it be injurious to promote the discharge from the bowels, it must, by force of the same cause, be also injurious if it be allowed to exist at all; consequently, we are brought to the conclusion, that it ought to be immediately stayed. The bowels are in a state of excitement, not from over-vascularity, or, in reality, from an over charge of nervous energy, although, in one sense, the latter is the case; but they are in a state of excitement, in the first place because of deficiency of vital resistance, and secondly, they have acquired temporary increased nervous energy at the expense of other parts of the system, which become more deficient in consequence; and there must be by continuance a greater degree of exhaustion—first, by a greater expenditure of vital force, less and less being propagated to replace such expenditure during progress; and secondly, by the power of the irritant matter to cause irritation therein being increased in consequence of diminished vital resistance; those remedies therefore must be most successful, which have the effect of raising the vital force of the system so as to enable it to oppose the necessary resistance to the action of these agents of irritation, in which case they may be safely expelled; and, from the functions of the lungs, skin, &c. resuming their natural character, would not again be formed.

The temperature of the body immediately suffers when the functions of the lungs and skin are impeded; in cholera, this is

imminently the case; therefore, the object of primary importance is the restoration of the temperature of the body—all vital manifestations are dependent thereon. The best method, and it is happily the most ready, is to place the legs and feet in warm-water,—as hot as it can be borne, and kept so to the last—for 15, 20 or 30 minutes, or longer in some cases, and repeated if necessary, at intervals. This artificial restoration of heat, renders the blood more fluid, and quickens its motion, the breathing becomes more free, the skin and lungs in some measure resume their functions, and temporary increase of nervous energy, and consequently, vital resistance, and diminished irritation is the result of this application alone.

Opium, in appropriate doses, is a remedy which at once acts on the nervous system; its primary effects are to exhilarate the system, and increase nervous energy. It resolves spasm, by enabling the nervous system to oppose the necessary vital resistance to the cause of irritation. In some cases a single dose of gr. j. will be sufficient; where it is not, a repetition of the dose, in mild cases, of half that quantity, every four or six hours for several times, may be required; and in severe cases where the symptoms are threatening, it is necessary at once to combine it with gr. j. or gr. jj. of acetate of lead, which, I believe, will rarely fail to stay the relax. In conjunction with this, Sulphuric Ether, in appropriate doses, every 4 hours, properly diluted, will be found peculiarly suitable and necessary.

The diet ought to be in quantity and quality, of that character best calculated for nutrition, and speedy assimilation, and having the least tendency to irritate the already excited mucous surface. Arrow-root with milk, and beef-tea, in quantities, often repeated, of not more than half a tea-cup full each time, and drank out of a cup—in fact, the diet ought to be conducted medicinally; and these things are superior to any other, being equally nutritious, and much less irritative (a much wanted quality) than almost any other. To them may be added an occasional half-cup of ordinary tea, or a little water if required. And together they form a diet at once agreeable, suitable and sufficient. It is neces-

sary not to subject the body to undue exercise, or exposure to cold or moisture, but to confine the patient to the house, or to bed, where the purging, and other symptoms are considerable.

When the temperature of the body is restored, and the purging ceased, the restoration of the system to a normal state, may require the administration of alteratives, and other remedial agents. The best aperient will be the Pulv. Rhei, if required, combined with an alterative mercurial dose.

When succeeding debility requires attention, very small doses of Sulphate of Quinine, (the mildest solvent of which, I have found to be Spt: Eth: Nitr: and which I have generally given in combination) is very useful and appropriate.

In debility resulting from dysentery, I have found quinine very serviceable. Large doses of quinine bring on purging.

Should it be argued that to check the relax suddenly in all cases, would be to subject the system to dangerous vascular excitement, and to serious local disease; I would remind them of what has been said of the condition of vitality generally, and of all diseases, at the present time assuming an asthenic character; and would ask—How prizable would be the excitement as the supposed result of speedily checking the relax, and how willingly, and readily would be poured into the stomach all here recommended, and infinitely more, to obtain that excitement out of the dreadful collapsed state?

Chalk, Aromatic Confection, &c. may be serviceable in ordinary diarrhœa, at ordinary times, but inasmuch as neither the one nor the other, nor both combined, will be of the slightest use in raising nervous energy, both, by reason of their inutility, being relied upon, will become passive irritants, and promoters of the disease.

In the case of English cholera, I before mentioned, as occuring about six weeks since, the man, about 45 years of age, felt sickly, and was purged in the morning, which shortly terminated in the usual symptoms of English cholera: the motions and matter vomited were watery, the temperature of the body much reduced, the cramps severe, and thirst considerable. I saw him

first about half after one p. m., and immediately gave him Pulv: Opii gr. ss. Plumb: Acet: gr. jss. in pill, and sent him three more pills, and a mixture of Spt: Eth: Sulph: ʒij. Aquæ ℥vj.; two table-spoonfuls and one pill to be taken every two hours. His feet and legs were put in warm-water, and afterwards wrapped in warm flannel, and the warm oven-plates, folded in flannel, laid under his hands and arms. He never had a motion until the next day after the warm-water, and first pill; the cramp had entirely left him at half after six same evening, and the next day he got up comparatively well. He took in all, three pills, and two mixtures, and since then has been quite well and had no medicine of any kind. The first motion he had, the day after his seizure, was sufficiently solid to take the form of the rectum.

Treatment in the Second, Cold, or Collapsed Stage.—Here, although the organism of the body is entire, all is, as it were, disorganisation. No organ of the body discharges its functions right, some, not at all. The blood is much changed in quantity, and quality; is everywhere blocking up the vessels of the body, is nowhere discharging, or able to discharge, the duties of its offices. The temperature of the body is gone far below the standard, beyond which, the functions of the body cannot remain in operation. Indeed the body is, to itself, inanimate; and fast going into decomposition.

It is here more than ever necessary to bear in mind the almost entire absence of vital force. To bleed in this stage, either locally or generally, would indeed be to avoid Charybdis, and fall upon Scylla.

The only possible good that can be presumed to be derived from bleeding is—by taking from the circulating system a portion of its contents, there would be less to be propelled, and require less effort for its propulsion, and thereby afford some chance of restoring the circulation. But when it is considered that the blood has already suffered great diminution in quantity, from the abstraction of its fluid part—the serum—that from the toe, and

finger ends, through the entire body to the scalp, the blood is in the same thickened condition—and that its course is obstructed by action—spasm—not the result of too much, or of suppressed energy, but of ill directed energy, the result of general deficiency ;—in fact, by an energy of action, plundered, as it were, from the whole system, as is manifested by the cessation of all organic functions, it will be at once admitted that no good whatever can by any possibility be hoped from the abstraction of blood in the cold spasmodic stage.

My impression is, that if several of the cases of Asiatic cholera I saw in 1832, which terminated fatally, and were treated by bleeding, opium, ammonia, and other stimulants, and external applications, of mustard, &c. had been treated with opium and acetate of lead, and ether, with proper attention to the artificial restoration and maintainance of the temperature of the body, with a full reliance thereon, a different result would have happened. Indeed the matter resolves itself into a very simple question—Whether would it be better to abstract blood impeded in its course by a condition of the body, its abstraction would in no way tend to remove, or to remove the condition of the body causing the impediment, and allow the blood, of which there is not too much, to remain in the system ?

To raise the temperature of the body and promote a free circulation of the blood are here the important primary considerations. Without the former, even a temporary manifestation of increased vitality is impossible, It is known that heat is conveyed to all parts of the body by the blood, and in those who die in the collapsed stage, we have seen in what a condition the blood is found. To attempt, therefore, by internal administration of remedies alone, either by the stomach or anus, to excite the circulation, and thereby increase the temperature of the body, would be to let the patient, as is often the case, die.

The effects of artificially restoring the temperature of the body in collapsed cases, even without improving in any way the quality of the blood, except as to its fluidity, is beautifully exemplified in the effects following the injection of warm fluid

into the veins, as observed, and related by Macintosh.—"The pulse rose soon after the injection commenced, and by the time about three pounds were introduced, it became a tolerably good one. On the cramps, the effect was quite remarkable; they generally ceased as soon as the pulse became good. Many cases that appeared to us hopeless, from age, &c., were injected solely with a view to mitigate the sufferings produced from cramps. The respiration, however weak previously, soon became stronger. The voice which had been whispering, now became natural. The countenance lost its shrunk appearance, and the mind became lively.

The thirst, however urgent, soon ceased. I have not unfrequently seen patients sit up in bed immediately after the operation, in perfect possession of themselves, and speak with joy on the sudden transition from agony and death to happiness and life."

And what was the cause of all this wonderful, and desirable transition? Nothing whatever was contained in the fluid injected capable of taking part in the effect produced—warm water would have had the same effect; as to whether the salines the fluid contained, would influence ultimate recovery, is another thing. The following other effect of the injection explains the whole.—"The effect on the temperature of the body is almost instantaneous; the body which could not previously be heated, now becomes warm, and instead of a cold damp exudation on the surface, there is a gentle and genial moisture."

Macintosh did not detect the true source of the benefit derived from venous injection. He attributes it to supplying the deficiency of serum to the blood, and in this way restoring the loss. He says—"That there is a deficiency of serum in the blood in cholera patients, was soon suspected, and I have no doubt of the correctness of this view. When artificial serum has been added by injection, and mixed with the circulating blood, the bad symptoms have vanished, and every appearance of health restored." Notwithstanding this, he observed the fact, and in describing the best way of using the injection, relates it—

"The good effects of the injection were rapid in proportion to the heat of the solution, but patients could not bear a higher temperature than from 106° to 120°."

We thus perceive how much may be done by restoring the temperature of the body alone. And it acts by supplying artificially a powerful natural stimulus—heat—to the body, thereby bringing into operation what of irritability remains therein—as in the case of Harvey's experiment on the heart of the dove—and so enabling the system to manifest temporary reaction. And why does it fail to produce ultimate recovery? Because the vital force is insufficient for the purposes of life; and the blood in both arteries and veins is completely incapacitated for the performance of its functions, being of the same condition in both sets of vessels, and has long circulated through the body since it became so incapacitated. The irritability of the system is almost exhausted—it requires regeneration; this regeneration is dependent on the organism, and on the blood, the condition of the organism, and of the blood is unequal to the causation of a transformation of tissues, as in a normal state, without which, a renewal thereof cannot take place, nor their properties be propagated; irritability, therefore, is eventually exhausted, and the patient dies.

The very slight return of the performance of the functions of the blood from venous injection, is indicated in the following other observations of its effects by Macintosh.—"The secretion of urine in general, soon returned after the injection; but in this we were more frequently disappointed than in any other favourable symptom." And why? Because the conditions of secretion did not as yet exist. Secretion is dependent on the functions of the blood in the organism, whereas the blood was simply made to circulate, and distribute caloric artificially supplied to it, not generated by its own agency in the body, as is the case in a normal state.

It is clear that a great point is gained by raising the temperature of the body—it renders the system sensible to the effects of remedial agents through the stomach, which in the condition of

the system without it is often impossible, the blood being almost motionless and of a consistence incapacitating it for motion. But along with the attempts to restore, and on the restoration of the heat of the body, it will be necessary to treat the disease as if the temperature of the body had never been lost—that is, it must be understood, that by restoring heat artificially to the body, nothing whatever is done towards checking the disease, save bringing on a condition of the system in which remedies may be administered with some chance of producing effect.

Therefore, notwithstanding all the wonderful effects resulting from the restoration of heat to the system, the disease still exists in all its force; and unless checked by other means, the body is brought only into that condition enabling it over again to manifest all the dreadful phenomena of the disease, and expend the little of irritability remaining to it. This is proved by fact—Macintosh says "vomiting and evacuations frequently returned with all the horrors of collapse."

The objects to be attained in the treatment of the cold spasmodic stage, are first, an elevation of temperature in the body. This produces increased motion in the organism, and in the fluids of the body, thereby the processes of life are in some degree resumed, and preparation made for the reception and appropriation of the effects of medicinal, and dietetical remedies.

And secondly, to sustain and increase nervous energy. This enables the system more efficiently to resume its functions, and oppose a more efficient vital resistance to the action of the causes of depression and irritation.

Except in extreme cases, where the temperature of the body is gone, and vitality almost suspended, the heat of the body may be sufficiently restored by external applications alone, such as vapour, or warm bath, moist and dry warm applications in various ways to the body; friction, &c.

And as to medicinal treatment, I have found all diseases, so far as treatment of them is known, subservient to principles of treatment; and those principles of treatment best which are the simplest and least complicated. Opium, Acetate of Lead, and

Sulphuric Ether, the two first in combination, in appropriate doses, according to the age, and condition of the patient; and repeated according to the urgency of the symptoms, and effects produced; and the latter also in appropriate doses, at necessary intervals, properly diluted, it may be, with the cordial waters—Peppermint, Cinnamon, Anise-seed, &c. &c., and combined with the cordial tinctures—compound Cardomom, Cinnamon, or Spirit of Lavender. These, as medicines, I am of opinion, will answer every requisite purpose.

The mode of action of Opium, I have before briefly, but sufficiently alluded to; it is an acknowledged good, and necessary remedy.

It is to be remembered the system is going into decay, and the stomach, bowels and muscular system generally is in a state of great irritation and excitement. Lead acts in the body by entering into direct combination with its structure, and arrests the progress of the change of matter—decay; and it is known to restrain muscular action, even to paralysis;—and by these properties it is, that it is so useful in combination with Opium, in restraining the action of the bowels, and fluid evacuations.

And where nervous energy is deficient, so as to leave the system unprotected from the action of external agents, for want of a sufficient vital resistance, Ether, by its power to diffuse itself through organic substance, and the property of its elements to combine with oxygen in the body in the place of its tissues, arrests the progress of the action of oxygen therein, and stays the progress of decomposition, thereby becoming a substitute for the deficient vital force of the system, and for the substances usually existing in the normal state of the body—the result of transformation of the tissues and vital functions through the agency of the blood. And, consequently, what of assimilation of nutriment, and renewal of the blood can take place, becomes a direct gain of strength to the system. The Ether thus becomes a direct stimulant and tonic.

In cases of extreme collapse where the blood has lost its fluidity, and caloric, and become so entirely changed as we have

seen it is in those who die in that condition, it must be at once evident, that the chances of making any impression whatever by means of external applications, or internal remedies, must be very remote. When it is seen how great are the effects resulting from the injection of warm fluid into the veins in such cases, it is worthy of consideration how far venous injection might be used for the purpose of raising the temperature of the body, sufficiently to bring into operation the circulation of the blood, and probably in some degree the functions of assimilation; and as temporary reaction progresses, introduce into the stomach the medicinal and dietetical remedies intended to sustain and increase nervous energy, and check the evacuations; at the same time by proper attention to external warm applications, sustain the artificially derived temperature of the body, till the vital functions are so far restored as to enable the system to generate heat, and properly establish reaction. The same diet as before recommended, more assiduously attended to, will be all that is required in the cold stage.

Treatment in the third Stage. In which to abstract much blood would be to insure certain destruction, for, although from the obstructed state of the blood vessels, and condition of the system generally, much excitement will ensue, it will be of an asthenic character, and want force, rather than possess too much. Blood can only be taken with a view to lessen local obstruction. The condition of the mucous membrane would much interfere with diminution of vascular excitement by aperients, as also the nature of the disease, but it will be necessary occasionally to resort to a judicious use of them. Calomel in alterative doses will be essential occasionally. Warm bran, or other warm Cataplasms applied to various parts of the body as congestion, or inflammation occur, will, in many instances, be found sufficient to remove or allay them. And, I am of opinion, it will be decidedly injudicious to give up entirely a stimulant treatment. To carefully nurse and increase vital force, by medicines, diet, warmth, &c., at the same time watchfully guarding the system against injury from congestion or excitement; judiciously relax-

ing, and allaying excitement, and again resorting to those means calculated to promote the re-establishment of the functions of the organism, will be the most judicious course.

Inflammation occuring in this stage of Asiatic cholera, is of that character existing in Cynanche Maligna—asthenic—and like it, may require relief by a little abstraction of blood from overcharged vessels, as also, in some degree, from the condition of the blood in them; but like it also it requires a stimulant treatment. And, as if the latter was abandoned to an antiphlogistic treatment, the inflammation and ulceration would extend, and the patient die; so in the former, if so treated, would there be found on autopsy, inflammation more extended, resulting from an irregular local expenditure of vital force, the result of a general deficiency thereof. The treatment on reaction from cholera to convalescence, in order to be useful, and successful, cannot be otherwise than symptomatic; always bearing in mind there is no vis vitæ.

PRECAUTIONARY MEASURES.

It has already been said that disease is chemical action; chemical action, governed by vital force, is also necessary to health; consequently, before disease can be avoided, it is necessary to know what circumstances favour chemical action producing it.

"Experience tells us that the vital phenomena are inseparable from matter; that the manifestations of the vital force in a living part are determined by a certain form of that part; and by a certain arrangement of its elementary particles. If we destroy the form, or alter the composition of the organ, all manifestations of vitality disappear. There is nothing to prevent us from considering the vital force as a peculiar property, which is possessed by certain material bodies, and becomes sensible when their elementary particles are combined in a certain arrangement or form. *This supposition takes from the vital phenomena nothing of their wonderful peculiarity.*" (Liebig.)

Nitrogen is an elementary constituent of all organic structure; and in its affinity for other elementary substances, except Hydrogen, exerts a very weak influence, but has a tendency at all times to escape from its combination therewith. In its combination with other elements of organic matter, it is governed and retained therein by the vital force; between the powers of which, to force organic elements into, and retain them in combination, the tendency of Nitrogen to escape, and the affinity of external agents for the other elementary particles, there is a continued struggle for ascendancy. It will therefore be evident, that when

the vital force from any cause fails, the system is abandoned to numerous active causes of disorder, and according to the degree of failure of vital force, suffers in intensity of chemical action—disease.

Water is a compound of Oxygen and Hydrogen. Nitrogen has a great affinity for Hydrogen; and it has been shewn that Ammonia (a compound of Nitrogen and Hydrogen) is always a result of organic putrifaction. Oxygen has a great affinity for all elementary constituents. Therefore, in places of low level, admitting but of imperfect draining, and in places imperfectly drained, and more especially if in a confined and badly ventilated locality, in consequence of these properties of the elementary constituents of organic matter, and of water, two important favourable circumstances for chemical action producing disease always exist. First, the existence of various compounds, the results of putrifying matter, brought into that condition by the motionless stagnant accumulation of moisture, which would be carried off by efficient draining. These compounds depress and weaken vital force, thereby enabling the second favourable circumstance—the constant presence of the elements of water to come into chemical action with the constituents of the body, and a more or less active manifestation of disease is the result. The same arguments are applicable to over-crowded unclean living or sleeping rooms; but the mode of action, and the effects thereof, would be somewhat different. It is unnecessary to particularize them.

It has been shewn that the phenomena of life, and therefore health, are only manifested in proportion to the arrangement of the elementary particles of organic structure in a certain form, it must, consequently, be evident, when the elements of moisture tend so greatly to derange that form, though not absolutely succeeding in destroying it, yet causing its constituents to be held by so loose and weak an affinity, that it is impossible the same manifestations of vitality or health can result from such a condition of the structure of the body, as would do were the conditions for the necessary resistance to the action of these

agents of change therein existent. Hence, is explained, the present condition of vitality, noticed herein when speaking of the cause.

To avoid the circumstances herein alluded to, as favouring the development of disease; and those irritant articles of diet, as cabbage, greens, peas, putrid fish, meat, &c., will be proper precautions against the disease.

JOHN SWINDELLS, PRINTER, MARKET STREET, MANCHESTER.