Asbury (J. V.)

A TREATISE

ON

EPIDEMIC CHOLERA;

ILLUSTRATING

A NEW THEORY OF THE DISEASE,

ON WHICH THE PRINCIPLES OF A SYSTEMATIC MODE OF TREATMENT ARE ESTABLISHED.

BY

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PREFACE.

In the absence of a generally received opinion relative to the Pathology of Epidemic Cholera, the Author of this Treatise advances a theory founded on the Physiological views proposed, and ultimately established, by Sir Charles Bell, on the functions of the nervous system. And at the same time that he acknowledges, with gratitude, the advantage which he derived by the elaborate discussions presented to the auditors of this original physiologist, in the exposition of his own system of the nerves of the human body, he ventures to affirm, from observation and experience in numerous diseased conditions of the system, that the divisions therein contained are not only in themselves natural, but they will be found of practical utility in the choice of remedies for the removal of any morbid action. This arrangement of the vital properties of the nervous system will prove as great a discovery in this period as the investigation and ultimate acknowledgment of the vital properties of the blood in the time of Mr. John Hunter. And it is gratifying to bear in recollection, that the subsequent professor, with whom the new system of the nerves originated, occupied the chair so distinguished and memorized by the discoverer of vitality in the blood.

ERRATUM.

In page 23, lines 7 & 15, the reader is requested to write *dormitive*, in place of *cerative*, by which the Author means to express an epidemic influence secretly operating in the night, and transmitting the repose of the nerves of sensation and voluntary motion during sleep to the par vagum, and so rendering the involuntary organs to which it is distributed inactive, torpid, and unable to perform their natural functions.

ON THE

PREVALENT EPIDEMIC

CALLED

CHOLERA.

THE origin and progress of Epidemic Cholera in India, about the year 1817, the appearance and rapid advance of it through Europe, its visitation to this Isle, and transmarine flight to the Continent of America, with the great mortality attending it in all places, are well known and minutely described by several authors, who have witnessed the pestilence abroad. And it may be observed, that most writers on this subject agree in the history, mode of attack, and other collateral circumstances attending its progress through different countries; but in the character of the disease given by practitioners in India, and in different parts of Europe, there is sufficient ground to infer that, either two distinct

diseases have prevailed, or that there are two great varieties of the same disease. In England we find cases which have occurred in distinct parts of the kingdom, and to which the term Cholera Morbus, Cholera Maligna, Spasmodica, Indica, &c. have been given, wherein two specific differences have existed; one is the absence of bile, the other is the presence of excessive secretions of that fluid. In the latter instance the superabundant flow of bile is the exciting cause of the vomiting, diarrhœa, &c. and forms the characteristic symptom of Cholera; but in the former, where there is a total absence of bile, we must look for some other exciting cause to account for the deranged state of the alimentary canal. From numerous cases that have fallen under my own observation, I am disposed to consider these specific differences as forming the basis of two diseases, essentially different in symptoms and general character, as well as in their remote and exciting causes, and each requiring a different mode of treatment. The disease accompanied with a superabundant secretion of bile is the old English Cholera, in the character described by Sydenham* and other authors, oftentimes pro-

* Opera Universa, edit. 3d, 1705.

ducing death in twenty-four hours; and the last three autumnal seasons it has been increasing in the number of cases, as well as in their degree of violence and mortality; and what has been called the Indian or malignant Cholera bears no resemblance to it, as will be found on further investigation. The disease now* so familiarized to the ear by the name of Cholera, which from the absence of bile is improperly so called, is entirely new in this country; and possesses such extraordinary properties of communication, that it has spread in all seasons, and in all climates, by principles apparently so diversified and contradictory, that mortal eye cannot unfold its mystery. The term Epidemic, therefore, meaning some influence in the atmosphere which nobody understands, is best suited to explain or identify what is meant by the word Cholera in this instance; and it is on this character of disease that I advance a new theory, which will be found to explain progressively the different phenomena that are presented in all its stages. A narrative of the symptoms will afterward become intelligible; and we may then

* A. D. 1832.

proceed to the consideration of a systematic mode of treatment.

Before I enter on this explanation, it may be of some importance to notice the prevailing characters of disease which fell under my observation previously to the irruption of Cholera in England; and tending to establish the principle, that either from some property in the atmosphere, customs of society, individual habit, or change of locality, diseases are frequently varying both in degree and in character. And it will be found, that *diseases of the mucous tissue, more particularly, have been present with, and did exist for some time prior to the appearance of, Epidemic Cholera.*

One of the most remarkable of these changes is in Typhus, which has been gradually approaching a milder type; and for the last twelve months, not a single case has occurred amongst the poor of my district, though heretofore the number of cases constantly on the sick list have been from six to ten during the months of November, December, January, and February. The ague made its appearance principally amongst the poor and middle class, being constant residents, in the month of August, during a very hot and dry season, when

there had not been rain for many weeks, and the cattle, in some districts, were driven from place to place for want of water. This disease was not known to exist in the parish for more than twenty years, excepting such cases as had been brought into it from the lower parts of Essex.

Diseases of the mucous membrane of the stomach, attended with fever, and great prostration of strength, from their frequent occurrence the last two or three years, have attracted my particular notice: in some of these cases, the debility has run on so speedily as to require the most energetic treatment. The affections of the mouth and throat, usually called inflammatory, have prevailed to a great extent, with a weak pulse and general debility. On inspection, the mucous lining presents a darker red than is usually seen in common inflammatory throats which terminate in abscess: there is considerable swelling and tumefaction of the subjacent tissues, evidently arising from a relaxed and injected state of the vessels, indicating a want of tone, and not an increased inflammatory action in them. I have a case now before me: the mouth is open, and the gums present a dark red, and are so swollen as to obscure a great portion of the teeth;

the lining of the mouth and palate has the same red and tumefied appearance; the uvula is swollen, and has its point resting upon the base of the tongue; and the tonsils are enlarged, and projecting from their beds. There is a profuse secretion from the surface, and a constant discharge from the mouth: no fœtor. The attack came on in the night, by coldness and exhaustion, followed by slight fever; great prostration of strength continues*. In similar kinds of disease, the tumefaction of the tonsils and soft palate has been so great as to threaten suffocation, and to require immediate scarifications; and in a case which came on suddenly in the night, I was obliged to remove a great portion of the uvula, which from its enlargement, and the motion given to it by laborious breathing, occasioned very distressing symptoms. Nature seems to relieve herself in these cases by establishing a profuse discharge of mucus from the affected parts. I have seen purgatives given in these affections of the mouth and throat excite more than ordinary irritation of the bowels; and their operation, if extended beyond emptying the

* This individual had previously enjoyed a good state of health, and had not been under the influence of mercury.

canal of feculent matter, has produced great exhaustion.

Affections of the mucous membrane of the bronchia and air-cells also have presented similar marks of debility, and required great caution in any depletory measures. These diseases of the mucous tissue in some seasons have occurred so generally, for a short time, and simultaneously in distant points of the same district, as to give them the character of an epidemic. It may be also of some importance to remark, that influenza prevailed to a considerable extent six months previously to the irruption of Cholera in London.

The only point worthy of notice connected with our atmosphere, during the prevalence of these diseases, is the long continuance of the east and north-east winds. In last spring these winds continued for nearly three months, with little variation, producing an influence on the functions of the human constitution, as well as on many domesticated animals; and effecting a change in the general character of disease.

We have epidemics, from some inexplicable influence of the atmosphere, affecting the mucous membrane of the nose, fauces, bronchia, &c.; and,

from the appearances of the stomach in post mortem examinations of Cholera cases, I am disposed to refer an analogous epidemic agency on the coats of the stomach and small intestines, through the medium of the respiratory nerves, as the direct cause of Cholera. It is probable also that the mucous tissue and elasticity of the lungs are affected, at the same time, by the same epidemic influence. What will be the effect arising from the inner coat of the stomach and subjacent tissue being brought into a similar state in which we observe the Schneiderian membrane in influenza, or the mucous lining of the mouth and fauces, in the cases before described?

The solution of this question involves a considerable train of physiological reasoning, connected with the function of respiration, the nervous and arterial systems. Such a state of the stomach implies a diseased action of its nerves and blood-vessels, by which it is amply supplied; the latter throwing out a considerable quantity of fluid, and the former paralyzing the organs to which they are distributed.

I must call the attention of my readers, in this place, to the nervous system, not as possessing one

common centre, the brain, but having a central point of action entirely unconnected with that organ in function, viz. the par vagum. It is the grand centre of the nerves, supplying the organs called into action during respiration, and takes its origin, along with other respiratory nerves, from a distinct column of the spinal marrow, "*from which neither the nerves of sensation nor of common voluntary motion* take their departure*. The distribution of the par vagum will fall on some of those parts to which I have alluded, as particularly affected by disease latterly, and on those organs which are the instruments of the phenomena presented in Cholera. There is the superior laryngeal branch of the par vagum to the organ of voice, then the recurrent laryngeal passing from below upwards on the trachea ; a great plexus sent to the lungs ; another to the heart ; and, lastly, the gastric plexus, or corda ventriculi, to the stomach. There are other nerves in this system connected with respiration, as the portio dura of the seventh, branches of the glosso-pharyngeal, the fourth nerve, the external and internal respiratory, &c.; but the par vagum is the centre of nervous action, and it is

* Sir Charles Bell's exposition of the natural System of the Nerves, edit. 1824.

the first of these nerves affected in Cholera. Such is the sympathy existing in this system of nerves, that an agency operating on one nerve affects the whole ; but in a much greater degree, and with more uniformity of action, are affections of a part of a nerve transmitted through its whole course, especially when the morbid impulse has its origin in a plexus.

The diseased action, then, arising in the stomach, is transmitted to the heart by the cardiac plexus of the par vagum ; that organ becomes diminished in power, its beat is slow, feeble, and almost indistinct : the circulation is proportionably retarded, and the quantity of blood sent through the lungs in a given time is much reduced. Proceeding onward, we find the lungs and bronchia affected, by the pulmonic plexus having its origin in the same nerve, either immediately from the action of the epidemic agent on it; or, mediately, from its operation on the gastric plexus, and which, in a healthy condition of the system, gives to these organs that specific sensibility which enables them to perform the office of expiration ; hence those changes are accomplished in the blood essential to health and the maintenance of life.

The diminished power in the organ of voice is

another illustration of this nerve being affected in Cholera. Its tone presents an unnatural character; it is feeble, and like a languid squeak passing through a piece of gauze, with a great indifference in the attempt at utterance, and which appears to require some effort. This effect arises from the transmission of the morbid action by the recurrent and superior laryngeal branches of the nervus vagus, and which opinion is further supported by the operation of tying or dividing these nerves, and so weakening or destroying the voice of the animal. The experiment was originally made by Galen, and forms the basis on which some facts are established, and connected with the mode by which the function of this organ is carried on.

The change in the function of respiration arises from the loss or suspension of the elastic property of the lungs, through the agency of which, expiration should be performed, leaving the air-cells partly free for the admission of fresh atmospheric air on the contraction of the diaphragm and intercostal muscles. The antagonists to these organs of inspiration were supposed to be the two oblique and transverse abdominal muscles; but, if the

fibres of these muscles be divided transversely, so as to prevent their contraction, expiration still goes on, without any diminution of force: we must consider them, by this experiment, as taking no essential part in the office of expiration. The muscles of inspiration are the diaphragm and intercostals, which derive their nerves from the phrenic and spinal, and have no direct communication with the par vagum; the function of these muscles therefore continues, while their antagonist (*i. e.* the elasticity of the lungs) is impaired, and incapable of expelling the air contained in the air-cells. Hence the equilibrium between these two opposing vital powers is, by disease, destroyed; and, "the contest" between them, to use the words of Dr. Carson, "in which victory declaring on one side or the other, is the instant death of the fabrick."

I cannot too forcibly direct the attention of my readers to this pathological fact—that, in Cholera, the balance of power between the organs of inspiration and expiration is lost; so that, although the diaphragm and intercostal muscles contract, and enlarge the capacity of the chest for the admission of air, yet the lungs have not the power again to expel it, and expiration becomes partly suspended.

Under this state of respiration, it is most important to observe that the heart, if it beat at all, must propel blood through the system, in a carbonized and impure state, giving rise to a train of consecutive symptoms, hereafter to be described. Notice the words of Harvey on this subject: "It would appear that the use of *expiration* is to purify and ventilate the blood, by separating from it these noxious and fuliginous vapours." The word expiration is here made use of by Harvey, evidently implying that it is the most important, though it be the last, stage of respiration; and that, unless the air which the lungs have received is again thrown out in sufficient quantity to admit of a fresh supply, no purification of the blood can take place.

The cause affecting respiration, then, is twofold in character—the heart is diminished in force, and cannot pump the blood through the lungs in the same ratio which a healthy condition of the system requires, and the lungs are unfitted for the vital changes of the small quantity of blood which may be passed through them by the enfeebled power of the heart's action.

A most important phenomenon here presents itself, connected with the manifestations of Cholera;

viz. the extreme coldness of the body. It arises from the reproduction of animal heat being suspended by the absence of those changes of the blood which take place in the lungs of a healthy body. Caloric no longer becomes latent in the circulating fluid by the process of breathing, and consequently cannot be given out to warm the system, by the general circulation in distributing the nutrient properties for the support of the body. In the action of the stomach, at the same time, we find the solids giving up their fluids; and the latent caloric which existed in the blood is given out, not in the process of nourishing the system, and the diffusion of warmth in the extremities, but in the transmission of the nutrient particles or fibrin into the fluid thrown out in the stomach and bowels, and which tends to the waste and exhaustion of the frame. It is on this principle that Franklin first discovered the extraordinary property in animal bodies of resisting high temperatures, by the transpiration of the cutaneous and pulmonary surfaces; and the mucous membrane of the alimentary canal in Cholera may be said to resemble those porous vases used in India, called alcarrazas, which allow the fluid they contain to

sweat through them, leaving the surface of the vessel humid, and its contents cold. The same phenomenon takes place from the lining of the alimentary passages ; the fluid thrown out by the gastric and mesenteric vessels, in conjunction with the general transpiration through the whole course of the canal, is accompanied by a great reduction of animal temperature ; consequently, we find the tongue cold, and the mouth and fauces humid. While this morbid action is going on in the stomach, the caloric, which was before latent, is rapidly given out, and gives rise to the burning sensation felt at the pit of the stomach. In local diseases of an opposite character, supported by an increased action in the vessels, the temperature of the part rises some degrees above that of the blood passing through the heart, which must depend on an augmented nutritive deposit, as we see in cases of effused coagulated lymph. In Cholera, therefore, we find that some of those changes which are essential to a live Being in a state of health are suspended, and others are transformed from a state of nutrition and repair into that of exhaustion and waste.

As to the nature of those changes which take

place in the blood during respiration in a healthy body, authors differ in opinion ; but it is now ascertained, and generally believed, that oxygen, instead of being absorbed, unites with the carbon, forming carbonic acid gas, which is thrown off the circulating mass by expiration, and the blood changes in colour from purple to red, from venous to arterial. This change, therefore, if it depend on either increase or deficiency of any of the component parts of the blood, must arise from the carbon being disengaged by the contact of oxygen in the lungs ; and also *from a different arrangement of the red particles taking place, in consequence of that chemical affinity.*

In pursuing this subject, we find that, when Rouelle, and other celebrated French chymists, about the middle of the last century, began to employ acids, alkalies, and alcohol, as re-agents for the analysis of the blood, and other animal constituents, our countryman Baker (who appears to have been well acquainted with the experiments of Boyle, in employing the same agents, and of S. Fracassati, who injected them into the veins of dogs, and both simultaneously, with the experiments of the French chymists, establishing the fact, that mineral acids

darken and coagulate the blood, and alkalies make it redder and more fluid) was investigating the structure of the blood by means of the microscope. The result of his observation, published in 1742, tends to prove, that the colour of the blood varies according to the figure, size, and arrangement of the red globules, and not from the addition or abstraction of any saline or acid principle. In this work is to be found the following remarkable passage:—"As to colour in the blood, a blackness arises in it from a deficiency of serum, as paleness does from too great an abundance of it; for it will be always found, that when globules cohere together in too great numbers, they give a black appearance. When this therefore is the case, means of diluting should be found out and made use of; since it is absolutely requisite to health, that the globules of the blood should float in a due quantity of serum, and be thereby circulated freely through the minutest vessels, a contrary state to which has proved the death of thousands"*.

But as the figure, size, and arrangement of the red globules alter the colour of the blood, by vary-

* On the Use of the Microscope, by Henry Baker, F.R.S. edit. 1742.

ing the angles of the rays of light which may fall upon them, so motion and temperature have a considerable influence in this change, as is proved by the simple operation of bloodletting. Open a vein in the arm, and the blood flows of a venous colour, and at the ordinary temperature: as it cools, an exhalation takes place from the surface of the fluid, and the serum is separated from the crassamentum. This exhalation is produced by the oxygen of the atmosphere combining with the carbon of the venous blood, forming carbonic acid gas, and the surface of the crassamentum becomes changed in colour, from venous to arterial blood. The under and convex surface of the crassamentum, immersed in the serum, and not brought in contact with the atmosphere, is found of a much darker colour than the fluid presented when taken from the vein, and which arises from a different arrangement of the particles of colouring matter, in consequence of the separation of the serum from them. But in order to effect the union of oxygen with the carbon of the blood, a certain degree of temperature is essential: when the convex surface of the crassamentum is cold, and exposed to the atmosphere, no exhalation takes place from it, and there is no change of colour.

TEMPERATURE and MOTION also influence the colour of the blood when contained in the vessels, by producing an alteration in the arrangement of the red globules, and a spontaneous coagulation of the fibrin. If the heat of the extremities be reduced sixteen or eighteen degrees below the ordinary temperature of the blood, the circulation becomes languid, and the blood in the vessels almost at rest: when its fibrin shews a disposition to coagulate, the colouring particles assume new arrangements, and the body presents a purple, or, from the absorption of some of the purple rays by the white skin, a bluish cast. And this opinion is further supported by the fact, that no difference* in chemical composition can be discovered between purple and red blood; which leads the eminent Berzelius to conclude, that the colouring globules are alone concerned in these changes.

The experiments of Mr. John Hunter and of Hewson fully establish the opinion, that the exposure of blood to air is not necessary to promote its spontaneous coagulation; and Dr. Bostock† further observes, "that coagulation not unfrequently takes

* The quantity of carbon in the blood varies with the energy of the respiratory function.

† System of Physiology.

place in the vessels or cavities of the body, where the blood must be completely excluded from the air; and, indeed, this change has been found to exist, to a certain degree, during life, as the polypous concretions that are occasionally found in different cavities of the body, and which from the previous symptoms, as well as from their appearance and texture, must, at least in some cases, have existed before death, are chiefly composed of fibrin."

This property of spontaneous coagulation in the blood, whether it take place out of the vessels, assisted by the atmosphere, or in them, and excluded from any atmospherical influence, is the natural death of the fluid, and takes place gradually, so that as life departs from it, chemical attraction comes into action, and the red globules, having a greater affinity for fibrin than serum, they become entangled in the coagulum, and the serum remains fluid, with its salts in solution. In cases of sudden death, this coagulation is prevented ; the vitality of the blood is extinguished, while the serum, fibrin, and red globules, are in combination and in motion ; the chemical affinities are destroyed by the instantaneous breaking up of the red globules and particles of fibrin, both of which con-

tinue diffused through the serum, and the whole mass presents a grumous appearance, as though putrefactive changes had commenced. Dilution with water prevents the coagulation of the blood, by separating its particles beyond the sphere of chemical attraction ; so the destruction of the globules, by annihilating the cohesive property in them, destroys their mutual attractions, and no separation of the fluid can take place.

The vitality of the blood, as established by Mr. John Hunter, will not be disputed ; it is, indeed, the first principle of life, which the first human body received by the action of breathing ; and the vital action of the solids followed that of the blood. We have in the sacred volume, " flesh, with the life thereof, *which is* the blood thereof*." I conceive it is implied here, that the solids derive their vitality from the blood, as well as being nourished, sustained, and perpetually rendered efficient by it, for performing their various functions. And the blood derived its vitality by the act of respiration ; for man, though he was made perfect, and every organ endowed with a specific agency, capable of performing its own peculiar office, yet he had no life in any part of his organized structure : formed

* Gen. Chap. ix. v. 4.

of the dust of the ground, he was inanimate, he was cold, he was dead ; when God " breathed into his nostrils the breath of life, and man became a living soul*." Vitality, therefore, is a superadded principle to the component parts of the blood which becomes fluid and is set in motion by it ; and the free action of the heart is necessary to keep it in motion, respiration to support its temperature, and the combined influence of both to maintain its vitality.

Whatever tends to diminish the action of the heart, and, at the same time, to render nugatory the function of respiration, must lessen the vital principle in the blood, by *retarding its motion* and *reducing its temperature ;* and all the secretions derived from the blood will be diminished in proportion to the weakened current of the circulation. The solids, therefore, do not receive their proper nourishment from the blood ; their specific vital principle is diminished ; they have neither the power to perform their natural function, nor have they the supply conveyed to them to act upon.

Such is the state of the system under the influence of epidemic Cholera ; the action of the heart, and that of the lungs, is attacked at the same moment ;

* Gen. Chap. ii. v. 7.

respiration is all but useless, so that no purification of the blood can take place; it *loses its temperature*, at the same time that it *loses its motion*; the body becomes cold, and, *from the blood resembling that of the fœtus in utero*, of a bluish appearance. This arises from the epidemic influence operating as a narcotic on the cardiac and pulmonic plexuses of the par-vagum; and, as the disease advances, the other nerves of the respiratory system become affected. The act of speaking becomes an effort, because there is an inability to push out the breath; and the tone of the voice is almost indistinct. The expression of the countenance is lost, by the respiratory nerve of the face, or portio dura of the seventh, partaking of the narcotic action, and which is continued to the fourth nerve sent to the eyeball, and the spinal accessary of authors, distributed to the muscles of the neck and shoulders; so that the combined actions of these muscles with the eye, giving to the upper part of the trunk, neck, and face, an animated expression in breathing and speaking, is destroyed. From this affection of the respiratory nerves, the body presents a most appalling figure, while the intellect remains undisturbed. There is no affection of the brain, or

nerves of sensation or voluntary motion (excepting from diminished temperature), so long as the body remains in a state of collapse ; but when reaction takes place, the function of the brain becomes disturbed, by the impure blood passing through it, and delirium, coma, and oftentimes sudden death, is the consequence.

There is a question of great moment to be determined,—whether in other cases, as in Cholera, the equilibrium between the organs of inspiration and expiration being destroyed, so as to render the circulation incapable of conveying healthful fluid through the system, is not a more frequent cause of disease than the supposed absorbtion of any malignant poison in the fabric ?

SYMPTOMS.

Life is less vigorous during sleep than in the opposite state ; and as this depends on the diminished power of the function of respiration reducing the quantity of carbonic acid gas thrown off the circulating mass by expiration, we find the attacks of Epidemic Cholera, although the symptoms called premonitory may previously have existed, generally

taking place between the hours of sun-set and sun-rise. But in the higher class of society, the period of the attack may vary, from taking stimulating food late in the day, and other collateral circumstances tacitly connected with modern customs. A full meal increases the quantity of carbonic acid gas thrown off the lungs by expiration ; and Dr. Prout remarks, that the quantity increases from sun-rise till noon, and decreases from the latter period till sun-set, and remains at its minimum again until daybreak ; a period the most favourable for the action of the epidemic property on the *expiratory* nerves.

The Epidemic Cholera (hereafter to be distinguished from English Cholera) is known by a sense of oppression, pain, and spasmodic constriction across the chest, following the course of the diaphragm ; with a difficulty of breathing, or rather an inclination to enlarge the capacity of the chest, and sometimes manifested by an evident rising and falling of the points of the shoulders, accompanied with coldness, languor, and great indifference to move. In a short time, violent cramp comes on in the bowels, and in the muscles of the extremities, with short periods of relaxation of the

muscular fibre, and relief from pain. This is followed by a burning sensation at the pit of the stomach, and often times (but not always so) with vomiting and purging of a fluid resembling rice water, without taste and without smell, and frequently very profuse in quantity. The coldness, in the mean time, gradually increases, till the body becomes reduced several degrees in temperature; the pulse at the wrist is slow, feeble, and almost indistinct, showing that the circulation is nearly at rest; when the extremities and face assume a bluish appearance. The fingers are shrunk in size, and their flexor muscles contracted; there is also numbness and an inability to extend them. The countenance wants animation, and what expression of it does continue is anguished and wretchedly miserable; the muscles of the neck and face are shrunk, and the cellular as well as the adipose tissues connected with the muscles of the eye are wasted, so that the eyeball appears large and deep in the socket. Such is the action of the disease, seen by a glance of the eye, on the respiratory nerves of the face, that the plump and vegete countenance of youth becomes changed into that of old age.

The voice presents a remarkable character,—it is feeble and indistinct, and requires a great effort to force out the breath, in order to produce a tone; with much indifference manifested in the attempt to accomplish it. There is a humid transpiration from the surface of the mouth, and the tongue is cold and contracted within the teeth: in some cases it appears shorter than it would be found in its natural state. There is a cold emission of vapour through the pores of the skin, which diffuses a remarkable odour; but frequently the skin is benumbed, dry, and shrivelled.

This is the cold or blue stage of Cholera, otherwise called state of collapse; in which the natural secretions of the body are suspended; there is neither urine nor bile secreted, because there is no free circulation of blood for the secretory organs to act upon. But the secretion of the mammary glands, being more immediately under the influence of the mind, continues; so that in this deplorable state of existence, a mother can give suck to her child. The individual answers when addressed in a loud voice: what appears, therefore, to be a dulness or absence of intellect, with diminished sensibility on the surface of the body, arises from the extreme coldness of its substance.

If this state of collapse continue twelve hours and upwards, the vomiting frequently ceases, and sometimes the purging, with an aggravation of all the other symptoms: no reaction takes place; the epidemic cholera subdues the function of the heart, and, at the same time, the elasticity of the lungs, and death very speedily ensues. In post mortem examinations of these cases, the stomach is found to contain undigested food, and its coats exhibit a softness and loss of texture.

During this cold stage, the heart has continued to beat feebly, and there has been some degree of circulation going on in the trunk; but the blood has not undergone its proper change in the lungs,—it remains carbonized and impure, and is neither suited to excite natural actions in the solids, nor healthy secretions from them. But here, mark the distinction; up to this period *the brain is not affected*, and the intellect continues a watchful memorial of the wretched condition of the fabric.

When reaction takes place, and the circulation is on the point of being restored, the function of the brain, and nerves emanating from it, becomes deranged by the impure blood of the trunk passing through the head, and coma, delirium, fever *resembling* typhus, and a whole train of consecutive

symptoms, are the consequence of it. In some cases the individual will have recovered from the cold stage, and appear to be doing well; when all at once drowsiness, preceded by slight pain in the head, coma, and sudden death, is the consequence of a portion of the carbonized blood entering, at the time, the vessels of the brain. This effect on the function of the brain has led to the belief that, in such cases, large doses of opium and other powerful narcotics may have been given, producing sleep, and ultimately death; when, on the contrary, it is the result of natural causes, and no medicine of the kind has been administered.

The consecutive stage is ushered in by slight but lethargic pain in the head, restlessness, a hot and dry skin; the pulse is at first small, afterward full and throbbing, but, at different times, varying much in strength and fulness, and it is often irregular. The tongue is crusted, brown, and dry, and its surface is sometimes fissured: there is a most intolerable thirst, an offensive halitus from the mouth, and a collection of sordes about the teeth and gums. The circulation in the extremities is not speedily restored, and, in colour, they continue of a bluish cast. The breathing is altered

in character; it is hurried, and there are more inspirations in a given time than in the cold stage, and the muscles are not so forcibly called into action to accomplish it. There is sometimes an inclination to rest on either side, with the limbs and body in a state of flexion; but this state of quietude is soon interrupted, by the limbs being thrown in all directions, and a most unwearied effort is made to change perpetually the position of the body itself. The irritation in the stomach and bowels, which existed in the cold stage, continues with retching, but not always vomiting, and diarrhœa; the dejecture is fluid, sometimes dark-coloured, and appears to contain carburetted hydrogen gas in solution. Bile is not secreted, and the secretion of urine is either very irregular, or entirely suspended: oftentimes there is soreness and pain on pressing the abdomen.

If these symptoms continue, delirium very soon follows, with an increase of restlessness; the vomiting has ceased, but the inclination to retch faintly continues, and it is sometimes accompanied with hiccup. This delirium is next succeeded by coma, but the pupil of the eye is fixed and contracted: I have not yet seen it dilated in this stage. From the

extreme restlessness during the delirium, the body becomes motionless, cadaverous, and emits a peculiar effluvium, possessing the property of contagion, and which augments the epidemic agency of the atmosphere, so that certain localities, in which many bodies may lie in this state at the same time, become powerful auxiliaries in the propagation of the distemper. The pulse is no longer perceptible in any part of the body; the eyeball is fixed, there are laborious inspirations at long intervals, and death very soon closes the scene of this most appalling picture of disease.

I have here given an outline of the consecutive form of disease, which has occurred under my own observation; but this stage being the effect of natural causes, brought on by a morbid action in the respiratory organs, and not from any specific poison absorbed in or acting directly on the system, it must follow that this secondary diseased state will vary in form and degree, according to the condition in which the body may chance to be in at the time of the attack. The fever will assume a different type according to the character of constitution, always bearing in mind the effect of the carbonized circulation on the brain and its nerves;

and the violence of any local symptoms, with congestion, will depend on the previous state of the organ.

Another form of the disease has latterly presented itself, by a sense of pain and oppression across the chest, in the course of the diaphragm, soreness in the pectoral and intercostal muscles, with cramp and laborious breathing, extreme coldness of the body, and anxiety. The pulse is feeble, small and indistinct, and irregular, with great languor and general apathy. But there is neither sickness, purging, nor any apparent derangement of the alimentary canal; in other respects the disease takes its usual course, and threatens immediate destruction.

In these cases the stomach is found to contain, post mortem, undigested food, which was taken some hours preceding the attack; demonstrating, beyond any reasonable doubt, the [illegible] action of the epidemic influence on the par vagum. There are instances on record, also, where profuse vomiting of the characteristic fluid has existed, yet, after death, undigested food is found in the stomach. The experiment of Dr. Haighton gives additional support to my view of the cause of this

disease: he fed a hungry dog, whose stomach was empty, with flesh meat, and then divided the par vagum on both sides of the neck. Many hours afterward he killed the dog, and found the food in the stomach perfectly undigested, and but little changed. Again, a violent blow on the stomach is well known to produce sudden death, and vulgarly called by the admirers of fisticuffs knocking the breath out of a man's body; that is, the blow instantly paralyzes the respiratory nerves, and, at the same moment, destroys the action of the heart and lungs. An equal or much greater force applied to the head does not destroy life in the same manner: it produces stupor and insensibility, from which there is a probable chance of recovery, as the action of the heart and lungs continues to circulate the blood, and effect the necessary vital changes during respiration. Here we have, therefore, a practical illustration of the central point of action, before alluded to in this system of nerves, being independent of the function of the brain; which corroborates the opinion already advanced, that (the brain being not affected in the first stage of the disease), in Cholera, the central point of attack also from the epidemic property falls exclusively, by some un-

known and mysterious fatality, on the function of the expiratory nerve, so that the elasticity of the lungs becomes suspended, and the balance between the organs of inspiration and expiration destroyed, whereby the preservative changes in the blood cease. But the precise nature of these changes may continue to be disputed, since they will be found, in all probability, to consist of aboriginal vital and not chemical properties; and although specific vital actions going on in other parts of the system may also influence them, yet the primary impulse in the lungs, by external agency, must take place through the medium of its nerves independently of the action of the brain.

DISTINCTION BETWEEN ENGLISH AND EPIDEMIC CHOLERA.

Before the appearance of Epidemic Cholera in India, it was not necessary to make use of an adjective to designate the character of the disease; and accordingly we find Professor Cullen (once the copartner of Dr. William Hunter), about the year 1770, using the word Cholera only, meaning a

flow of bile. And from the following description of the disease (Cholera Anglica) we may trace, by comparison, its specific symptoms; and how easily it may be mistaken for the epidemic, without due regard to the character of the ejections. "In this [English] disease, a vomiting and purging concurring together, or frequently alternating with one another, are the chief symptoms. The matter ejected, both upwards and downwards, appears manifestly to consist chiefly of bile.

"From this last circumstance I conclude, that the disease depends upon an increased secretion of bile, and its copious effusion into the alimentary canal; and, as in this it irritates and excites the motions above mentioned, I infer, that the bile thus effused in large quantity, is at the same time, also of a more acrid quality. This appears likewise from the violent and very painful gripings that attend the disease, and which we can impute only to the violent spasmodic contractions of the intestines that take place here. These spasms are commonly communicated *to the abdominal muscles*, and very frequently to *those of the extremities*.

"In the manner now described, the disease frequently proceeds with great violence, till the strength

of the patient is greatly, and *often suddenly*, weakened; while a coldness of the extremities, cold sweats, and faintings coming on, an end is put to the patient's life, sometimes in the course of one day."—*Cullen's Practice of Physic, edit. by Dr. John Rotherham*, 1791.

If these symptoms be compared with those in what is now called Cholera Maligna, it will be seen that, the sudden and violent attacks of the epidemic speedily terminating in death; its great mortality in all countries; the sickness and purging, the cramp and pain in the extremities and in the abdomen; extreme languor, exhaustion, and coldness of the body; all these indications, either considered separately or in combination, do not form any distinguishing character of the disease: they are common both to the Epidemic and English Cholera, and are certainly more uniformly present in the latter. The violence of English Cholera consists in the great irritation of the stomach and bowels, and the excessive discharges producing sudden exhaustion, which very soon proves mortal. In Epidemic Cholera, on the contrary, there is frequently no irritation in the stomach and bowels, neither sickness nor purging; there is no profuse

evacuation of any kind; and yet death frequently occurs in the course of twelve hours. These cases often terminate fatally much sooner than those accompanied with sickness, or diarrhœa. In English Cholera, the ejections are bilious and muco-feculent; in Epidemic Cholera, they are serous, and have no trace of bile in them. The reduction of animal temperature in English Cholera is secondary, and takes place from sudden exhaustion on the approach of death; but it is neither attended with a disposition of the blood to coagulate, nor a blueness in the colour of the skin. On the contrary, in Epidemic Cholera, the reduction of animal heat is primary, and arises from a deficient action in the heart and lungs, with a strong disposition in the blood to coagulate, as it loses its motion and temperature, and the colour of the skin changes to cholera blue.

The specific character of Epidemic Cholera, therefore, will be found principally to consist of pain and spasmodic constriction across the chest; an almost total suspension of the action of the heart; sudden loss of temperature; with a disposition in the blood to coagulate, giving the skin a bluish cast; of ejections without bile; a stridulous

voice; a cold stage, in which the brain is not affected; and a consecutive fever, with considerable derangement of that organ.

TREATMENT.

In the pathological view which has been described, the treatment of Epidemic Cholera will be established on the principle of restoring the equilibrium between the functions of inspiration and expiration, and, at the same time, to obviate, as speedily as possible, the morbid condition of the system induced by the suspension of the function of expiration diminishing the temperature, and the loss of action in the heart retarding the motion of the circulation. And the reduction in power of these two vital agents are the cause of the different phenomena shown in the cold stage or state of collapse; therefore what appear to be, on investigation, chemical changes in the blood, are direct consequences of an alteration in these vital properties.

The separation of the component parts of the blood, either by the action of the secretory organs on the circulating fluid, or the absorption of any malignant effluvium in the system, is not supported

by the general characters manifested in this disease; for on the one hand, we know that the natural secretions are suspended, and on the other, we have no evidence of any controlling power admitted in, and acting directly on, the composition of the blood itself. Changes, therefore, which are found to exist in the fluids of the body, in conjunction with the spasmodic action in the muscular fibre, can only be referred to the epidemic influence operating in the manner explained on the function of respiration.

A passing allusion may here intervene relative to the character of the influence operating on the expiratory nerves: its existence appears to be incompatible with that property in the atmosphere producing typhus, scarlatina; measles, &c., as these diseases are known to have retired or totally disappeared on the approach of Cholera, so that the mastery is proclaimed by this unknown and plenipotent epidemic.

These two vital properties of animal motion and animal temperature in the blood, being essential to the support of the necessary vital actions in the solids, there cannot be any secretions naturally or artificially excited in them, without these vital principles are supported and duly maintained:

hence we find recorded immense doses of powerful medicine administered in the state of collapse producing no effect on the system, though continued at short intervals, with great perseverance, which under opposite circumstances, such as an active state of the circulation and an increased temperature of the body, would mainly contribute to the destruction of these vital actions. And to establish a successful mode of treatment, it will not only be necessary to take into consideration the precise stage of the disease at the time a remedy is proposed to be administered, but also the previous habit of body, whether any constitutional tendency to particular states exists, or any local character of disease with congestion likely to influence the general character of the consecutive fever.

The indications of cure originating in the pathology advanced, will be,—

1st. To restore the circulation and the elasticity of the lungs.

2d. To arrest the morbid action of the exhalents in the stomach and bowels.

3d. To prevent the brain being acted upon by impure blood passing through it.

4th. To restore the natural secretions.

In order to obtain the first two indications, it must be borne in mind, that the progress of the disease is oftentimes so rapid as to destroy life in a few hours; consequently remedies which are intended to be administered with positive effect, must be such as are known speedily to produce their full operation on the system. And not only the nature of the remedy, but the mode of its exhibition is also of the utmost importance; for we have seen doses of medicine recommended on high authority to be administered every four hours, for a disease which may prove fatal in the same space of time; so that, before the practitioner can number his doses, the patient is numbered with his forefathers.

It has been remarked, also, that either two specific diseases, or two varieties of the same disease, have existed, more particularly in different parts of England; and as they are found to arise from different exciting causes, the mode of treatment in each will be established on opposite principles. In cases of Cholera, properly so called, the saline treatment, dilution with cold water, or other bland and soothing liquids given in sufficient quantity to neutralize the acrid bile, so as to render it less irritating to

the stomach and bowels, have been found of great service; and in those cases where the exciting cause has arisen either from a superabundant secretion of bile, or vitiated quality in the fluid, there may be unquestionable evidence tending to establish considerable merit in these curative agents. And the addition of opium, in accordance with the mode of treating this species of Cholera in the last century, powerfully contributes to allay the action in the stomach and bowels induced by the flow of bile. But if these medicines be continued beyond the principle of dilution which renders the exciting cause producing the vomiting and purging inoperative, we have also ample evidence, in many cases of recent occurrence, wherein they have proved detrimental. The saline treatment, if adopted and strenuously practised on the supposed chemical principle of the absence of serum and saline matter in the circulating fluid, must be attended with dangerous effect; for although there is, and must be, in the usual order of morbid actions, variations in quantity of the component parts of the blood, yet they are consequences and not a cause of the disease; and a mode of treatment directed to the removal of the effects of diseased action, in-

stead of the cause producing it, must be attended with injurious consequences. As the globules of the blood require a due quantity of serum to enable them to circulate freely through the most minute vessels, so too great a separation of them proves mortal; which is demonstrated by the injection of alkaline solutions into the veins of dogs and other animals, causing death; thus rendering the blood florid and too thin for the maintenance of its vital properties. Chemical changes in the blood, therefore, in whatever way induced, must be attended with diminished vital principle, as the due support of health in a live being is perpetually exerted by vital actions to counteract chemical affinities in the fluids from taking place: *even dead matter, which is in contact with living matter, is under the dominion of vital and not chemical laws.* Hence, any mode of treatment established on chemical principles is incompatible with the laws of the animal œconomy: and it is probable that the success of such remedies may have depended, not on the alleged supply of such component parts of the blood as are supposed to be deficient in the circulating mass, "but on minute portions* acting on

* Professor Daubeny, in the University of Oxford, on the Atomic Theory.

the system with an energy commensurate, not to their own quantity, but to the change their presence occasions," by altering the arrangement (and not the "*properties*") of the different particles, so as to augment the influence of the vital actions on them. And the transition from venous to arterial blood in the lungs, by the act of respiration, may depend on analogous principles, as the chemical combinations remain the same; and the change in colour, as well as the important vital principle derived by this process, cannot be satisfactorily explained on the laws of chemistry only, but must also be referred to the governing properties of vitality so operating as to effect a different arrangement of the particles composing the blood, thereby increasing the vital action of the solids on them. In this vital influence may originate the diversity of opinion expressed by chemical philosophers on this subject.

In the first indication, then, our remedies must not be directed to alter the character of the blood, either by the addition or abstraction of any of its component parts, but to increase the action of the solids on it, so as to change the arrangement of its particles, and augment its vital principle. The temperature, at the same time, will be increased

and maintained by exciting the elasticity of the lungs; and both these vital properties of motion and temperature, on which the life of the blood depends, may be supported by the same curative agents.

Here it is important to bear in mind the distinction between English and Epidemic Cholera, and their different exciting causes; as, in the former, opium is the main remedy operating directly on the cause of the disease, and subduing the irritation and excited action of the liver and alimentary canal: whereas, in Epidemic Cholera, its baneful operation is manifested by increasing the torpor existing in the expiratory nerves, and reducing the motion and temperature of the circulation. Opium therefore, and other narcotic medicines, are contraindicated in this stage of the disease, and agents of an opposite character in their operation seem to be the remedies required. In the accounts published of the treatment of this disease, we find a great variety of methods, much diversified in principle, that have been adopted to remove the stage of collapse; but the result does not warrant the preference given to any particular plan, since all appear to want the power of *speedily* exciting

the action of the heart and lungs; and in any English or foreign Pharmacopœia hitherto published, there is no preparation which appears to possess such a power as is wanted in the cure of this disease. If we examine the whole class of stimulants, either diffusible or permanent; of antispasmodics and astringents; of tonics, mineral and vegetable, there are none of them, in their present combinations, which have been found to answer the object in view. When a medicine* is discovered that will arouse the action of the heart and lungs, it will approach the character of a specific as nearly as the pathology of the disease can admit of such an application; for it must be evident that the consequences of the epidemic on the system will be increased in proportion to the duration of the stage of collapse, in which those vital actions necessary to the purification of the blood in the lungs are suspended; and the restoration of these vital properties, in the shortest space of time, will

* The author has employed, in his own practice, a remedy which, in fifteen successive cases of decided collapse, aroused the action of the heart and lungs, and stanched the open mouths of the exhalents in ten minutes from the time of the first dose being administered: in many other cases it has been equally successful; and several medical friends possess it for further trial.

establish the excellency of the remedy employed. Its mode of action on the system also will involve considerable merit, as it should excite the respiratory function, without producing a direct stimulant effect on the brain.

The mode in which artificial heat should be applied in this stage, deserves attention: as the volume of air admitted into the cells of the lungs by the utmost effort of inspiration is small, so the application of hot air to the body, tending to rarefy the atmosphere which the patient must breathe, lessens the reproductive power of animal heat in the lungs. The ingenious contrivances and assiduous exertions made to raise the temperature of the body by artificial means are, at the same time, counteracting the laborious efforts of the system in the attempt to raise the heat of the body by natural means. The hot water-bath is liable to the same objection, by the vapour ascending and rarefying the supernatent air while the patient is in the water. The evaporation from the surface of the body on the application of moisture is also another means of reducing its temperature, which is already too prone, from the diseased actions going on in the system, to part with its caloric through the pores of the skin. An

easy, and, at the same time, a very effectual method, is to place the patient in a warm bed, with plenty of flannel covering; then surround the body with bottles of hot water, also place them between the arms and body, thighs and legs, keeping the body up to the neck well enclosed, so that an accumulation of natural as well as artificial heat must take place. This process is assisted by compressing the chest, alternately with the act of inspiration; so as to supply, in some degree, the deficiency of the elastic property in the lungs.

Bloodletting is a remedy of great importance in this disease; and the extent to which it should be employed not only depends on the state of the constitution and previous habits of the individual, but on the progress which the disease has made on the force of the circulation. When the means suggested in the onset have been adopted, and the pulse is beginning to rise at the wrist, from two to six ounces of blood should be abstracted from a vein in the arm, the quantity being regulated according to the strength and fulness of the patient's habit. This operation will have the effect of diminishing the volume of impure blood in the system, of altering the arrangement of those par-

ticles forming the mass which remains in the vessels, and augmenting the action of the heart and capillaries on the contained fluid, which vital property of motion, both in the solids and fluids, being excited, will tend to remove the stage of collapse. But if the quantity of blood removed from the circulation be increased in this state of exhaustion, the system will not have the power to rally, the period of collapse will be prolonged, the general shock by diseased action much increased, and generating variations of character in the subsequent stages of the epidemic. Any further abstraction of blood will depend on the degree of power which the action of the heart and function of the brain exemplify during the sequel of the disease.

Mercury has been extensively employed, in various forms, in large doses, and at short intervals, during the state of collapse; but as the natural secretions cannot be artificially established without previously restoring the circulation, the inference is, that no effect can be produced by it, until motion and temperature in the blood are again predominant. But the employment of the remedy is not merely negative; for, if it have been lavishly

adopted in the cold stage, as soon as reaction does take place, adding motion and temperature to the blood, and activity in the absorbents, such a spontaneous salivation comes on, as again threatens the destruction of these vital properties. The external application of mercury, by friction in this stage, has gained numerous advocates; and it appears to have been employed, in many cases, with success; but, from the internal use of calomel by eminent practitioners, and their admission (though the cause be not explained) that no effect seems to be produced by it, we may conclude that the advantage of the external, over the internal employment of this medicine, arises from the rubbing required on the surface of the body to introduce it. We may estimate the degree of power employed in these cases by the quantity of mercurial ointment said to have been used in a given time; and which appears in the proportion of one ounce to the hour in continuous application for several hours. The immense quantity of so powerful an agent, employed in a short time, is, perhaps, the strongest proof that can be shown of its being a mere drug in this stage of the disease; and the

good effects supposed to have been produced by it may be referred, with more nicety, to the act of friction.

It has been observed, that two characters of the Epidemic Cholera have prevailed,—one attended with vomiting and diarrhœa, the other showing no derangement either of stomach or bowels. But in this latter variety of the disease, the alimentary canal is well disposed to put on the morbid actions, and an emetic or active aperient administered will readily excite them ; and there will be found, afterward, great difficulty in arresting the excessive discharges. Bleeding, and, at the same time, the use of stimulants to arouse the action of the heart and lungs, are the most successful remedies in this form of the disease. Although, in a cursory point of view, this practice may present an inconsistency, according to established principles in other diseased states of the system, yet the history, mode of attack, and pathology of Epidemic Cholera fully justify its adoption : to stimulate without bleeding is to accelerate the approach and increase the violence of the consecutive disease, by exciting the circulation of impure blood through the brain ; and to bleed without

stimulating, is to destroy the enfeebled action of the heart, thereby arresting the vital property of motion in the blood. The application of the same principle in apoplexy has been found by the writer of this Essay remarkably successful : many cases arise from the circulation of blood in the brain being stagnant, and not from pressure on the brain suspending the function of the organ ; when to bleed without stimulating gives no relief, and to stimulate the action of the heart without blood-letting, supplies, in addition to the stagnant vessels, pressure on the brain.

In those cases of the Epidemic accompanied with rice-water discharges, emetics and purgatives are also injurious, as they increase the irritation in the stomach and bowels, which is already beyond ordinary control ; lower the vital action in the heart ; retard the motion of the blood, and diminish its temperature. It is of importance, therefore, to avoid all irritating medicine to the alimentary canal in the state of collapse ; but, at the same time, the morbid action of the exhalents must be arrested by remedies which do not contain any anodyne or narcotic principle in them. The state of collapse in India, it has been said, oftentimes

terminates in a profuse perspiration, which proves critical; but in England the critical discharge is more frequently that of urine, which is sometimes accompanied with, or succeeded by a flow of bile. When these natural secretions take place immediately on the circulation being restored, the consecutive form of the disease is either wholly prevented, or in degree of violence much diminished; hence it would seem that nature herself, by restoring these discharges, so purifies the blood as again to establish its benign influence on the functions of the brain. But if these critical discharges do not follow the restoration of the vital properties of motion and temperature in the blood, and the means recommended to supply the place of them, by the abstraction of impure blood from the circulation, have not been adopted, then the consecutive fever is ushered in with violence, the brain becomes affected, and the excretions of the body assume an offensive odour, demonstrating the suspension that existed of the purification of the blood in the lungs during the cold stage.

It has been remarked, in the enumeration of specific characters of this disease, that, in the state of collapse, the intellect continues its identity with

the function of the brain; but it is otherwise in the consecutive form of the Epidemic; for, as the natural state of the blood is encumbered during its passage through the lungs, the skull, on the return of the circulation, becomes the receptacle of its impurities, so

> "That Memory, the warder of the Brain,
> Shall be a Fume, and the receipt of Reason
> A Limbeck* only."

In this state of the intellectual organ, the animal functions labour under a second morbid action, differing essentially from the first, and which establishes a train of symptoms varying with the particular state of constitution affected. But the general treatment must be directed to restore those secretions which are obstructed, as well as the natural action of the brain. Here we find mercury, which in the cold stage has been inoperative, becomes a powerful remedy, when the circulation is re-established; and calomel in small doses, and at short intervals, or one larger dose, will excite the action of the liver and promote biliary ejections; so the combination of diuretics with calomel will tend to encourage the secretion of urine. By

* A Limbeck.] A corruption of alembic; a still, in which crude ingredients are put for distillation.

arousing these organic functions, we aid the operations of nature in her critical discharges, and may so alter the character of the blood as to render its operation on the brain salutary.

In cases where stupor and insensibility, preceded by lethargic pains in the head, follow reaction in the system, bloodletting, even to the extent of requiring stimulants to excite the action of the brain afterward, will be found of essential service; but it will be difficult to establish a scale, applicable in all cases, as to the quantity which should be abstracted. For as this stage of the Epidemic is consequential, and in general effect opposite to the primary diseased state of the system, so the choice of remedies, and the extent to which they may be employed, must depend on the urgency and variety of present symptoms, and the prevailing habit of body.

The most important and specific object in the treatment of this disease, then, depends on the speedy restoration of the vital properties of motion and temperature in the blood, so that the consecutive form of the Epidemic may be prevented, and the life of the individual brought under the ordinary control of remedial agency.

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