Some new views respecting Asiatic cholera / by Arthur Leared.

SOME NEW VIEWS

RESPECTING

ASIATIC CHOLERA.

BY

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"———— Quod medicorum est,
Promittunt medici"

Hor. Epist.

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AMONGST the numerous and dissimilar scourges, bearing the general name of epidemics, which, from time to time, since the remotest ages, have devastated nations and depopulated their cities, there is none whose history is fraught with more direful details, and whose advances have been more clearly defined by some physical agency, however remote, than that to which the name of the Epidemic, or Malignant Cholera, has been assigned.

The first of these assertions requires no confirmation; there is scarcely a locality upon the face of the habitable world but can, more or less, bear melancholy testimony to its truth; and for the second, we have only to refer to its remarkable *trajet* in a westerly direction, from its origin in India, and its arrival at given places, in close accordance with the predictions of European observers. To this we may add, the inefficient attempts to check, or even suspend, its progress by quarantine, or similar regulations of civil policy; and the equally ineffectual obstacles which the occurrence of mountains, rivers, seas, and even the ocean itself, have presented to its inroads. The vicis-

situdes of climate, and the apparent variations of the atmosphere, and other circumstances which are usually regarded either as barriers or promoters of disease, leave us no data upon which we can proceed, and afford us as little light in the obscurity in which the subject before us has been involved.

That all these matters have received the attention which the importance of the subject required, there can be no doubt; perhaps, even in this respect, it is unparalleled. The number of treatises upon Cholera which our public libraries afford, is absolutely prodigious; and the different theories of its production, and modes of treatment founded on these preconceptions and exclusive doctrines concerning it, almost as many; yet, strange to say, still it continues to be the *quæstio vexata* of our age, and its recent advances in a direction similar to its former memorable one, is again attracting painful observation of its onward career.

To avoid prolixity, and the imputation of uselessly repeating what is already well known, or, as has been the case with too many, of aiming at some new and startling theory about to be brought before the world, which was destined to supersede all its predecessors, the author will at once state his views upon the subject of investigation, together with the plan he has adopted in the prosecution of his inquiry. At the same time, premising that the remarkable discrepancy of opinion respecting the matter of which he is about to treat, sufficiently proves the difficulties which beset his path; and that to the scientific speculator, as to the patient and perhaps more useful labourer in the

field of practical treatment, it must still be considered an open subject.

There is, however, another course, a sort of medium, which, it is to be hoped, will not be thought objectionable, namely, an attempt to draw from the investigations of others such inferences as may lead to some right conclusions; for it is hardly to be conceived, that in the midst of the vast mass of information that we possess on the subject, that there is not a good deal of this desirable ingredient, even though involved within mazes of error. It forms no part of the author's plan, however, to enter upon any details unconnected with his immediate object. Although numerous catalogues *raisonné* of Cholera, professing to give its phenomena and its treatment, but in a manner desultory and incomplete, have already issued from the press, even these he considers a desideratum; but from such a task, considering the wideness of the range over which the material is diffused, had he either time or inclination for the effort, he would almost shrink in despair. The utility of a more complete compilation than has yet appeared, he infers from the facts, that not only would it arm the practitioner, in case of a future invasion of the malady, with the doctrines of its most successful combaters, but would be likely to preclude, in many instances, further and unnecessary experimentalizing, with the vain hope of discovering thereby the long sought Ευρηκα, a specific, or, at least, dependable treatment. That an efficient book of reference would promote these desirable ends there can be little doubt; for fertile, indeed, must the invention be, that could

devise a new mode of treatment or view of the disease, that would not be too often found (however strenuously supported by their advocates at the time) already stereotyped in these recorded annals, as abortive or illusory. But it would also subserve to another end, in the opportunity thus afforded in the hands of many, of comparing the labours and experience of others with their own, and of elucidating in this manner, by a process closely allied to the operation of the inductive sciences, some most important facts in connection with the subject.

It is manifest, that the more we can bring it within the pale of demonstrative evidence, particularly in unravelling the devious and often almost hopelessly obscure connection between cause and effect in relation to disease, the more do we assimilate our noblest of arts, and the better can we claim kindred to what have been termed by contradistinction the exacter sciences; and every attempt to determine even a single link in this vast chain, provided the task be approached in the proper spirit, with the mind unclogged with prejudice on the one hand, and unfettered from the paltry motives of upholding particular doctrines, from a consideration of private ends, on the other, may fairly claim commensurate attention, since even a single fact which it may have succeeded in establishing, may prove the future pivot upon which others of far greater importance are destined to depend.

Of all the means employed to accomplish this desirable purpose, none have been attended with more satisfactory results than those afforded by morbid anatomy. Through careful study of this subject,

some of those remarkable changes of structure are rendered manifest to the senses, that, taken in connection with pre-observed phenomena, by a species of retrograde reasoning, enables us to infer their existence in the living organism. Take, for example, that of Phthisis Pulmonalis. With this disease, it is not so long since, that many less grave ailments were ruthlessly confounded; now, however, not only may we be said to have approached its more remote cause, in the light thrown upon the minute conformation of the tuberculous deposits, but, taking into account a further sequence and their rational effect, to quote the words of an accomplished writer upon the subject, "by, as it were, turning the ear into the eye," in the use of the stethescope, we are enabled to predicate the certain existence of the latter, and to distinguish the former as a disease from every other.

The collateral sciences, and chemistry in particular, as directed of late to the examination of the organic world by the distinguished Liebig, have readily contributed their respective quotas; and of its practical application in our own country, what better instance can we select than its original adoption by Dr. Bright, to ascertain the *causa mali* in certain hitherto obscure renal affections.

That there are some diseases that will always defy our closest scrutiny and best directed efforts, by the foregoing, or any other like available methods, is certainly not improbable, particularly those included in the protean class of the neuroses; and it is in reference to these that the principle of induction, as a sole, and not merely an auxiliary reliance, as in some cases,

should be more vigorously prosecuted; so that by a systematic grouping and combination of particulars, such a mass of general facts might be collected as, by their further comparison, would lead to inferences no less valuable than those established upon more tangible evidences. Yet it is to be feared that this useful aid has been, in its application to medicine, but too much neglected.

It has been already hinted that there are few diseases which, from the number and authenticity of its records, present fairer opportunities for exercises of this sort, than the Epidemic Cholera. Most of them have also the recommendation of being of very modern dates, so that their authors have themselves possessed the advantages, which the more recent advances in medical doctrines might have supplied them. The present intention of the author partakes of this nature; at the same time, for the sake of brevity, choosing rather the broader and more recognized features of the disorder, it is not his purpose, in every instance, to adduce individual testimony in support of such arguments as he may advance; while he would venture to add what, perhaps, may afford some claim upon the indulgence of his readers, that his knowledge of the disease consists in somewhat more than is to be found within the precincts of a library.

It is strange that the remarkable similarity between the effects and symptoms of excessive hæmorrhage and of Epidemic Cholera, should not have attracted greater attention amongst writers on the subject. Many have written voluminous works without even alluding to so notable a circumstance, and Dr. J. Johnson seems to

have been the first who has openly asserted the close connection between them. He says, "From an attentive observation of Cholera, as it appeared in England, I am perfectly satisfied that the disease is a serous hæmorrhage from the bowels, that is, that the serous part of the blood is drained off from the internal surface of the intestinal canal, till the powers of life are worn out, or the remaining blood becomes too thick to circulate. This is the only view of the disease that can account for the greater number of the symptoms, and the fatality of the malady. Men die of Cholera precisely in the same way as from hæmorrhage; shrinking, paleness, and *coldness* of all external parts, —even of the *breath*, with spasms, the invariable attendant on severe hæmorrhage."* In this he has been followed by some subsequent writers, but usually more in the mode of a tacit acknowledgment or recognition, than of attributing to it the importance which so leading a feature in the disease would appear to require. Let the above extract from this able writer be compared with the well known effects of great losses of blood, and can any fail to be struck with the coincidence? That certain differences should exist, is perhaps the rather to be expected, when we reflect that in ordinary hæmorrhages, whether from mechanical injury, or originating in diseased or irregular action, the effects to be looked for are such as bear a relation between the loss of the circulating fluid which has been sustained, and the amount of it remaining within the system; while in Cholera, the relation of the same will be to the loss of its more fluid portions, and

* *Johnson and Martin on Trop. Climates.* Sixth edit. P. 345.

the residue containing the whole, and, consequently, an undue proportion of the grosser components. It is also to be taken into account, that the former being frequently the result of the lesion of a considerable vessel or number of vessels, and of comparative local operation, are, on this account, more likely to cause sudden disturbance of equilibrium, and that, therefore, the effects of the deranged circulation, will vary from that in which the extensive intestinal surface is the medium of effusion. We find, accordingly, that syncope, one of the most common sequences in hæmorrhages, is rarely seen in Cholera, while, on the other hand, in the latter, we find more strongly marked the more partial failure of vitality, and the apathetic state of the patient's mind to impending fate; the more complete shrinking of the surface, from the desertion of the contained fluids, and its greater coldness and clamminess, together with other conditions connected with an alteration in the blood, and strongly indicative of an impeded circulation of this important fluid, owing to its unwonted viscidity and unfitness in relation to an essential condition of hydraulic motion, for propulsion through the minuter channels. In this, too, it is reasonable to suppose, is to be found a solution of the appearance so characteristic of the disease, as to have given it the appellation of the Blue Cholera, from the fact of the nails and general surface usually assuming, even during life, a livid or bluish colour; for it seems a fair inference, that pending the unwonted commotion taking place in this elaborate compound, by which it is in some measure resolved into its separate elements, that after the repeated efforts of the

systemic apparatus to sustain its important functions under so serious and increasing an interruption, that the globular or coloured portions, partly from want of the requisite *vis a tergo,* and partly owing to their own want of fluidity, from the abstraction of their appropriate medium, at length become clogged in the superficial capillaries, and thus affording an abnormal intensity of colour, are the efficient cause of the peculiar and unpromising aspect; and that this would hold good, more particularly with regard to the extremities, requires no further comment.

The greater number of authorities on the subject have remarked the centralization of the blood, as shown by post mortem examinations, particularly of the portal system, as palpably evidenced by the distension of the larger vessels, and also in the extraordinary injection of its minuter channels, as seen on the internal surface of the digestive cavity. But without at present entering upon any investigation of the obscure cause of these phenomena, and alluding merely to the facts, that the nature of their contents appear amply corroborative of the opinion with regard to a singular feature in the disorder, the separation of the blood into distinct portions uniformly presenting the dark, tarry-looking characteristic, while those of the intestines, unless where they have been altogether removed by the consecutive purging and vomiting, afford the more or less limpid, whey, or *congée* water appearance. We shall now offer a few remarks as to the proximate cause of the disorder itself, which we do not hesitate to say is to be found in the circumstances which have

been stated—the disturbance in the balance of the general circulation, with accumulation and eventual cessation in that of the portal system throughout its complicated connections, attended with separation and extensive loss of the serous part of the blood.

The remarkable suspension of the secretions, which so universally occurs, seems to take place, especially in the case of those organs which are provided with vessels of a considerable size, and whose distribution evidently has relation to the secerning functions of the parts to which they are distributed—thus, the bile, the urine, the saliva, and probably, also, the pancreatic and gastric juices (the latter may be inferred from the undigested condition of the injesta pending the disease) are found to be remarkably deficient,* while the cutaneous exhalation and sweat are apparently so far from being arrested in Cholera, that their presence, to an unnatural amount, is a very prominent feature, and adds, in no small degree, to the palpable horrors of the disorder. That these should supervene at a moment when the circulating fluid is withdrawn, in a great measure, from the subcutaneous apparatus provided for their elimination, would appear, *a priori*, an anomaly; but, at least, it can be shewn, that in similar conditions of the system, induced by very different causes, and of even partial operation, an apparently uniform

* It is true that it is common to find the gall bladder full; but that the function of the liver is suspended during the disease is a general opinion. The reappearance of the bile in the dejections is always favourable.—See *Johnson and Martin on Trop. Climates.* Sixth edition. Page 308, *et seq.*

effect is the result. Thus, during a sudden withdrawal of the nervous energy, such as takes place in syncope, and during the sway of the depressing passions, which are also attended with a central tendency of the circulation, a profuse cold sweat is a usual concomitant. On the contrary, in the opposite state, that of excitement, and in the more permanent one of fever, in contradistinction to that of Cholera, dryness of the surface is more usual as well as characteristic. Perhaps in accounting for the amount of perspiratory fluid thrown out in the disease in question, there should also be taken into account the suppression of the urine, and the well-known alternation of action between the kidnies and the skin. How far the preservative instinct of the economy to rid itself of *effete materiel*, notwithstanding the drain of its fluids by the gastro-intestinal mucus membrane (but, it is to be recollected, in an unsecreted form, and, therefore, unlikely to be available in reference to vicarious action) may be conducive to it, it is difficult to say; and we have, however, further to consider whether the fluid poured out upon the skin be the true perspiratory secretion, or, as appears to us, far from improbable, analogous in composition and mode of elimination with that to which we have just referred; the peculiarly cold, clammy sensation communicated to the touch, and the unpleasant odour afforded by the patient's body, are sufficiently distinctive, as every body knows who has experienced them; and the latter, Mr. Thom, in his late valuable and accurate report of the disease, as it appeared amongst our

troops in Scinde, has compared to *the unpleasant smell from blood which had been long drawn;* and, he adds, that "the cold perspiration often exceeded the quantity of fluid poured out by the intestines." From this, it would seem that while the intestinal mucus surface is usually the chief medium employed in effecting the morbid process, the other extensive surface, the skin, is for the most part implicated as well (cases have occurred in which it continued dry throughout), and that occasionally it plays the most active part of either in the mischief which ensues—the direct abstraction of the serosity from the blood. An analysis of the fluid poured out by the skin in Cholera would be interesting; none, that we are aware of, having been as yet published. It is worthy of observation, that notwithstanding the contraction of the surface generally, from loss of the contained fluids, turgescence of the superficial veins has been very commonly remarked; congestion internally being manifestly connected with the separation and abstraction referred to occurring there. With regard to the singular perception of heat at the surface, while to the bystander it feels of death-like coldness, we would refer to some remarks we shall hereafter make upon the still more marked degree in which it is experienced by the patient in the præcordial regions; for if the suggestions with regard to it be admitted in the one, they may with safety also in the other, provided they be acknowledged to depend upon the operation of similar causes in both.

The cutaneous exhalation and sweat are certainly true secretions; but if what we have above advanced

be admitted, that the superficial moisture in Cholera is of the same nature and origin as the fluid thrown out into the digestive cavity, we conceive it to be very possible that the same outlets, namely, the spiral secretory tubes, may be made available in the morbid passage of the fluids of the blood from the capillaries and minute veins, whose functions, under other circumstances, consist in the elimination of peculiar secretions. The sympathy and analogy between the skin and mucus membrane, have been constantly remarked, and that a similarity of action may be the result in Cholera, we think not unreasonable to look for.

But, it may be asked, how it is, that though internal congestion is held to be a main feature of the disease, and suspension of secretion an effect of it, the revelations of post mortem examinations are not more uniform in their testimony with regard to the condition of the organs in question; and that although the right side of the heart, with the lungs, together with the larger vessels appertaining to the visceral circulation in general, are found to be gorged with blood, the surface of the stomach and intestines, the kidneys, and occasionally even the liver and spleen, may present no abnormal appearances whatever. But we believe this by no means inexplicable, when it is considered that although the tendency of the peripheral circulation is towards the gastro-intestinal mucus membrane, where the blood is being deprived of its proper fluids, that meanwhile, notwithstanding so serious a deterioration, the circulation being carried

on as long as it is capable, as has been said, on hydrostatic principles, at length becomes arrested in the superficial and remote capillaries, especially in those of the extremities; and thus, after a deposition of the grosser portions in parts not immediately connected with the preservation of the general vitality, and the imperfect restoration of the relation between the materials of the blood thus afforded, nature would appear to direct the struggling powers of life, as if in desperation, by a withdrawal within a narrower scope for the effort (like a tottering state that is compelled to shake off its distant dependencies, to allow of a concentration of its resources for the exigencies of home) to avert impending dissolution, even at the sacrifice of the parts exterior to the circle, within which her operations have become confined.* In this way, then, is probably prevented the sudden internal congestion of semifluid blood, which must otherwise prove more immediately fatal. While we conceive that the cases of sudden death that have been observed to occur at the outbreak of the Epidemic in particular districts, often unattended by any of its broader features, such as purging or vomiting, are attributable to a stronger or more concentrated operation of the same cause, producing death in the mode referred to, and which, in a milder degree (as subsequently occurs when the disease has raged for a variable interval), would have been attended

* The cessation of the circulation, even in the largest vessels of the limbs, and the marble coldness of the latter, long previous to death, are constantly observed in Cholera.

by the various characteristic phenomena which it displays.*

A *status* of the blood then, commencing in the veins, attended or followed by a disorganization of its components, and the subsequent expulsion of a great part of the latter, by means of the two most extensive surfaces of the body, we believe to be the proximate cause of the various and complicated symptoms which, in the aggregate, have been misnamed Cholera. What is the still more remote cause of these grave disturbances in the previously healthy organism, we shall afterwards venture to offer an opinion upon, at present contenting ourselves with some further remarks on the subject under discussion.

Further; in this arrest of the circulation, that the portal system, in addition to its being the first, should also be the severest sufferer, can hardly excite surprise, when it is considered that here the *vis a tergo* from the heart, which is now clearly proved to influence the passage of the blood through the capillaries, even if it continue still unimpaired, only serves to increase the accumulation of blood in its larger vessels, which, in its transmission through the former, and its more minute venous branches distributed upon the vascular gastro-intestinal mucus surface, has been deprived of its fluidity, and is thus rendered incapable of easy transmission even through those of much larger caliber, at which, in its deteriorated condition, it ultimately arrives. Besides

* See *Orton on Cholera*, page 8, in which cases are mentioned as having occurred in the East Indies, of natives being seized with it while walking in the open air, and having fallen down and almost instantly expired.

that, to the natural disadvantage, owing to the isolated position of the portal, as compared with the general circulation, from having to overcome the resistance of a second capillary system, by which the impetus derived from the heart must be sensibly impaired; and its being similarly situated with regard to those aids which the systemic venous circulation is supposed to receive from the organs of respiration and right chambers of the heart, is to be added the existence of a new source of detention in the attraction which the separation and passage of the serosity into the intestinal cavity, must be supposed to exert upon the blood in proximity, even in the larger vessels, so that the supervention of this action in their minuter connections probably increases the evil that occurs primarily in the former; and the remote cause of all this morbific mischief, doubtless itself possesses a specific power in arresting the motion as well as of destroying the integrity of the vital fluid, as proved by the instances of almost instantaneous death referred to. What individual share each of the foregoing has in the congestion occurring in the more prolonged cases, is not easy to determine, but that it is owing to a combination of all of them is not improbable.

That the burning sensation in the præcordial regions is the effect of the congestion, is generally supposed; but whether the physical causes which we have assigned for the production of the latter may not collaterally, some of them, be the source of the former, deserves consideration. And although, in the present state of our knowledge, it would be too much to allege, the unwonted separation and passage of

the serum, so often alluded to, appears certainly more consonant than any thing else with this remarkable sensation, and to bear to it a very constant relation, being one of the most uniform as well as peculiar features of the disease, occurring as it does, when the temperature of the body is found to be actually below the natural standard. That an anomalous perception should accompany a new physical action set up in the system, seems reasonable to expect; and, for the reasons stated, we have been induced to offer the explanation of this in question, although of a purely conjectural nature.

But, as has been said, the general circulation soon becomes involved in the disasters commencing in that which is accessory, so that at length, as has frequently been observed, the appearance of the blood in both sides of the heart is often found exactly to correspond, and the lungs, as is commonly the case, too, are ascertained to be engorged with the same dark unoxydized blood. The results of post mortem examinations of the latter organs, however, have occasionally presented some remarkable discrepancies; instead of this abnormal congestion, they have occasionally been found in the very opposite condition, and exhibiting such extreme collapse, as to have induced one observer to resort to the experiment of piercing the thorax while immersed in water, under the impression that it resulted from the presence of gas between the pleural surfaces capable of overcoming the atmospheric pressure, but without the effect, namely, the extrication of it occuring that was anticipated; upon which Dr.

Johnson thus comments:—"As there appears to have been an absolute vacancy in the cavity of the pleura, that is to say the lungs did not by any means fill it, it would seem that that viscus had exerted a contractile power adequate to overcome the pressure of the atmosphere." But granting this unusual circumstance to have occurred in those cases, we cannot so readily acquiesce with the views of this distinguished author, and will at least offer something in further explanation of the matter; for, although believing that the lungs possess considerable contractile power, it is difficult to conceive how so remarkable an effect could have been produced by this agent solely, so long as the organs preserved their usual contents. We would, therefore, add, that possibly the same status of the circulation, which, as has been said, causes arrest of secretion in other organs, may, in certain cases, by its more or less sudden occurrence during the last moments of life, in the larger vessels connected with the right auricle of the heart, have at length deprived the pulmonary* artery of its accustomed supplies, or else that this tube itself had become obstructed, while the motion of the blood remaining in the bronchial capillaries being sustained a little longer, owing to the tendency to a vacuum from the action of its left cavities, that in this way is caused a very anæmic condition of the organs in question. Admitting, then, the correctness of the assertions of Reisessen, Laennec, and others, with regard to the existence of muscular fibres in

* The pulmonary artery has been found plugged with a fibrinous clot.

the minute tubes, which, taken in connection with the recent satisfactory demonstration of the contractility of the lungs upon the direct application of a stimulus, and the well-known phenomena of spasmodic asthma; it can hardly be considered improbable, that in certain cases of Cholera, a disease so essentially characterized by spasm, these organs themselves become seized with it, and that this occurring just previous to dissolution, under the circumstances detailed, when, in consequence of the great diminution in the contents of their vascular parenchyma, they are placed in the most favourable position to undergo the change, the natural apposition between the pleural surfaces becomes thus permanently destroyed by the subsequent intervention of death.

Their condition, in cases of death from hæmorrhage, the general effects of which, as has been said, offer a striking resemblance, throws no light from analogy upon the matter, for, in these, the organs are found to be filled with serum.* Suddenness in the change of volume would appear to be an essential condition in the cases referred to, as we find that when it occurs under a slower process, from the effect of pressure as from a pleural effusion, the subsequent absorption of the compressing medium is uniformly attended, when re-expansion does not take place, with an access of the surrounding viscera, or dislocation of them, as it has been termed, to fill up the space they occupied. Altogether the idea of a vacuum within the body, well proved, as it appears, and supported on such high authority, in its explanation,

* See *Dr. Marshall Hall on Loss of Blood.*

presents, it must be confessed, much difficulty. We have given that which appears to us most feasible.

Great attention has been paid, both in Europe and in India, to the examination and analysis of the blood in Cholera, and the result of these investigations have been very uniform. All agree in noticing the extraordinary disproportion between the serum and crassamentum, the increase of the carbonaceous matter, the decrease of albumen and fibrin, particularly of the latter, and the salts of the serum; while correspondingly the components of the dejections are found to be water, mucus, fibrin with albumen, and the various salts of the blood; the flaky matter contained in them being principally fibrin. Comparing the results of these with the analysis of healthy blood, there appears a closer connection than usually occurs, at least in the living organism, between cause and effect, since we find the very materials which are defective in that of Cholera, present in an excrementitious form consequent upon the disorder, and whether thrown out by the intestines in the mode of a secretion, as some maintain, or by a new physical action, the inference that the vital fluid has undergone great deterioration from the consequent destruction of its integrity, can hardly be denied. How far this alone may be productive of mischief in the system generally, owing to the primary alteration in the vital stimulus, we do not pretend to say; but that its secondary effects, resulting from a mechanical obstruction of the circulation from the thickened state of the blood, is the source of certain grave disturbances of important functions, some of which

have been enumerated, is our firm conviction; and further, that it will be seen, that this very serious lesion is sufficient to account for other matters which are themselves secondaries or sequences, to what in turn become excitants in the morbid train which is to follow. Thus there seems no necessity for having recourse to the supposition of a morbid and specific poison existing in the blood, which nature endeavours to rid herself of through the medium of the gastro-intestinal mucus membrane, and, therefore, that the evacuations in Cholera are salutary, the process, in fact, by means of which the sufferer is to be restored to health, by the effusion of that portion of the blood which passes with most facility through membranous parietes, or, as another author holds, by a secretion at the nearest point to the centre of circulation, that can be effected. So that, in accordance with these views, it would appear either that the poisonous material resided solely in the serum, and, as we may infer, was equally diffused throughout it, and that the latter was poured out in an unchanged form, the effort of nature being to get rid of, as much as possible, of the offending matter; or else, that although the whole of the blood was implicated, her unassisted efforts were unavailing in effecting the requisite depletion, except of the portion capable of the new transit; namely, the serosity. Or viewing it in the light of a secretion, that a new action had become established for the purpose of separating, through the agency of the gastro-intestinal mucus membrane, a poison pre-existing in the blood, but which required to effect it, great dilution with a fluid, which was

found to contain so nearly the normal components of the serum, as to be almost physically identical with it. Such are the explanations which appear the most rational of some of the prevalent views, of a poison in the blood being the cause of Cholera; and according to which the evacuations, so far from holding a primary position, are to be regarded as the means adopted for dispelling the disorder—a supposition that must be regarded as utterly untenable, if it be considered that if ever "cure proved worse than the disease," it surely would be found in this, by which the blood is rendered unfit to circulate in its channels, and all the powers of life are observed to flag, in a great measure at least, palpably in consequence of the physical interruption of so important a function, which, nevertheless, according to these conceptions, is to be regarded as an ordeal, by means of which the sufferer, provided his vitality proves competent for the struggle, is to be restored to the condition of health.

We maintain, then, that the blood, after having been deprived of its fluid as a primary source of the mischief to follow, and reversing the order given as that upon which is founded most of the theories to explain the phenomena of the disease, becomes, as it were, its own poisoner; and how this is effected is not difficult to explain, since the same viscidity which, as has been said, is, in the first instance, the result of destruction in its integrity, becomes, as we have also endeavoured to show, the cause of arrest of those secretions which are destined solely, or in part, for the elimination of certain deleterious matters which

must otherwise accumulate in the system. Without unnecessary detail, we may mention those of the bile and the urine; to the former of which especially, in addition to the imperfect transmission of blood through the lungs, is to be attributed the disproportionate presence of carbonaceous matter always found in it, both in the arteries and in the veins, a change that is to be regarded in no other light than that of poisonous, not to mention the other consequent *effete* accumulations which might be adduced, but which, being sufficiently obvious, do not seem to require separate enumeration.

Thus from what may be termed a mechanical lesion in the first instance,* there arises another which may be termed chemical. By the first it is disorganized as regards its normal proportions, and by the second it loses, gains, or combines materials, which are either foreign to its healthy condition, or incompatible with this as regards both combinations and proportions. We may proceed next to explain some other phenomena, apparent or real, which, in their turn, have been taxed as the specific causes of what they are themselves to be regarded, as playing only the subordinate parts of incidental effects. A remarkable one is that which attributes the disease to paralysis of the heart, the dejections being a salutary drain by secretion to relieve its distress; but there appears no reason to

* It may be objected that the lesion spoken of, the separation of the serum and crassamentum, is not strictly a mechanical one, part of the albumen of the former being retained within the vessels; but we conceive it to be sufficiently so to warrant the expression, the watery dejections and the serum, appearing to be otherwise quite analogous.

have recourse to this explanation, since we imagine what has been already stated amply sufficient to account for any symptoms that might simulate such an affection of the organ, impeded as its motions must be, and deprived of its accustomed stimulus, arterialized blood. And that the latter want, especially in reference to the nervous centres, is the cause of other symptoms more particularly in connection with the failure of the circulation and of the state of collapse, is also highly probable, for the conclusion of Majendie, that the brain does not require the presence of arterial blood for the performance of its functions, in consequence of the unaffected state of the mind in this disease, although it may be correct, regarding it as the medium of mental operations, is certainly not universally so as regards its relations to the vital functions in connection with the other nervous centres.

In estimating the effects of the malady generally then, we are not to lose sight of the several resulting and concomitant circumstances which, as we have endeavoured to show, although deducible from the same grave lesion of the circulating fluid, and, in reality, secondaries, yet so speedily assume such formidable positions, and present so nearly the appearances of specific and independent origins, as with difficulty to be connected with their original source. Thus the extreme prostration, constituting the state of collapse, is to be traced to the want of the requisite stimulus to the heart and nervous centres, arising, on the one hand, from diminished nervous energy, and, on the other, from failure of the heart's action; and it will be readily admitted that both these defects must

mutually react upon each other, thus jointly increasing the compound evil, and more certainly ensuring its continuance. There is here, then, we conceive, without further entering into the subject, a key to the solution of other matters evidently depending upon their due discharge, and also a *rationale* of the production of many of the phenomena of Cholera; and why effect has been so frequently mistaken for cause in the conclusions of some most accurate observers of the disorder. There is still, however, an important doctrine with regard to it to be considered, which attributes the disease, in common with some others, perhaps equally questionable, to the vital alteration termed inflammation; from which, notwithstanding the high authority of Broussais and his numerous followers, both in this country and on the Continent, and of Corbyn and others in India, we express our entire dissent; but that it often speedily, and too commonly, ultimately supervenes in the progress of the disorder, as readily admitting, and that in this way, as in other cases, it comes to be taxed as the original cause in the course of diseased action with which it has become blended. That the alterations in the blood itself may be alone sufficient to produce it, is not improbable; but the single, well known fact, of the close alliance between congestion and inflammation, the merging of the one into the other so commonly, although not invariably observed in other diseases in which the first condition preexisted, is sufficient to show the liability of the occurrence of the latter in a disease so eminently characterised by congestion as this. Accordingly, we find some of the most dangerous sequelæ of Cholera of this nature,

.ch, in cases where death has occurred, pending the disease itself, provided the progress of it has not been too rapid for its supervention, traces of gastro-intestinal inflammation, as *a priori* might be expected, are common morbid appearances revealed by the scalpel. But the rapidity with which the disease arrives at a crisis, usually in a very few hours; its occasionally almost immediately fatal termination from the period of its first invasion, and also its sometimes abrupt termination and transition to health, after an interval which seemed to threaten speedy dissolution; the state of the pulse, of the surface, which, although to the patient feeling warm, is, in reality, cold and damp beyond what is natural; the calmness and indifference of the mind, and other circumstances which a state of feverish excitement, almost inseparable from inflammation, would be least likely to be associated with; and, lastly, the state of the blood when drawn during life, which has been scarcely ever known to exhibit indications of inflammation, are all opposed to the assumption.

But it may be asked how it happens that the remedies which experience has shown to be the most efficient in combating inflammatory action, have been found, especially in the hands of our Indian brethren, the most successful agents also in the treatment of Cholera, although the *ratio medendi*, in the latter instance, must be essentially different from what takes place in the former, if it is held that its production is independent of this fertile source of diseases, which, being thus primarily analogous, admit of being usefully grouped for practical purposes into the class requiring the antiphlogistic treatment. Two of these are so

noted for their efficacy in the latter, and have been so lauded, on most respectable authority, as the main dependences in Cholera, as to require separate consideration; we mean calomel and the lancet. As to the action of the former, although it has been probably more universally employed, and bears a higher repute than any other internal remedy that has been subjected to an equal trial, it must be regarded as still quite undetermined. Those who refer it to its ordinary antiphlogistic properties, will find many difficulties to contend with in maintaining their views; particularly the shortness of the period within which the beneficial effect of the remedy must of necessity be exerted in many instances, being at variance with our observations of it in other diseases; and the well known fact that the existence of ptyalism is no safeguard from the invasion of Cholera, and seems to exert as little influence upon its progress. To attribute it to its effect upon the secretions, particularly of the liver, is open equally to objections; the idea that the disease depends essentially upon arrest or depravation of the bile, being already quite obsolete, and its action upon any of them being altogether insufficient to furnish grounds for so important an argument; and thus dissatisfied with both these explanations, choose to refer it to what has been termed its sedative effect, from its supposed utility when given in large doses in allaying the vomiting and purging. But while this has, perhaps, been sufficiently demonstrated in some instances, it is to be recollected that these acts do not constitute the disorder, resulting merely as they do from the contact of offending matter within the digestive

cavity.* Others, again, but they are the smaller proportion, deny its efficacy altogether, and never administer what has been termed a sheet anchor by its advocates in this and so many other diseases. How this great discrepancy of opinion amongst the upholders of the mineral is to be explained, and what is the true *modus operandi* by which its beneficial effects are elicited, since the occurrence of the latter is supported by such respectable authorities, and seems established on the most extensive trials, are no easy matters to resolve. As for blood-letting, than which nothing has been more praised and practised by one party, or deprecated and neglected by others, perhaps its beneficial effects, where it can be borne on other grounds than a combatter of existing inflammation, admits more easily of explanation; since, in a disease known to be essentially characterized by congestion, the abstraction of blood from the system would appear a tolerably clear indication, and a measure that would serve to check the gastro-intestinal serous effusion, by promoting a withdrawal of the accumulation of blood from the larger internal veins, a morbid process which is likely to be assisted by the pressure of the columns of sluggish fluid reacting upon their minuter tributaries. Besides, it is not improbable that the loss of blood from a vein may artificially serve to restore its proportions, taken as a whole, by giving exit to the grosser portions, a matter that had been hitherto exclusively confined to the more

* Vomiting, it may be mentioned, however, being also an attendant upon excessive hæmorrhage, that which occurs in Cholera may partly be attributable to depletion.

watery; while the state of general collapse of the vessels, which might be hoped to result, instead of their local and irregular distension, would be calculated to give a check to the latter. Certain it is, however, that seldom in the epidemic, as it appeared in this country at least, was the operation warranted by the condition of the patient, and that whenever attempted, it should be with a cautious hand.

While upon the subject of remedies, we may add that it is by no means part of our purpose to enter into a separate investigation of the merits of the countless others which have been employed on various principles, and, with a view to meet almost as varied indications; most of them having been tried either upon so local or so small a scale, or have enjoyed such ephemeral reputations, when subjected to more extended examinations, as not to require any particular notice. There is, however, a remarkable one, that of the saline class, as originally introduced by Doctor Stevens and modified by Doctor O'Shaughnessy, upon which we mean to offer a few remarks hereafter, which, considering its bold and daring nature, coupled with the numerous well-attested cases in which it has proved beneficial under the most unpromising circumstances, appears worthy of more extensive trials, and an accurate observation of its action. That this may consist in something more than the restoration of the salts to the blood alone, with which intention it was originally administered, has often occurred to us; and although having little faith in reputed specifics in general, yet in a disease characterised by such awful rapidity, whose invasion is like that of

the midnight thief, whose advance is by giant strides, and whose natural termination would seem to be in the dissolution of the delicate fabric it has made its victim; perhaps a deviation from one of the soundest aphorisms in practice, that the doctrine of specificism appertains more to the charlatan of modern, or to the more excusable dreamy applications of science by our forefathers of bygone days, than to the enlightened physician of our own, is in this particular instance defensible, in which the train of symptoms are equally new, sudden and alarming, in which analogy from other diseases lends us little aid, and in which general principles almost entirely fail us. They are not the phenomena of fever which we have to combat, nor are they such as are referable exclusively to lesion of the nervous energy, nor yet are they explicable by reference to previous organic changes; but standing apparently inscrutable and alone, they are the phenomena of a new mode of disorganization.

More particular attention has been paid to the antiphlogistic treatment, at present so widely prevalent, with a view to meet the objections of those who contend for an inflammatory origin; and the opinions of Dr. Budd, in the article "Cholera," *Library of Practical Medicine,* speaking of the theory of Broussais, are so much to the purpose, and so entirely coincide with our own, that we cannot forbear transcribing them. He says:—"The supposition advanced by an ingenious author, that Malignant Cholera consists in inflammation of the mucus coat of the stomach and intestines, is opposed by the fact that

inflammations of these viscera occur in their greatest severity without giving rise to the same symptoms, and that the appearances after death do not accord with the ordinary effects of inflammation.* Besides, if this disease be simply inflammation of the coats of the intestinal canal, why have we not witnessed it until the last few years? The history of medicine offers examples of the occurrence of new specific diseases, but there is no evidence that there have been any modern additions to the list of simple inflammatory affections. The recent origin of Malignant Cholera, then, as well as its epidemic nature, concur with the reasons above assigned, and prevent us from considering it a simple inflammation—a supposition, indeed, utterly untenable, while the peculiar character of the evacuations, the unusual development of the intestinal follicles, the rapidity with which the disease proves fatal, its wide diffusion, and the permanence of its essential characters in circumstances the most various, show that it every where depends on one and the same special cause—a cause whose first effects are manifested in derangement of the functions of the intestinal canal, but which exerts on the economy the action of a powerful poison."

There is still to be considered the difficult question of the exciting cause and propagation of Epidemic Cholera, concerning which, also, we mean rapidly to glance at the opinions of others, previous to offering our own upon the subject—a difficulty which will be found only enhanced by the embarrassment of a

* That this admits of exceptions, when the disease has been of some continuance, we have already stated.

vast number of discrepant theories. Some of them are advanced by authorities whom one would almost hesitate to reject, upon the score of respect to the established ability of their propounders, while others carry with them such intrinsic evidences of ingenuity, as would lead us to embrace them as unexceptionable, did we not find, upon examination, that it is not one but several, and some, too, based upon the most opposite assumptions to which this merit is undoubtedly due. All, too, when brought to the test of a comparison with the few established facts that we do possess on the subject, more or less fall short of that practical corroboration which theory must borrow from practice in the elevation of the former to the rank of any scientific, and more particularly, if possible, of a medical axiom.

Foremost in the ranks, because the most important, in a social and political point of view, are the contagionists, who contend that the disease once produced, from whatever cause, is capable of propagation from contact with the infected or their fomites. Happily for the fears and convenience, too, of the public on this head, although the idea is not yet quite exploded, and, we believe, the disease is still within the pale of quarantine regulations; as it is the most untenable, so it already holds one of the lowest places of all in the estimation of those who have impartially devoted even ordinary attention to this interesting subject. The almost universal testimony of army medical men in India, where the opportunities for observation on a large scale are constantly being afforded, in the junction of corps suffering with the disease with others

which are healthy, or the reverse of this, in the negative; the no greater liability of persons engaged in constant attendance upon the affected, and, above all, the inefficiency of any of the quarantine regulations hitherto devised, in addition to many other circumstances that might be adduced, appear amply sufficient to set the matter at once and for ever at rest. To attribute it to the influence of terrestrial malaria, is evidently of too local a character to bear examination, inasmuch as no description of surface has proved exempt from its visitation, whether dry or moist, or however characterized by its geological relations, unless we could suppose the malaria to be conveyed by the atmospheric currents to places very remote from the sources whence it emanated, and that it was capable of overcoming every obstacle opposed to it; such as the intervention of the loftiest mountain ranges, remaining equally unabsorbed and unaffected after traversing the heating sands of a desert or the cooling waters of an ocean. These are all matters hardly reasonably admissible; but there is another consideration that would seem fatal to the supposition, the established fact of its being repeatedly observed to advance in directions contrary to the prevailing winds, as in India, for instance, against the steadily and strongly blowing monsoons. The same observations, we conceive, are applicable to Dr. Holland's ingenious theory in reference to Cholera, as suggested in his *Hypothesis of Insect Life as a Cause of Disease.* And that the extremes of heat and cold, although the former would appear more congenial to its development, and more

particularly connected with its eastern origin, are not to be taxed as the efficient causes either of this or its subsequent progress through regions the most diverse and discordant with each other, as well as regards temperature as every other aspect of physical climate, are evident enough. For although experience has shown that the summer season is the most favourable for both, it remains to be seen whether the increased activity of a different agent besides heat, at this period, may not be concerned in causing it.

There is still, however, another important agent universally connected in its operations with the globe which we inhabit, and which, beyond doubt, exercises a more extensive influence upon our physical well-being than is at all recognized as yet, although in other departments of science, having long since received attention more commensurate with its merits, and having already advanced to a position which, on account of its practical importance, it demands—we mean electricity. To this, also, the origin of Epidemic Cholera has been by some vaguely ascribed; and although no explanation or *rationale* of its action has been as yet offered, that we know of, still it is an opinion every day gaining ground, and it will assuredly be found more consonant with the eccentricities in the course and development of the disease, and its singular exemption from interruption from ordinary obstacles, than any other that can be urged. The subject of atmospheric electricity, nevertheless, has not been altogether neglected, and some valuable facts in reference to it have long since been ascertained. Thus the experiments of Mr. Read and

M. Saussure go to prove that it is subject to a periodic flux during the twenty-four hours:—"The times of its greatest force being some hours after the rising and setting of the sun, those when it is weakest preceding these periods." Now it is worthy of notice that the attack of Cholera, as is well known, most ordinarily occurs during the night, particularly a little preceding daylight; and the question would seem a natural one, whether this can be connected in any way with the phenomena alluded to, since either any irregularity or accession of force in this powerful agent, which would appear ordinarily to be controlled within periodic changes, is most probably attended by corresponding results.

There is such a mass of evidence to prove unusual disturbances of the elements previous to great outbreaks of the disorder, that the conclusion that a connection existed between them seems irresistible; and that the latter, more or less, depend for their development upon electricity, is also in accordance with what we know upon the subject. Fearful thunder storms have been particularly frequent;* and if proof be required that it is dependent upon some great and universal cause, such as this in question could furnish, it will be found in the fact that the disease, when it has appeared in its most marked and aggravated form, has not been confined to the human species merely, but has extended to those of the lower animals possessing similar internal comformations, of which, also, very ample evidence could be adduced. Mr. Jameson, in his faithful account of

* See upon this subject, *Corbyn on the Epidemic Cholera.*

the invasion of 1816 in India, speaking of it, says:— "Throughout Upper Hindostan, it was observed that horned cattle were very sickly at this period, their bodies could be seen by passing travellers, strewed in vast numbers in the pastures." By other authorities, purging and vomiting are mentioned as common amongst the lower animals, whilst the latter, even amongst horses, an act very rare with these animals, the matter ejected being a *serous fluid*, attended with profuse sweating, and followed by death, has been known to occur.*

From a consideration of all these circumstances, that the tendency exhibited by certain similarly organized beings, although widely differing in some respects, to be at the same time affected with the peculiar symptoms, which have been in the aggregate termed Cholera, is dependent upon some universal but progressive commotion or irregularity in the electric currents pervading our earth and its atmosphere, owing to causes which, although at present involved in mystery, the advance of science may hereafter reveal, appears to us the most reasonable hypothesis in the difficulty, and the most consonant with general observation.

Electro-magnetism, a department of science as yet almost in its infancy, will, probably, when better known, be found to throw some light upon these obscure matters. The question has frequently occurred to us, can the chiefly westerly variation of the magnetic needle in this hemisphere bear any relation to the uniform track of the Epidemic in a similar

* *Johnson and Martin on Trop. Climates.* Page 354, Sixth Edition.

direction? Such a connection may seem remote; but it is by no means impossible. It is from comparative observations of the diversified phenomena of the physical world that we can only hope for an elucidation, nor should we be induced to hesitate from our own apparent independence of their existence. At all events, it is most desirable that, during the prevalence of the Epidemic, in future, to the ordinary atmospheric observations, there be added others connected with its relative electric conditions; a sufficiently portable and, at the same time, accurate instrument for the purpose, being still a desideratum.*

That widely different diseases may be the result of modifications of the same primary excitant, by which its force is weakened, or its direction within the organism altered, is highly probable. As, for example, the influenza, so analogous to Cholera in its course, and in some other respects, which there is every reason to suppose is also of electrical origin.

* Since the above was written, the following, which would seem to bear out our views, has appeared in a late number of the *Manchester Guardian*:—"CAUSES OF CHOLERA.—In reference to this we have been favoured with the following extract of a letter from St. Petersburgh, written by a gentleman well known in Manchester, to the firm here, in which he is a partner:—'A very important discovery has been made here very recently, which clearly proves that the malady is in the air, and that, therefore, quarantines are utterly useless; the air here has had a very singular effect on the magnetic power, whilst the Cholera was at its height, the action of the magnet was nearly neutralised, which, now the disease is gradually subsiding, assumes by degrees its former power. A magnet block, which used to carry 80lbs. would, during the worst time of the Cholera, not carry above 13lbs. Its strength has now increased again to 60lbs. The Electro-Magnetic Telegraph at one time would not work at all.'"

A principal feature in Mr. Thom's excellent report, is his supposition that the Choleric Diathesis, "in the absence of exciting causes, may be dormant in the system for months or even years;" and the latter he seems to identify with an elevated temperature combined with a very moist state of the atmosphere. Yet his own statements are, we think, sufficient to induce inquiry into some other causes than those alleged. He says in one place, "The thermometer is at this moment, October 14th, as high as it was during the Cholera, being 90 to 92 in houses, and 100 in tents, in the middle of the day, yet we feel fresh, elastic, and free from that *horrible undefinable sense of oppression* that prevailed in June; evidently it is not simple temperature, and *lichen tropicus* has disappeared." This he attributes to an alteration in the dew-point, and again he mentions, as a very common occurrence among people in general, while the disease prevailed, *an unpleasant tingling sensation* in the palms of the hands and in the soles of the feet, often pervading the whole extremities, and producing *twitchings and spasmodic startings* of the limbs when in bed. Now the similarity between these last, and the effect of electricity artificially excited and communicated to an individual, is obvious enough, while, as regards the first mentioned, unpleasant effects from certain electrical states of the atmosphere, upon persons of highly nervous organizations, are circumstances every day to be met with, and we can easily conceive how a concentration of the same could produce the feelings in question generally.

We can no more assent to this author's conviction of

the long incubation of the disease in the system referred to, in the sense in which he appears to regard it, as similar to the mode in which some others are known to remain dormant, until called forth by circumstances favourable to their development, than we can to the doctrine of contagion. Our view of the matter being, that during the operation of a widely diffused agency, to which great numbers are equally obnoxious, a certain proportion, owing to a constitutional adaptation to its influence, whether original or acquired, will only be affected by it, and that this proportion will be determined as well by the degree of susceptibility possessed by those exposed to it, as by that of the concentration or energy of the exciting cause, which shall have exerted no deleterious influence whatever upon the remainder, but that the adaptation referred to is itself controlled or regulated by several modifying circumstances. Thus, for example, age, occupation, and, as Mr. Thom's experience shows, even stature, and, above all, previous habits of life, whether temperate or dissipated, and the position in the social scale occupied by the individual, exercise very important influences upon its diffusion.

There is a circumstance, however, that seems to deserve notice, as bearing on the subject both of contagion and incubation. It has been observed that the first appearance of Cholera in a country has sometimes occurred amongst individuals who had recently arrived from places where it had been prevalent previous to their leaving them, as, for instance, amongst sailors who have lately come into port, so as to give rise to the suspicion that the disease had been imported, and

was, consequently, contagious. Yet we are far from thinking this single fact, opposed as it is to so many others, sufficient to establish so important a conclusion, for we can easily imagine that in the case of persons who had been recently exposed to a general exciting cause, a suspension of effect might occur for some time after their removal from its immediate influence. This may be owing, probably, to the retention of the morbid electrical condition at first impressed from without upon the organism, for some time subsequently to a change of position, placing the recipient, as has been said, beyond the external agency where it had been acquired, while some other circumstances, such as irregularities of living, &c., may be looked for, to account for its being called into play, so as to produce the disease.

It is not to be understood, from what has been said, therefore, with regard to the anomalies of the disorder, which render it incapable of being subjected to some of the laws which are known to regulate the propagation of disease, and that would seem to place it beyond the pale of ordinary prophylactics, that it is meant to be held as affording less scope for the exercise of the means of general sanitary improvement and amelioration of the social condition as an indirect, but efficient means, of arresting its ravages amongst communities exposed to its invasion. This is a sentiment that would fall little short of the fatal absurdities which, for a different reason, are taught, with regard to the plague, by the disciples of Mahomet. On the contrary, we have the most unequivocal evidences that the poorly clad and nourished, the de pressed in mind and body, are almost invariably

amongst the earliest victims; whilst those whom fortune has placed in superior stations, and are less exposed to such vicissitudes, proportionately enjoy exemption. It seems probable, however, that the power of resistence in some measure diminishes correspondingly with the length of period which it has been called into action, and that in this way is to be accounted for its subsequently, as has sometimes been remarked, attacking individuals amongst the affluent that had hitherto escaped with impunity, after devastating those of lower circumstances.

But we have still to examine by what morbid process, after a separation of its components, a portion of the blood gains exit from the system, independently, as has been said, of the vital act of secretion? Amongst the many modern additions to our knowledge, few, perhaps, are more valuable, and none more curious, than those which the researches of Dutrochet, and of some others subsequently, relating to the transmission of fluids through intervening parietes, have afforded; serving to explain, as they have done, phenomena previously inexplicable, and throwing a new light upon some most interesting departments of physiology. The influence which the facts in question may have in connection with or producing the morbid changes that constitute or accompany diseased action, being, however, little investigated, yet we are disposed to believe that by a physical process, something analogous to those described by the above author, probably called into action by electricity, the morbid effect under investigation is produced, the separation of the serum being also attributable to this agent.

Nothing that we are acquainted with affords so reasonable an explanation of what the result of observation indicates, namely, that the most constant attendant upon the disorder, and usually the earliest, is the discharge of a quantity of fluid from the intestines, and when not discharged, that they are found (unless in certain rare cases, where death has occurred almost immediately after seizure from congestion), distended with the same, showing its essential relation to the disease, and that this fluid is, as has been chemically proved, the serum of the blood, so little altered as to warrant its being regarded as a mechanical separation, and effected by a process entirely distinct from the vital one of secretion; while to prove its special production might be adduced various particulars, such as the sudden occurrence of the effusion, its being independent of inflammation, and originating under a condition of the system the very reverse of this, namely, of depression.

If it be asked how, in accordance with what is already known on the subject referred to, this takes place, or, in other words, what is the exact explanation of the process; perhaps it may be said, that probably nothing exactly analogous has yet been elicited by experiment, but that even in the present state of our knowledge, the modifying circumstances are found to be so various (that is, the transit of the fluids experimented upon is influenced by so many causes, that possibly this will one day be found capable of demonstration), that the absorption of the fluids of the intestines into the blood is effected upon this principle, seems now a settled question.

We know that it may be objected, that along with change, of volume, there is implied in the terms endosmosis and exosmosis, a mixture of the fluids, a supposition not warranted by the phenomena of Cholera; since it would seem that the source of mischief, is the simple drain of the serous part of the blood from the vessels outwards, independent of a reciprocal action inwards, from the intestines. But without insisting on the allocation of the process, by which this is effected under the foregoing denominations, we have been induced to bring them forward, from their acknowledged operation in the human body, as causes of the motion of the fluids—convinced that that by which the escape of the serosity is effected, is closely allied to the extensive group of causes producing the changes of volume, to which the terms in question have been applied. Besides, from the explanation given by Liebig, of the absorption of the fluids of the intestines, it would appear that this mixture or interchange does not necessarily occur; he says:—"The blood vessels contain a liquid for which their walls are in the normal state far less permeable, than for all the other fluids of the body;" and a reference to the context will show that an interchange is not spoken of.* Now it appears to us not too much to suppose, that in certain abnormal states of them, from an alteration in their pores allowing this fluid, or at least the serous part of it, to pass with facility, added to changes in the fluid itself, dependent, as we have surmised, upon electrical irregularities, a reversion of the act of absorption may

* *On the Motion of the Juices in the Animal Body.* p. 59.

be the effect. And, perhaps this is all that is necessary to be conceived, so far as the loss of the serum is concerned.

Whether the alteration in the pores of the living vessels consist in a mere enlargement of them, mechanically admitting the passage of the serum; or, as appears to us more probable, in some changes in the affinities between them and the fluid in contact with them, of electrical origin, by which the direction of the latter is altered, we do not pretend to speak positively. The experiment of M. Porret, which we are about to mention, proves that the galvanic action is capable of causing the passage of water through a membrane, and it is plain that by reversing the connection of the poles in the performance of it, a reversion of its current or direction would be the result; this would appear corroboratory of the latter hypothesis.

It would by no means answer the scope of our present limits, to enter into any minute details of the many curious properties of what has been termed the endosmosic current, nor would it at all subserve to the purpose; suffice it to say, the conditions which regulate it are sufficiently complicated. Thus, for example, it is not in every instance towards the denser fluid that it is turned. The nature of the membrane employed may affect it; acids and alkalies serve to destroy it, by combining with the membrane; and it must not be forgotten, that in M. Porret's experiment already referred to, in which simple water was employed separated by a membrane, exactly similar results were obtained by the action of the voltaic pile—the positive pole being put

in connection with one compartment containing it, and the negative with the other.* The subject, however, still demands much investigation, and we have merely noticed the above to remind of its complex nature; and, at the risk of being regarded as taking too mechanical a view of phenomena connected with diseases which are referred exclusively by some to what have been termed vital alterations; we do assert our opinion, that many of those whose exciting causes appear locked in obscurity, and amongst those such as belong to Cholera, depend on the operation of purely physical agencies, acting directly upon the organism, and that of these, one of the most important is electricity.†

* *Annales de Chimie*, tom xi., p. 137.

† There is one circumstance relative to the greater or less liability of persons of various occupations to Cholera, that we will go the length of citing, in connection with the views which we have advanced, and for reasons that will be stated:—It has been long remarked in the city of Calcutta, that the large portion of the native population termed beesties, or water-carriers, whose mode of performing their tasks is by means of large leathern bottles carried across the loins in close proximity with their naked bodies; enjoy a singular exemption from the disorder, so much so, indeed, as to have attracted general attention, and we believe a death from Cholera amongst this laborious and low caste body is a very rare occurrence. Can it be, as we have sometimes thought, that the body of fluid so constantly in apposition with their persons, and only separated by a porous envelope, exercises in some way an attractive force, by which the fluids within the body are prevented from yielding to the morbid impulse, that would otherwise (in a certain number of instances) be communicated by the general agency to which all are exposed? That we should look for some more concealed reason why these people should possess this remarkable immunity would appear obvious, as there is nothing in their habits of life essentially different from the other classes of natives who

If the separation and passage of the serum be effected by this agency, and the latter by a physical mode, which, as may be expected from analogy, is perhaps liable to modifications, it may not appear improbable that, under other circumstances, the coloured portions of the blood should in this way pass into the intestines, the serum being the part retained. At least, we have frequently suspected that the black matter ejected by the stomach and bowels in bad cases of yellow fever may be from this source (it has been attributed by some authorities to extravasated blood), and the general history of this fever would seem in some other respects to bear us out. Take for example the definition of yellow fever, given by Dr. Bartlett, of the Transylvania University, United States :—"In nearly all cases, *unusual thinness and fluidity of the blood,* and redness, mamellation, changes in the thickness and softening, one or more, of the mucus membranes of the stomach, this organ and the intestines usually containing a considerable quantity of *a very dark or black fluid or semifluid matter,* which disease differs essentially from all others in its causes, its symptoms, and its lesions, and is only to a moderate extent, at least in its graver forms, under the control of art."

To revert briefly to the subject of treatment: if the views we have taken be correct, and the true *causa mali* be the rapid loss of the serous part of the blood, by a physical process called into action by electricity, we have

usually suffer in a fearful degree during the prevalence of the epidemic. As any addition to our record of facts upon the subject, appeared to us worthy of it, we have noted this, but without insisting upon the explanation suggested.

at once a clue to what our efforts should be directed, namely, primarily the arrest if not the reversion of this morbid process; but how this is to be best attempted, must remain for future experience to determine. It has, however, occurred to us, that perhaps in this way, more than from the restoration of the salts to the blood, *per se* the saline method may have proved efficacious. These substances are known to possess, when in solution, a tendency, under certain circumstances, to permeate membranous structures, but then, according to observation in the living body, this will occur only when the per centage contained in the solution is less than that contained in the blood—and in this manner has been explained the determination of the action of certain medicines of this nature, either as purgatives or diuretics—according to the relative quantities in which they happen to be administered. But it may be supposed that in the case of Cholera, where the blood has already lost the greater portion of its salts, that a larger amount than ordinarily would in this way gain access, and hence that the administration of salines may have proved efficacious, not only by restoring some of its normal components to the blood, but by promoting a reversion or suspension of the morbid action by which they were originally lost.

As plain water enters the circulation with still greater facility, it establishes a reason, we conceive, why its free use should not be interdicted, while, if warm, it may be rendered suitable for the stomach by some simple medication. The cravings of the patients for this element are usually remarkable, so that it would seem as if nature by this means aimed

at a dilution of the blood. But, at the same time, such measures should be attended to as would serve to restore and promote the natural perspiration, which, as is also ascertained, is essentially concerned in the absorption and distribution of the fluids, and is, at this time, more particularly requisite in consequence, of the almost invariable suspension of the functions of the urinary organs, the special apparatus for regulating the state of concentration of the blood, and, consequently connected indirectly with the process of absorption in the intestines.*

As it would neither answer our prescribed limits, nor be conformable with our original plan, which did not contemplate the consideration of practical treatment, we shall not enter upon a detail of how this is to be best accomplished. Suffice it to say, that such external appliances, as common experience indicates as suitable, should not be omitted, these, we think, combined with warm drinks, will be found most eligible for the purpose.

Neither should be neglected the class of astringent remedies; we have seen from direct experiment upon the dead membrane, that certain substances in solution destroy its power of transmitting fluids, and a timely exhibition of them may be hoped to check the serous depletion by their action upon the pores of those within the living body. Their indication, however, would appear to be confined chiefly to the earlier stages of the disorder.

Of such agents as are known to possess efficacy of this sort, perhaps opium is the most eligible,

* *Motion of the Juices*, &c., page 59.

as, in addition to its astringent qualities, its great power in allaying spasm should not be lost sight of, nor the analogical inferences that may be deduced from its value in excessive hæmorrhages.

One circumstance stated, that we look upon as of great moment, in a disease characterized by such extreme asthenia, especially when the stage of collapse impends, or has set in; and we have said all that is necessary as regards a general view of the treatment, which, as we conceive, it demands. The importance to be attached to the preservation of the horizontal position, and the gentle manipulation of the patient, especially if circumstances render removal desirable, as amongst the humbler classes from their own homes, to the superior accommodations of an hospital.

Before concluding, we here present a summary of such leading propositions, as in the foregoing we have been endeavouring to establish:—

I. That the proximate cause of the phenomena of Cholera is the separation and loss of the serous part of the blood.

II. That many of these are such as bear a near resemblance to the symptoms of excessive hæmorrhage, thereby showing a close analogy in their production.

III. That some which have been regarded as special are in reality secondary to the foregoing lesion, owing to the consequent obstruction of the circulation.

IV. That the separation and depletion are effected, independent of secretion, by a physical process, the depletion being through the medium of the gastro-intestinal mucus surface.

V. That it is probable that the external moisture

thrown out upon the skin is of similar origin and constitution with the fluid in the intestines.

VI. That the more remote cause of the disease consists in certain disturbances in the electricity pervading the earth and its atmosphere.

VII. That the first effect of these upon the organism consists in congestion, and that this commences, and is most marked, in the portal system. The second being the calling into action of the morbid process alluded to.

VIII. That the disease has no connection with inflammation beyond its occasional occurrence as a secondary effect.

IX. That almost every circumstance connected with it precludes the idea of contagion.

We have now brought to a close this brief exposition of our views. By some they may be censured as weak in argument, or deficient in proof; but when the present inadequate data, from the absence of sufficient statistical and special information in reference to applications in a great part new, notwithstanding the large amount of a general nature already in existence, are considered; these defects may, in some measure, claim indulgence; and if the opinions we have advanced, in what we trust will be regarded a calm and dispassionate spirit, may have thrown a light, however imperfect, on the obscurity in which the subject of our consideration has hitherto been involved, or be the means of directing inquiry in a new path, we hope it will be thought that our efforts have been well exerted, and that this short treatise has not been penned in vain.

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