

proved ventilation, &c. The results are thus described by the resident medical officer, Mr. Corfe:—

“There has undoubtedly been a more rapid and general improvement in the convalescence of patients since the introduction of the ventilating shafts, new windows, &c.—in fact, since the new hospital has been opened—compared with the progress of the sick to convalescence in the former building. For instance, there have been one, two, and at the most five cases of erysipelas in the wards, where we formerly numbered 12 or 16; it has been especially observed that there have been no cases breaking out in the wards of any severity; and those which did occur, perhaps 15 in the last nine months, have done well. The improvement in the statistics of erysipelas is most striking and peculiar. We have had no case of fever breaking out.”

Exemption of the Jews.—Among the instances of exemption, one of the most remarkable is that of the Jews, who, in London, as in Liverpool, &c., have suffered very slightly. The following details relating to this point are extracted from Mr. Liddle's Report:—

“It is a well-ascertained fact that the Jews residing in London have suffered less in proportion to the population than the other inhabitants. It is reckoned that there are about 20,000 Jews in the metropolis. The number of Portuguese Jews is about 3000, and up to the 13th September only two cases of death from cholera had occurred among them. Not a single case of cholera happened in the Portuguese Jews' Hospital in the Mile End-road. In the year 1832 only 4 deaths from cholera occurred among this section of the Jews. The above facts are recorded on the information kindly furnished to me by Mr. S. Aselnino, the secretary of the Portuguese synagogue in Bevis Marks.”

Mr. Liddle, having received further information from the secretaries of the great synagogue, Duke's-place, and the new synagogue, Crosby-square, says,—

“I may fairly infer, from the above respectable sources of information (the best that can probably be obtained on this subject), that the Jews have suffered much less from cholera in proportion than the other classes of the community, probably not more than 13 out of a population of 20,000; whereas, up to the middle of September, the deaths from cholera in the metropolis amounted to 12,837. This would give a proportion of 0.6 per 1000; whilst the deaths vary in the Superintendent-Registrar's district from 1 in 1000 of the living at Hampstead, to 29 in 1000 at Rotherhithe. At Whitechapel the deaths were 6 in 1000; in Shoreditch, 9 in 1000; and in the City of London, 7 in 1000.

“This comparative immunity of the Jews from the ravages of cholera may perhaps be accounted for in the following manner:—

“1. It is well known that, however poor the lower class of Jews are, they never crowd more than one family into the same room; whereas, among the lower orders of other communities, especially among the Irish, the system of subletting rooms to different families is by no means of unfrequent occurrence. Three or four families are known to occupy a single room.

“2. The Jews are, as a class, not given to the abuse of intoxicating liquors. I have had, during the last twenty years, much intercourse with the Jews, and I cannot call to mind a single instance of drunkenness in any family I have visited.

“3. The Jews, in virtue of their religion, are particular in the food they eat. All shell-fish is avoided, and the meat which is exposed for sale is inspected by an officer appointed for the purpose of ascertaining the healthy condition of the animals when killed, and, if any disease is found in the slaughtered animal, it is condemned, and not allowed to be sold for human food.

“4. Sabbath rest is strictly enjoined by their religion, and is for the most part rigidly observed.

“5. The Jews are unable, from religious motives, to enter our workhouses, and, being comparatively few in number, are relieved by the more wealthy classes of their own persuasion, and a sufficient staff of relieving-officers is appointed to inquire into cases of distress, which being promptly relieved, extreme destitution is avoided.

“6. The Jewish festival of the Passover enjoins every Jew to have his house thoroughly cleansed annually, and the rooms of the lower classes are, for the most part, annually limewhited.”

SECTION V.

On the Predisposing Causes of Cholera.

DURING the late, as in former epidemic attacks of cholera, various theories were advanced, in this and other countries, respecting the essential or primary cause of the disease: this being so, and as, moreover, the views of those advocating sanitary principles have sometimes been misconceived as to the amount of influence they attribute to defective drainage, cleansing, water-supply, &c., it is desirable to explain that the following observations refer strictly to secondary and predisposing causes; or, in other words, to those conditions which, by favouring the action of the essential and at present unknown cause, tend to the reception and spread of the disease. It is further necessary to premise, that ignorance of this essential cause need in no degree operate as a bar to the full and successful investigation of the various circumstances which give force and impetus to this as to other destructive epidemics. It will, indeed, immediately occur to those who are familiar with the study of natural phenomena in general, that the objects of the present inquiry are precisely of the same character as those forming the subject-matter of other similar branches of research; in which the successful observer is more concerned to determine the laws and conditions of the forces he studies, than to wander in search of the essential nature of these last. There is still another consideration which it is proper to notice, as having a direct bearing on the question about to be discussed. In glancing over the multitudinous forms of disease to which the human body is subject, it soon becomes apparent that, although secondary or predisposing causes are most important in all, their influence is specially operative in the great zymotic class to which the various forms of fever, as well as cholera, belong. Observation and experience have further shown that in this class the predisposing causes are more susceptible of detection, and, which is still more important, of removal, than in more ordinary or sporadic diseases, such as inflammation of the lungs, of the stomach, or brain. The principal reason of both these facts, speaking generally, appears to consist in this: that in zymotic disease—I allude here to the leading members of the class, not to the specific diseases, such as syphilis

and hydrophobia, at present included in the category—the predisposing causes are, to a great extent, external to the body, and thus open to investigation; whilst, in sporadic disease, they, for the most part, are internal, depending on certain modifications of structure and function, the nature of which is but very imperfectly known: there are exceptions in both cases, but that this is a real distinction is patent to all observers; the victims of typhus, for example, present nothing peculiar in their internal organization which renders them, more than others, specially liable to its assaults; the most robust countryman, if placed in one of the crowded and filthy lodging-houses of London, that is, if he be exposed to the external predisposing causes of fever, is as subject to attack as a delicate and weakly person. But as regards such sporadic diseases as apoplexy, bronchitis, or insanity, it is obvious that the liability to these depends, in a great degree, on certain internal conditions of organization, which may even, in some instances, be transmitted from the parent to the offspring, and so become hereditary.

Predisposing Causes of Cholera.—Some of the most valuable evidence obtained during the late epidemic is that relating to the various circumstances which favoured its extension, or to the predisposing causes of the affection. What these causes were, considered in the aggregate, has been sufficiently indicated in the preceding sections; but it will now be proper to consider them individually, so far as sanitary measures are concerned, and to explain in what way they operate injuriously on the human body. There is, however, one great difficulty which presents itself on the threshold of such an inquiry, and it is this: in densely populated districts, where zymotic diseases prevail, the various predisposing causes, such as overcrowding, foul water, open cesspools, &c., are usually all present, therefore acting together, and concurring in the production of a common result. Successfully to analyse causes thus combined is obviously a process demanding ample data and much caution; but, at the same time, it is one familiar to all engaged in scientific pursuits, in which one of the primary objects to be accomplished is to investigate groups of co-existent, and frequently most intimately associated, but yet distinct phenomena, in order that the exact signification of each may be determined, and its right value assigned. It is not pretended that the present state of sanitary science will allow of this analysis being completely effected, but several important data have been already acquired; and these, like the known quantities in mathematics, may be employed to discover what at present is obscure or unknown.

On the Respiration of a vitiated or poisoned Atmosphere.—The quality of the air which is habitually breathed is a matter, before all others, of supreme importance to health; but upon this point very vague and often most preposterous notions are entertained. It may appear almost incredible that, by many persons even of the middle ranks of life, the foul exhalations of privies, stables, and cow-stalls, are deemed to be innocuous, or even beneficial; and yet it is certain that such opinions are by no means rare. I have heard in a London Board of Guardians the argument maintained, that the effluvia from a cesspool could not be noxious because the speaker, who was advanced in years, had lived close to one all his life. In one of the eastern counties it is deemed to be a beneficial thing for children labouring

under hooping-cough to hold them over a privy "early in the morning." A more prevalent opinion is that the air of a cow-stall, no matter how many animals are crowded together, is particularly advantageous, especially in consumptive cases. Even by many of those who have paid some attention to the sanitary question, the grosser and more palpable contamination of the air of towns by smoke has attracted more general attention, and has given rise to more stringent legislation for its removal, than the infinitely graver evils arising from those subtle, invisible, but all-powerful effluvia, proceeding from decomposing organic matter, whether animal or vegetable, which, in a multitude of different, and by the general public little-suspected ways, lay the foundation for those diseases which so frequently debilitate or destroy numbers of the labouring classes. Properly to estimate the baneful influence of these agents, it must be understood that the lungs incessantly receive an enormous amount of atmospheric air, into which all the impure gaseous matters generated in towns are poured. The activity of this process may be estimated by the following facts: at each inspiration there enter the lungs of an ordinary sized person about 20 cubic inches of air; and there being 20 respirations in a minute, 400 cubic inches of air enter in that time, 14 cubic feet per hour, and 366 cubic feet, or 36 hogsheads, per diem. To meet this, the heart sends into the lungs at each contraction two (some say three) ounces of blood; there are about 75 pulsations in a minute, during which 150 ounces are propelled into the lungs; a quantity which gives 562 pounds in one hour, and 13,488 pounds, or about 24 hogsheads, in 24 hours.

The Blood absorbs poisonous Gases.—It is further to be understood that the living body has no defensive power, either against the entrance into the lungs of the most poisonous gases, when these are suspended in the atmosphere, excepting in certain instances, where they are much concentrated; or against their absorption by the blood as it circulates through those organs: thus, if an animal breathe an atmosphere containing an injurious amount of a poisonous gas, as carbonic acid, sulphuretted hydrogen, chloroform, &c., the gas is taken up by the blood, is by that fluid carried into the very substance of the vital organs, and either seriously affects the system or destroys life. In respect to these phenomena, there are none of those beautiful protective contrivances seen in so many other parts of the animal frame; nature, it is evident, designs that safety should be found among animals in their instinct, and in man by the exercise of reason and experience. It is almost needless to point out that there are several ways in which aerial contamination may be caused, so as to predispose to disease, the most important of which I purpose now to consider.

Overcrowding.—Overcrowding is a relative term; it has reference, not simply to the absolute number of individuals lodged in a given cubic space; but also, and in an important manner, to the means of renewing the air; since a comparatively small number of persons may be injuriously crowded in a large room, wanting ventilation; whilst a larger number may safely occupy even a smaller apartment, provided proper precautions be taken. This may appear to be a trite remark, and yet it is certain this simple axiom is often violated; for example, I have seen many charity-schools, even of a recent construction, and situated in the open country, which were expensively built, spacious, and lofty, and yet so defective in proper outlets for the foul air as to be most offensive to

the senses of a visitor, and debilitating to the children and teachers. In the present excessive pressure for space, in all quarters—in the dwellings of the poor, in workhouses, in prisons, in lunatic asylums, in hospitals—the question of ventilation is not merely one of health, it is one of economy; and there is, on both these grounds, no subject more eminently worthy of study and investigation. Of all the causes which predispose to preventable disease, the most influential and deleterious, so far as my observations extend, is overcrowding—a conclusion supported by the experience of large establishments of every description, as well as by that of most medical men. My reasons for this opinion, so far as cholera is concerned, are principally as follows:—

I. In the large majority of instances in which cholera has broken out with unusual violence, it has, on careful investigation, appeared that, whatever might be the case in regard to other noxious conditions which might or might not be present, overcrowding was never absent: so far as my own personal experience extends, I have found no exception to this statement. Thus, among the hop-pickers at East Farleigh, many of those attacked with cholera had used bad water and eaten putrid fish, but others who suffered had partaken of neither one nor the other; all these people were, however, greatly overcrowded in ill-ventilated rooms or sheds: and so in the institution in Hackney-road, where the mortality was 15 per cent., the inmates were amply supplied with food and other comforts, but they were lodged in overcrowded and ill-ventilated dormitories.

Secondly, a large number of examples has occurred in which the force of the epidemic was in the ratio of the overcrowding, all other circumstances being the same. Thus, among the workhouses of the metropolis, although the official returns relating to them have not yet been received, it may be stated that the attacks were the most numerous in those establishments in which the wards were the most crowded and defective in ventilation. As an example of this may be mentioned the workhouse of Shoreditch, which suffered most severely; so that, among the inmates, 109 cases of cholera, 61 terminating fatally, besides a large number of diarrhoeal cases, occurred between December, 1848, and September, 1849. This house is, in all the older parts, most defective in construction; several of the dormitories and other rooms were found, when inspected by Dr. Arthur Farre and myself, in the beginning of 1848, to be low, dark, and ill-ventilated. In reference to the above attacks, the medical officer, Mr. Clark, says—

“I am convinced that wherever large numbers of human beings are congregated together, and who eat, drink, and sleep in the same apartment, as is the case of the young and old in workhouses (among which classes diarrhoea has in our house been most prevalent), there the inmates are most liable to suffer.”

In a most fatal outbreak, occurring in a large establishment for pauper children, and to which the public attention was at the time painfully directed, it was observed that the girls suffered more than the boys; and yet the former, as is usually the case in such institutions, were in better condition than the latter. On investigation it was found that the girls' dormitories were more overcrowded, and much worse ventilated, than those of the boys; and this was the only difference I could discover to explain the greater number of attacks in their case.

Several instances, of a similar kind to the last, occurred among the general population—when, that is to say, other circumstances being the same, the extent of the overcrowding appeared to make the difference in the severity of the attack. This was the case, so far as could be learnt from a careful investigation, in the place called Jennings'-buildings, Kensington, of which an account has been given in a previous Section. (See p. 59.)

The Committee of the Academy of Medicine of Paris, in their instructions to the people, place the avoidance of overcrowding at the head of their precautions:—

“The first, and without doubt the most important care, is to maintain around each person a pure atmosphere, experience having shown that those who neglect this precaution in the time of the epidemic are the most exposed to be attacked by it; consequently persons should avoid as much as possible sleeping in too great numbers in the same room,” &c.*

Cause of the Evils of Overcrowding.—Although the evil resulting from this inordinate overcrowding is generally recognised, it appears desirable shortly to notice how the mischief is caused. The skin and the lungs exhale at each moment of existence, independently of carbonic acid, in itself a poisonous gas, a certain amount of animal matter of a highly putrescent nature, as it has been demonstrated by condensing experimentally the vapour in which, as it passes from the lungs, it is suspended. If there be no free escape, this effete matter, owing to the condensation of the expired air, is deposited on the walls of sleeping-rooms, clings to articles of clothing,† bedding, &c., and is the source of that nauseous smell perceived on entering dirty and crowded dormitories, school-rooms where many children are collected, &c. If a matter thus noxious, and to remove which out of the system nature has provided such important organs as the lungs and the skin, be again introduced by respiration into the living body, as happens when a number of people are crowded together, as we see among the poor, what but the most pernicious effects can be expected?

Atmosphere of Privies and Cesspools.—Next in order as to the extent to which it prevails, and the evil results produced, is, according to my experience, what may be called “the privy atmosphere,” arising from neglected privies and overflowing cesspools, and which abounds in poisonous gases, sulphuretted hydrogen being one of the most abundant and deleterious. A large body of evidence, which I have received from medical practitioners both in London and other populous towns, as Liverpool, Manchester, and Nottingham, distinctly proves that persons habitually exposed to such an atmosphere are thereby predisposed, in an especial degree, to fever and other sickness; and that, in courts and alleys, those persons who reside in the houses immediately adjoining foul privies, all other circumstances, as to food, lodging, &c., being equal, suffer more from typhus than the other inhabitants. So much is

* Séance de l'Acad. de Méd., Mars 13, 1849.

† This is a reason why the clothing even of boys, and especially in pauper establishments, should, as far as possible, consist of articles capable of being readily washed. I have been informed by the surgeon of a large parish that the health of the boys had improved on such a change being made in their clothes: in every instance these and the bedding should as often as possible be freely exposed to the external air.

this the case, that houses so situated have been pointed out to me by the medical officer as being the constant seat of fever, families after families coming to reside in them, and all in succession being attacked.

Influence of putrid Animal Effluvia.—Many facts induce me to believe that the action of the bowels is particularly prone to be disturbed by breathing privy air, and that this is the most common cause of the diarrhœa so generally prevalent among the poor of crowded cities. Nightsoil must be regarded as consisting essentially of decomposing animal matter; and that the gaseous products of such matter will induce severe diarrhœa has been proved by a number of well-marked cases. The importance of determining the influence of putrid animal effluvia upon the human body is so important, that I trust I may be permitted to introduce some details in reference to this point.

Christchurch Workhouse, Spitalfields.—To the following case I would particularly solicit attention, as it illustrates at once the frightful evils arising from noxious trades carried on in the midst of a great city, and the almost insurmountable obstacles opposed to their removal. Christchurch workhouse, Spitalfields, belongs to the Whitechapel Union, and contained, at the time to which reference is about to be made, about 400 children and a few adult paupers. Immediately opposite the workhouse, and only separated from it by a narrow lane a few feet wide, was a manufactory of artificial manure, conducted by a Frenchman, in which bullocks' blood and nightsoil were desiccated by dry heat on a kiln, or sometimes by mere exposure of the compost to the action of the sun and air, causing a most powerful stench. The surgeon of the workhouse, Mr. Byles, to whom I am indebted for the particulars of this case, and who is an experienced practitioner, attempted to have this great nuisance removed, as he had distinct evidence of the injury it inflicted upon the health of nearly 400 children who were inmates. In a letter with which Mr. Byles has lately favoured me, he says,—

“The obvious injury produced by the disgusting effluvia to the inmates of the workhouse, especially the children, induced me at various times to array against him what imperfect power the law afforded; and whenever the manufacture was stopped *pro tempore*, an improved condition of the health of the children was clearly perceptible. Distinct from the production of diarrhœa, other prejudicial effects were noticed when the works were at all actively carried on, particularly *when the wind blew in the direction of the house: c. g.* prevalent fever of an intractable and typhoid form; a typhoid tendency to measles, small-pox, and other infantile diseases; and for some time a most unmanageable and fatal form of aphthæ of the mouth and genitals, running rapidly into gangrene. From this last cause alone, I think, I had 12 deaths among the infants in one quarter.”

In the month of December, 1848, when cholera had already occurred in the Whitechapel Union, 60 of the children in Christchurch workhouse were suddenly seized with violent diarrhœa in the early morning, but by prompt and efficient treatment all recovered. This attack was attributed by Mr. Byles to the same cause as the evils above narrated, and in consequence legal steps were adopted, by which, although after so many lives had been sacrificed, the proprietor was compelled to close his establishment. The circumstances which are now to be related are most instructive. Five months afterwards—namely, in April, 1849—

a new proprietor having taken the premises, the master of the workhouse observed that the works had been resumed; and a day or two subsequently, the wind changing and blowing from the manufactory, a most powerful stench pervaded the workhouse, and on the night following, or rather in the early morning, 45 of the boys, whose dormitories directly faced the manufactory, were again suddenly seized with severe diarrhœa; whilst the girls, whose dormitories were in a more distant part, and faced in another direction, escaped, with the exception of two or three, who were attacked on the following Sunday. This second outbreak, occurring immediately upon the reappearance of the putrid effluvia, was again attributed by the medical officer to the same cause as the first attack; and on inquiring subsequently into the circumstances of the case, I ascertained that the new proprietor had found on the premises some barrels filled with the putrid matter used by the former occupant; and that, in the attempt to remove these, some barrels broke, and produced a most offensive effluvia. The circumstances of this remarkable case left no doubt on my mind that the diarrhœa was, in both attacks, directly caused by the effluvia proceeding from the putrid blood, and other animal substances used, and that all the other evils above noticed were mainly dependent upon the same cause. This conclusion is much strengthened by the fact, that, during the last nine months, according to the statement of the medical attendant—

“There has not been a single death in the workhouse, except from chronic disease, or in the case of children brought in with mortal diseases upon them, such as cholera or typhus in their final stages.”

Case in St. George's, Southwark.—In the summer of 1847 a similar manufactory for preparing artificial manure from putrid blood, &c., was established in the heart of a populous district in the parish of St. George, Southwark. On the very first occasion when operations were commenced, a most powerful stench pervaded the neighbourhood, so as to attract general notice, and in a short time afterwards a large number of persons living around were suddenly seized with diarrhœa. In consequence of this outbreak, Mr. Hooper, a gentleman in large practice, and who related the circumstance to me, had a great number of applications for medicine; and being convinced that the diarrhœal attack depended upon the poisonous animal effluvia, the necessary steps were immediately taken by the parochial authorities, the nuisance was at once suppressed, and the diarrhœa directly subsided.

In reference to these two cases, it is not superfluous to remark, that, in both, the parties offending were foreigners; a class of persons, it appears from information I have received, who are somewhat extensively engaged in the manufacture in question, and who are attracted to London by the existence of facilities so properly denied them by the laws of their own country.

Dr. Baly, physician of the Millbank Penitentiary, has expressed his opinion that the diarrhœa and dysentery to which that prison is subject are connected with the noxious animal effluvia wafted across the Thames from the bone-boiling establishments at Lambeth, having observed that those diseases are most prevalent when the wind blows from that quarter.

The preceding instances relate to diarrhœa, but a large number of examples might be adduced to prove that cholera was most severe in

houses situated close to privies, and especially where the filth from the cesspools found its way into the interior, a circumstance not unfrequently happening. Thus Mr. Howard, a very intelligent medical visitor, states that, in Stepney, the intensity of the epidemic was in the ratio to the proximity and foulness of the privies; and this was especially the case when, as often happened, the drain from the privy ran under the house. Thus, in one house in East Field-street, where the privy overflowed into the yard, the mother and two children died in one week, and a fourth person died at the next door. In Liverpool, houses were pointed out to me by the medical officer, situated in courts next to privies, and where it had been remarked the attacks and deaths from cholera were more severe than in the other houses.

As so many instances of the noxious influence of animal effluvia have been adduced in a preceding section, I need only remark further, that, whether these proceed from foul drains and sewers, from pigsties, from slaughterhouses, or bone-boiling establishments, they are all more or less injurious, and predispose to cholera, according to their intensity and concentration.

As to the mode in which this poisoning of the blood induces diarrhœa, the clue to this phenomenon is to be found in the fact, that the mucous surface of the intestines, small as well as large, is an important and normal organ of excretion. Owing, however, to the more obvious action of absorption going on, by which the nutrient part of the food is taken up and carried into the system, this excretory office, so well known to the physiologist, is liable to be overlooked; but it is essential, and it is incessantly going on—a fact which is conspicuously seen in animals deprived of food, where fæces are still formed. Now, as the final cause of this important operation is to get rid of certain noxious matters, which are poured into the blood as the necessary result of healthy vital action, it is a natural inference that, when any additional matters, hurtful in themselves, are accidentally introduced into the common mass of the circulating fluid, the excretory action of the intestinal mucous surface will be preternaturally augmented, and purging consequently produced. An instance of this form of diarrhœa, and depending on the same cause—the respiration, namely, of an atmosphere poisoned by putrid animal effluvia—is that of medical students, who, when first visiting the dissecting-room, are for the most part subject to relaxation of the bowels.

Evils of defective Water-supply.—A supply of water, unlimited, pure, and of suitable qualities, is one of the prime and essential conditions of health. Water forms nine-tenths of the whole weight of the body; it thus penetrates into the very substance of every organ, and in the ratio of its importance; it is the medium for all the changes effected by nutrition in the composition of the body; and as these never cease for an instant, it is constantly being introduced from without by absorption, and discharged by excretion.

Water stands in relation to several distinct wants:—

- I. It is essential as an article of food.
- II. It is necessary to personal cleanliness.
- III. It is essential to external cleansing, whether of houses, streets, waterclosets, or sewers.

In each and all of these respects the supply of water has an immediate, and, in some instances, an unsuspected effect, on the health and well-being of the labouring classes: even in villages and rural districts many of the evils about to be explained exist, and have attracted the attention of those interested in the condition of the poor, especially of the clergy and of medical practitioners.

I. Influence of polluted Water.—It has been proved by unquestionable evidence, that the water used by the poor of London, and even by many of a higher class, is contaminated in various ways by decomposed organic and other noxious matter; as by the absorption of deleterious gases when kept in tanks, butts, and tubs; by percolation into wells of the contents of cesspools, graveyards, drains, &c.; by the original impurity of the supply, as in the case of the water taken from the Thames by so many of the Water Companies, &c. Now that these injurious substances get into the blood is susceptible of distinct proof. It is one of the most familiar truths of physiology, that not only pure water, when introduced into the stomach, is absorbed, but, which is not so well known to non-professional persons, all matters dissolved in it are also taken up, and this without any regard to their quality, the most poisonous being soaked up by the blood-vessels of the alimentary canal as readily as the most harmless. Thus a second great inlet is established by which injurious substances in a liquid form as certainly find their way into the circulating blood, as noxious aerial agents do by the way of the respiratory apparatus. Injurious articles of solid food, capable of solution, are also absorbed, though by another agency (that of the lacteal vessels), and so by a rather more circuitous route reach the blood.

One or two illustrations will serve to establish this important fact, and also to elucidate the mode in which diarrhœa may be induced by the use of polluted water. If a liquid poison, such as opium or nuxvomica in solution, be introduced in a living animal into a loop of intestine, tied at each end, the poison is taken up by the blood-vessels and destroys life. Even mineral poisons, when they enter the stomach, are taken up by the vessels and mingle with the blood, where they have again and again been detected by analysis. A well-known instance of such an occurrence is the discoloration of the skin following the continued use of the nitrate and oxide of silver in cases of epilepsy—a phenomenon only explicable by the introduction of those substances into the circulation. This absorption into the system of soluble matters throws light upon the way in which noxious substances dissolved in water operate injuriously on the animal economy. It also explains how diarrhœa may be one result; since it is found that saline aperients produce their effect, not by acting directly on the mucous surface of the bowels, but by being first absorbed into the blood, and secondarily inducing a flux into the intestine. This explanation may to some persons appear improbable; but the analogous phenomena produced by arsenic will indicate how certain substances introduced into the blood may produce their specific effect on the alimentary canal: if, for example, this substance be applied to a wound or ulcer, by becoming absorbed it may produce inflammation of the stomach. It is then a general principle of physiology, that substances which have undergone perfect solution are, when swallowed, capable of permeating the blood-vessels of the alimentary canal, and of mingling

with the blood. This process also takes place rapidly, so that prussiate of potash, when injected into the stomach, has been detected two minutes afterwards in the urine; a rapidity of transmission explicable on the velocity of the circulation, which is so great that the whole mass of the blood is carried round the body in about a minute.

Proofs of the noxious Effects of polluted Water.—It has already been explained that, in populous localities, the different causes of unhealthiness are so combined together as to render it difficult to demonstrate their isolated influence. In the section on the habitat of cholera, several well-marked instances are however given, in which it is difficult to arrive at any other conclusion than that the use of water polluted by decomposed organic matter acted intensely as a predisposing cause. Such a case is that of Silkmill-row, Hackney, where those persons only who made use of the filthy water into which the matter of a cesspool had found its way, were attacked with cholera and diarrhoea, whilst the other inhabitants, who were supplied from other sources, escaped. Windmill-square, Haggerstone; Albion-terrace, Wandsworth-road; and the locality first attacked at Rotherhithe, are, in my opinion, similar instances. In one court (Surrey-buildings, Horsleydown), consisting of 13 small houses, each generally occupied by one family, no fewer than eight deaths occurred in one week, and another in the ensuing week; all the houses were supplied with water from a sunk tank, the edge of which was even with the pavement, so that the washings of the court ran into it. In another court, in Lambeth, two most severe cases of cholera having occurred, the surgeon was induced to examine the water supplied by a pump, when he found it discoloured and so foul that "it stank at a distance of the contents of a cesspool;" the piston of the pump was removed, and no other case of cholera occurred in the court up to the date of the report recording this case.

As a specimen of the kind of water which so many of the poor of London are compelled to use, and the dire consequences thence resulting, the following details are given of a well-known and miserable locality, called "Jacob's Island." Mr. Walsh, one of the medical inspectors, visited this place, and from his Report the particulars here given are derived:—

"Jacob's Island is the name given to a portion of the parish of Christchurch, Bermondsey. It is surrounded by the tidal ditch or mill-stream. In the island and on the banks of the ditch are 300 or 400 houses, inhabited chiefly by persons employed in the wharves and shipping, called 'long-shore men,' and their families, but partly by persons whose characters are more known than respected. The drains and sewers of all the houses that are drained empty themselves into the ditch. The refuse of the neighbouring houses, and the contents of their privies, are also thrown into the almost stagnant water; heaps of filth, which projected into the water when I first visited the place in August, still project [this was written in March, 1850] about the same distance, being constantly renewed above as the lower edge is carried away. One hundred and fifty of the houses have no water-supply whatever; and when I first visited here in August, many of the inhabitants were in the habit of using the water for cooking and other purposes; nay, had even drunk it unboiled during the heat of summer. Some of the houses are totally unsupplied with water from any other source than the ditch; a few have wells which communicate with it. The analysis shows the immense quantity of organic matter which it contains; some of the water bottled in November was opened this week

(March 30th); the stench is unbearable. The ebb and flow of the tide are regulated by a floodgate; the occupier of the mill lets the water in and out as he pleases: sometimes it is retained for many days, and sometimes the bed is nearly dry for the same length of time. The foulness of the water and of the mud at these times is incredible. Dead animals abound in it: only last week a calf lay there till the carcase burst."

The following analysis, very carefully made at the College of Chemistry by Mr. Charles Mansfield, under the inspection of Dr. Hoffman, will demonstrate the quality of this ditch-water: other analyses are added for the sake of comparison:—

TABLE* showing the Quantity of Organic and other Matters contained in an Imperial Gallon of Water taken from the

	Artesian Wells of		Water-works of Hampstead	Thames at			Tidal Ditch of Jacob's Island.
	Grenelle.	Trafalgar Square.		Twicken-lam.	Greenwich.	London Bridge.	
Organic matter	0·014	1·008	1·97	3·48	4·08	7·0	13·36
Total residue on evaporation	9·87	69·40	40·11	22·49	28·04	28·59	37·07

Mr. Walsh directed the attention of some gentlemen, unconnected with the neighbourhood, to this deplorable case:—

"They were so shocked at what they saw, and so convinced that such a state of things could not be allowed to last long when once the attention of Government had been called to it, that they subscribed for the erection of two covered water-butts, one in London-street, and one in Gutteridge-place, and for their daily supply for six months by the Vauxhall and Southwark Company, the only one which had mains in the neighbourhood. A strong memorial was addressed by these same gentlemen to the Commissioners of Sewers; a public meeting was called, at which I attended with the Honorary Secretaries of the Metropolitan Sanitary Association; and a Committee has been formed to act with the Bermondsey Improvement Commission."

This provision was made in the beginning of the present year: what is to be the lot of the poor people on the gratuitous supply ceasing does not appear.†

* See Quarterly Journal of Chemical Society of London, vols. 1 and 2.

† The following is a copy of a handbill which was issued by the benevolent "strangers" who came forward to rescue the inhabitants from the misery and danger to which they were exposed:—

"To the inhabitants of Jacob's Island.—The shameful want, in Jacob's Island, of water fit to drink, has led some persons, strangers to the neighbourhood and parish, to arrange with the Southwark and Vauxhall Water Company for a temporary supply of water, free of rent or charge to the inhabitants, by means of two tanks, now set up in Gutteridge-place and in London-street. As the whole expense of this measure will be borne by the parties above referred to, it cannot be continued beyond six months. This should give time for the inhabitants to obtain from their landlords, or from other persons interested or responsible, a proper supply of water in every house, and such other changes and improvements as are indispensable for health and decency. The occupiers of houses that are at present supplied from the ditches only, who may wish to have better water, are requested to apply immediately to Mr. Dale, at No. 6, Mill-street, for a key to the water-taps, that the required number of keys may be provided."

That the use of such polluted water should not produce the most serious results was impossible. Decomposed organic matter, principally of an animal character, is precisely the agent calculated to induce relaxation of the bowels, a most pernicious thing during epidemic cholera, and which has in a multitude of instances led to an attack.

Mr. Walsh had not the superintendence of the house visitation in Bermondsey; but with the assistance of Mr. Martin, the medical officer and registrar of the district, and by examining, on the spot, the Registrar-General's returns, he has obtained some interesting information:—

“In 1832 the earliest fatal cases of cholera occurred close to this ditch; in 1849, also, the earliest fatal cases occurred here: diarrhoea and cholera abounded; hardly a house escaped, perhaps not one. On the south side of an irregular square, formed by the tidal ditch and its immediate neighbourhood, there occurred between June and October 41 deaths, in the centre 12, and on the west side 8, making a total of 61 deaths. Of this square, two whole sides and more than half the superficies are taken up with granaries, a timber or stave yard, and other uninhabited portions of ground. Dyspepsia, cachexia, a peculiar ‘sickness of stomach,’ and irritable bowels, are at all times very prevalent. There is very little typhus or acute febrile diseases.”

Some further details will still more strikingly demonstrate the evils caused by the use of this polluted water. Thus, in one part unsupplied with water, and where therefore the inhabitants used the ditch-water, five deaths from cholera occurred, whilst in Edward-street, closely adjoining, with thirty houses, but all supplied by the Water Company, only one death took place.

In regard to the pipe-water supplied by the Water Companies, this being so generally used, it is impossible to demonstrate its injurious influence by special instances; but as it is known that this water abounds in impurities, and that even, as Dr. Hassall has demonstrated, the water which is submitted to filtration before it is delivered to the public still contains much solid organic matter, no other inference can be formed but that such water would be liable to disturb the bowels, especially during such an epidemic as cholera; and that in this way it would act as a predisposing cause of the disease. Nor can there be any doubt, recollecting how actively water absorbs noxious gases, that the use of open tanks, tubs, &c., would, by promoting such absorption, and by exposure to the atmosphere favouring decomposition, increase the evil, especially in poor and crowded localities. It is also a point of vast importance to be understood, that, as matters in solution pass through filters, except they are removed by chemical action, organic substances completely dissolved, and in the condition precisely adapting them for absorption into the blood, are not removed from water derived from a foul source even by filtration.*

* The following appears to be a marked example of marsh-water exciting fever; it is related by a physician, M. Boudin, who has paid great attention to the influence of external causes in the production of disease:—“In July, 1834, 800 soldiers, all in good health, embarked on the same day in three transports at Bona, and arrived together at Marseilles; they were exposed to the same atmospheric influences, and were, with one essential difference, supplied with the same food and subjected to the same discipline.” On board one of the vessels were 120 soldiers; of these 13 died on the passage from a destructive fever, and 98 more were taken to the military hospital of the lazaretto at Marseilles, presenting all the pathological characters proper to marshy localities;

II. Independently of the evil consequences following the internal use of impure water, the want of an ample supply of water, as regards personal cleanliness, has in various ways a marked influence on the health of the poor in large towns. As this subject, however, is only indirectly connected with cholera, one illustration of its importance will here be adduced to show how invariably every sanitary amelioration is followed by an improvement in the public health. In rebuilding the city of Hamburg, after the fire, an ample supply of water, at high pressure, was provided, and among other results was one not anticipated, the diminution, namely, of that loathsome affection the itch; this has been so marked as to attract the attention of the medical practitioners, by some of whom it was calculated at 50 per cent. This is a complaint to which many of the London workhouses are subject; and yet, after having, with Dr. Arthur Farre, investigated the whole subject, I do not hesitate to affirm that, with proper arrangements, not a single case ought to exist among the permanent inmates of those establishments. But to secure this desirable object an unlimited supply of water for regular personal ablutions is a necessary condition; by which means it is certain the general health would also be greatly invigorated.

III. With respect to the supply of water for the purposes of external cleansing, the necessity of this is generally recognised. Without an unlimited supply the filth cannot be washed out from courts and alleys, even when the expense of flagging them has been incurred; drains and sewers wanting such a supply, invariably, and of necessity, become loaded with foul deposits; nor, in the absence of this prime sanitary requirement, can the disgusting cesspools, which are an unceasing and most active source of disease, be replaced by waterclosets.

Drunkennes and Excesses.—Abundant evidence was afforded during the late epidemic that habitual drunkards were highly predisposed to cholera; and of them a large number perished. Occasional excesses also led to a vast number of attacks; thus, at Hamburg, it was ob-

so that “by the side of a simple intermittent was seen a pernicious fever; here was a type recalling the yellow fever of the Antilles, and there was the cholera of the Ganges with its most terrible traits.” On an inquiry being instituted, it was ascertained that on board the affected ship the water supplied for the soldiers, owing to the haste of the embarkation, had been taken from a marshy place near Bona; whilst the crew, not one of whom was attacked, were provided with wholesome water. It further appeared that the nine soldiers who escaped had purchased water of the crew, and had consequently not drunk the marshy water. Not a single soldier or sailor of the other two transports, who were supplied with pure water, suffered.—*Essai de Géographie Médicale. Par Dr. Boudin, p. 53.*

Dr. Evans, of Bedford, related to me an equally well-marked instance. A few years ago he was staying at Versailles with his lady, when they both became affected with ague, and on inquiry the following facts were disclosed. The town of Versailles is supplied with water for domestic purposes from the Seine at Marli. At the time in question, a large tank, supplying one particular quarter, was damaged, and the mayor, without consulting the medical authorities, provided a supply of water consisting of the surface-drainage of the surrounding country, which is of a marshy character. The regular inhabitants would not use this polluted water; but Dr. and Mrs. Evans, who were at an hotel, drank of it unwittingly, and it was also used by a regiment of cavalry. The result was, that those who drank the water suffered from intermittent fever of so severe a type that seven or eight of the soldiers, fine young men, died on one day, September 1, 1845. On a careful investigation it was ascertained that those only of the troops who had drunk the marsh-water were attacked; all the others, though breathing the same atmosphere, having escaped, as did also the townspeople.

served that there was among the numerous sailors in that great port a regular accession of cholera every Monday and Tuesday, owing to the men going ashore and getting drunk on the preceding Sunday. In London also, several medical men informed me they had noticed the same thing; excess either in drinking or eating, particularly if improper food was used, such as pork, cabbage, &c., being followed by attacks, which thus became more frequent on Sunday night and Monday.

Noxious Effects of bad Food.—There is no doubt that many attacks of cholera were also indirectly induced by defective nourishment, and by the use of improper food among the more destitute part of the population: thus I saw one poor family in Lambeth, where the husband had died three weeks previously, and the son was at the time in collapse; they were in great misery, and the only food they could procure were muscles, under the circumstances a most objectionable article of food: these are matters, however, which, though most painful, do not belong to a sanitary report. But it is proper to state that urgent representations were made in different parts of the metropolis, both by the local authorities and medical officers, respecting the open sale of articles of food, especially fish, altogether unfit for human consumption; it was stated, further, that the existing state of the law did not secure the suppression of this practice, which, in poor neighbourhoods, was felt to be a great evil. Several marked examples were brought under my notice, where violent attacks of cholera were distinctly traceable to the use of putrid fish, bad pickled pork, decayed cheese, &c. It would therefore appear desirable, in the event of any return of the epidemic, that more facility should be afforded for preventing the sale of such deleterious articles.

Were this a medical, in place of a sanitary Report, various other predisposing causes would have to be considered—as errors in diet, and especially as regards the imprudent use of vegetables and fruit; bodily and mental exhaustion, and especially night-watching; fear; grief; the improper use of aperient medicine,* &c. &c.

In weighing the influence of the predisposing causes noticed in this section, it must be borne in mind that during the epidemic, when at all active, great multitudes of persons are in a state in which the slightest possible cause will turn the balance. Many instances were related to me where a sudden fright brought on an attack. In one case a young woman was seized immediately after receiving a letter announcing the death from cholera of a near relative; in another, from seeing a cholera patient carried along the streets. There is no doubt that many attacks were thus brought on by grief, attending a relative suffering from the epidemic, night-watching, &c., which were often attributed to direct infection. In fact, the most trifling circumstance, bodily or mental, was often sufficient to give a fatal force to the efficient cause of the disease.†

* One very painful case of this kind was related to me: a lady gave to her four young children some aperient she was in the habit of administering; this was at night. Early the next morning the children were seized with violent purging and vomiting, and ultimately they all died.

† Some interesting examples, illustrative of the operation of predisposing causes, will be found in a valuable paper on the Health of London during the Epidemic, by Dr. Webster, F.R.S. (London Journal of Medicine.)

SECTION VI.

On the Primary Seat of Cholera, and on the Existence of a Premonitory Stage; Notice on Diet and on the Treatment of Premonitory Diarrhœa.

ALTHOUGH it forms no part of this Report to enter into the pathology of cholera, yet some notice of the nature of the epidemic and its leading features is indispensable, both for the due appreciation of the measures adopted by the General Board, and also for properly estimating the influence of the poisonous atmosphere generated by the neglect of sanitary principles.

Primary Seat of the Disease.—One of the most fundamental questions of the whole inquiry concerns the primary seat of the disease—a question which has been answered (principally) in three ways:—

I. It has been affirmed that one or other part of the nervous system is the true seat of the disease.

II. By another and more numerous class of observers it is said the alimentary canal, and especially the small intestine, is the part primarily affected.

III. The last and more prevalent doctrine is that according to which cholera is a disease of the blood.

I. The first of these opinions has had many advocates, especially among the Russian physicians. The arguments adduced at St. Petersburg in support of this hypothesis are principally as follows:—1. Disturbances of the nervous system, such as intermittent fevers, neuralgia, dragging pains in the limbs, were common both before and during the epidemic: all diseases bore a nervous character, whilst inflammatory diseases were rare. 2. The premonitory symptoms were not essential, and merely indicated deranged innervation: in many cases the disease broke out so suddenly, and destroyed the vital powers, especially of the spinal cord, so rapidly, that no other seat of the evil could be assumed. 3. Recovery was so rapid, in many cases, that it was impossible there could be any serious lesion of the intestinal canal. 4. When there were consecutive diseases, they were always affections of the nervous system—sopor, delirium, mania, and a fever resembling but not identical with typhus. 5. A cure was never obtained through the customary modes of controlling irritation of the intestinal canal. 6. The electrical equilibrium was destroyed, so that from all bodies, even when isolated, electricity passed off, and thus sudden lesion of the nervous system was produced.*

These views have been received with little favour either in England or on the Continent; and it is certain that, whilst some of the arguments stated would carry no weight with physiologists, others, and especially that relating to the alleged incapability of controlling the alimentary canal, have been distinctly disproved by the extensive experience acquired in this country during the late epidemic. The rôle assigned to the spinal cord is certainly erroneous, as all the phenomena con-

* See British and Foreign Medico-Chirurgical Review, Jan. 1849, p. 14.