

Modern epidemics : cholera, general conclusions / by J. Foster Palmer.

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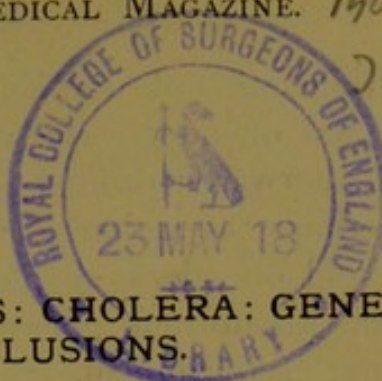
MODERN EPI

By J.

The first essential of cholera is a good deal to be done, especially before and during the break and to mitigate the immediate matter, whether the material can be eliminated or not is the personal principal factors avoidance of exposure with avoidance of or exclusive system.

There remains the question of the dissemination of the disease in the infected area be it this, and equally in

* It has been observed of locusts. This is probably the case with the spread of the disease and the spread of the disease is generally the same degree of intensity of the river and usually the most favorable water contained in it.

Incomplete.

MODERN EPIDEMICS: CHOLERA: GENERAL CONCLUSIONS.

By J. FOSTER PALMER, L.R.C.P., etc.

(Continued from ^{Vol. X} page 221.)

THE first essential condition for defence against the invasion of cholera is a good water supply ; but individual action can do much, especially in one or two important matters, both before and during epidemics, to lessen the chance of an outbreak and to mitigate its intensity if it comes. One is to dispose immediately of all superfluous animal and vegetable matter, whether meat, fish, fruit, vegetables or leaves. Such material can be either cremated or utilised as manure.* Another is the personal cultivation of our resisting powers. Here the principal factors are constant activity of mind and body, with avoidance of excessive fatigue ; a moderate but sufficient diet, with avoidance of all excess on the one hand, and of deficient or exclusive systems on the other.

There remains the important question : Can communication of the disease from the sick to the healthy within an infected area be controlled by special means ? Arising out of this, and equally important, is the question whether the disease

* It has been observed in India that cholera is often preceded by a plague of locusts. This is probably not a mere coincidence. The decomposition of myriads of these insects would produce a state of the atmosphere highly favourable to the spread of the disease. When the dead insects are collected in heaps and burned or buried, instead of being left to decay on the ground, as is more generally the case, it has been found that the disease does not assume the same degree of intensity. Another common observation is that when the water of the rivers reaches a certain temperature, a temperature which is presumably one most favourable to the decomposition of the animal and vegetable matter contained in it, cholera follows as a matter of course.

fruit, let us flog and not imprison our boys, except in the case of hardened offenders, who can only be treated in reformatories and afterwards drafted into the army or navy, and preferably, perhaps, as stokers. Our young men, and those who are not old offenders, should find their place in a less glorified moral sanatorium perhaps than Elmira, but at all events in some establishment, where the idea of reformation is put far away in front of punishment. In the case of hardened offenders, they must be interned for the term of their natural lives, and induced to earn, with the use of as little brute force as may be, as much as they can for their common support. Punishment even, or the proper dealing with persons who have gone wrong, is but one prophylactic against the commission of further crime. Education, better housing of the poor, better conditions of labour, and many other like things are also absolutely necessary to decrease our growing volume of crime. But, till we have the Moral Hospital instituted and intelligently conducted for all proper cases, the bitter cry will still go up from our prisons, "Is there no balm in Gilead? Is there no physician there?" And the echo that public opinion will give back must most surely be, "*Mea culpa, Mea maxima culpa!*"

May it not long continue, that this complaining is heard in our streets!

in any individual case can be recognised in its preliminary incipient stages, and, if thus recognised, be nipped in the bud before it attains its full development? With certain reservations it may be said that, so far as our present knowledge extends, both these questions may be answered in the affirmative.

Although the routes taken by the cholera microbe are devious, it is fairly certain that if cholera is directly conveyed from one person to another, it is usually by means of the excreta of the patient. If disinfectants are of any use in the prevention of epidemics, it is here that they would find their legitimate function. When used in sufficient quantities their employment has been attended with some success. The most powerful disinfectants, however, must be used, and used thoroughly and unsparingly. Strong solutions of the mineral acids (nitric or hydrochloric), chloride of zinc (Burnett's fluid) or carbolic acid (1 in 50) are the most suitable. The milder disinfectants are useless for this purpose and only serve to lull people into a state of false security.

That all the microbes can be destroyed by this means is more than doubtful. The pathogenic organisms have been found by experiment to be destroyed when immersed in these strong disinfectants, but it is probable that the advantages of this method consist less in the actual destruction of the microbes themselves than in the prevention of decomposition, by which they are deprived of a suitable culture medium. This view is consistent both with sound reason and with the accumulated mass of evidence. Decomposition is a great practical fact, the effect of which in favouring the spread of zymotic disease is known to us by the experience of ages. Experiment, too, has shown that the products of retrograde metamorphosis form an excellent culture medium for bacteria. If the pathogenic organisms have no suitable soil to grow in they will die of themselves, and if we can prevent the pollution of air and water with the products of decomposing animal and vegetable matter we shall do something towards removing the conditions which we know to be most favourable to the development and convection of zymotic disease.

This is our chief object. All attempts to destroy the bacteria of the atmosphere in a room during an attack of illness are a delusion and a snare. If aerial disinfectants were introduced in sufficient quantities to choke the patient they might cause some inconvenience to the bacteria also. In smaller quantities than this they would be a discomfort and an injury to the patient by deteriorating the quality of the air, and would be very little use in reducing the number of organisms. One of the most essential aids to recovery in zymotic disease is a plentiful supply of fresh air, and the chances of a favourable result are certainly not increased by the introduction of noxious vapours into it. Fresh air, however, is not necessarily cold air. In cold weather it may be warmed by passing through a heated chamber. In some of the Paris hospitals, where the system of ventilation is perhaps the best in the world, the air is passed through series of bricks heated by a furnace before entering the wards, and can be thus raised to any required temperature. It is upon the constant supply of fresh air, and that alone, that we must depend for the prevention of atmospheric infection. For every cubic foot of air introduced an equal quantity must make its escape; the concentration and consequently the potency of the infecting influence becoming less in a direct ratio to the circulation of the atmosphere.* It is in the disinfection of the room after the departure of the patient that the poisonous aerial disinfectants find their place. Of these there are practically only two of any real value, chlorine and sulphur dioxide. The latter, which has been in use for thousands of years, is still in every respect the best.† Disinfectants, however, can never take the place of efficient sanitary measures, and must always be employed with some definite object, as the prevention of decomposition or the

* The value of aerial circulation consists in the attenuation by diffusion of the organic matter in the air, which deprives the bacilli of a suitable nidus for their cultivation.

† The "sulfura viva" of Virgil (*Georgics*, iii., 449) is evidently sulphur dioxide.

destruction of certain atmospheric media of infection, and not to supplement a possibly defective system of drainage and thus prevent the discovery of its weak points.

The answer to the second question, that relating to the possible recognition and abortion of cholera in its prodromal stage, must depend on the character of the attack. In some cases it is sudden and there is no prodromal stage. Fortunately, it has been found by the experience of most epidemics that in about two-thirds or three-fourths of the cases the attack is gradual and is ushered in by certain premonitory symptoms. The important symptom in all these cases is *diarrhœa*. During an epidemic of cholera an attack of *diarrhœa*, so slight as to be at ordinary times hardly worth noticing, may develop, and frequently does develop, into a severe attack of cholera. This is the symptom which must be watched and attended to in its earliest and slightest manifestations, and when this is done many cases of incipient cholera are no doubt cut short before attaining their full growth. For this purpose a diagnosis must be made, and here the researches of the bacteriologist give promise of the most fruitful results. Possibly some newer method of diagnosis will have to be employed before the bacillus can be universally detected in these ambulatory cases, as they are called, but in some of them Hueppe of Hamburg has found the comma bacillus, and it is probably only a question of time before its detection becomes general. For such cases, however, a more delicate test may be required than that now employed in the more fully developed cases.

When, either by bacteriological or by circumstantial evidence, the case is shown to be one of cholera, the treatment must be carried out with thoroughness; the more so as in fully developed cases all treatment seems to be absolutely devoid of effect. Warmth, rest and invalid diet are essential. The patient must be sent to bed, solid food must for the time be forbidden and warm poultices applied to the abdomen. Up to this point there is a pretty general agreement; but on the question of the drugs to be given there is a great divergence of opinion. Some physicians appear to be constantly on the look-out for some definite morbid material which they conceive

can be driven out of the system by main force, that is, by powerful aperients. Others depend on quieting the nervous system by sedatives and thus neutralising the excessive action caused by the toxins. The first view is represented by those who give large doses of calomel, the second by those who give large doses of opium. It is hardly conceivable that bacilli can be driven out of the system by aperients. That some may be expelled from the intestines is possible, but it is more than doubtful whether bacilli, so long as they are present in the secretions only, have any toxic action. When symptoms of cholera have been developed, the bacilli have already taken up their abode in the tissues and toxins have begun to be formed. They cannot be dislodged, but, as in the case of tuberculosis, the soil may be made less favourable to their cultivation. This is not likely to be done by irritating the mucous surface of the intestines with calomel, while any antiseptic action of the mercury would be confined to the bacteria contained in the secretions. Opium, on the other hand, appears to have been successful in many cases in checking the disease in its preliminary stage. Some success, too, has been claimed for the calomel treatment. At present, however, the number of ambulatory cases in which the comma bacillus has actually been found is too small to establish any definite basis for treatment. In nearly all the cases treated the diagnosis rested on indications which are now considered to be fallible. There is always the possibility that the symptoms were due to some other cause, and that the cases were not really cholera at all, but something simulating it. The treatment cannot be established until it is thoroughly tested on cases in which the bacillus has been found. Whether the effect of opium consists solely in allaying the irritation of the nerve centres brought about by the action of the toxins, an irritation the effects of which are seen in a disturbance of the balance existing between the two sets of nerves (sympathetic and spinal) which control secretion in the alimentary canal, is uncertain. It may have a further effect in diminishing the susceptibility of the mucous membrane and thus checking the manufacture of the toxins. In any case, the symptoms are due to irritation

of the nerve centres. Without attempting to define the share taken respectively by the cerebro-spinal and sympathetic systems in promoting and in checking secretion we may speak of the branches which increase the supply of blood by dilating the vessels and those which actively promote secretion as the "vaso-dilator" and "secretor" nerves ; those which act in opposition to them as the "vaso-constrictor". In cholera the first symptoms appear to be caused by the undue stimulation of the vaso-dilator and secretor nerves. Meanwhile the vaso-constrictor nerves are overpowered or are morbidly inactive, and an abundant and morbid secretion results. The "algide," or cold stage, would be due to an equally violent action of the vaso-constrictors, either primary or as a result of reaction from the former condition ; that is to say, of an attempt to overcome the action of the vaso-dilators. The extreme coldness of the surface and extremities is due to the absence of blood in the vessels on account of the powerful contraction set up in them by the vaso-constrictors. This is confirmed by the appearances after death, for the arterial system and capillaries are usually found almost empty, while the whole nervous system is gorged with blood.

When, therefore, cholera has attacked a human subject, even in a mild or incipient form, our war with the microbes, as microbes, is practically at an end, so far as this particular case is concerned. It is now the effect on the nervous system with which we have to deal ; and it is only by controlling the nerves of secretion and dilatation in the first stage, and those of constriction in the second, that we can hope to exercise any influence on the disease. It is evident that in this disturbed condition of the nervous system everything which tends towards its further stimulation or excitement, whether through the mucous membranes, the skin, or the muscular system, must be avoided. Perfect rest, abstinence from solid food, and keeping up the temperature of the body are, therefore, indicated both by reason and experience. These measures, of course, are not directly curative, but may sometimes give Nature the required conditions for a successful struggle against the disease. For the actual control of the diarrhœa we must

depend upon opium. This is the only drug equal to the emergency. All remedies which have gained any deserved reputation for checking cholera have opium for their basis. The application of heat and cold to the spine are remedies which have been shown to have a powerful effect on the vaso-motor nerves, the former causing constriction of the blood-vessels, the latter dilatation. Thus heat applied to the lower dorsal and lumbar vertebræ might be of advantage in the secreting stage, and cold applied to the same region in the algide stage. During any epidemic of Asiatic cholera it is of the highest importance not to neglect those insidious attacks of diarrhœa, which are so often warnings of the graver disease. When the disease is fully developed it is a matter of almost universal experience that no treatment, even the most heroic, has any effect whatever.

Of the bacteriology of Asiatic cholera there is not much that is new to record. The comma bacillus, or, as it is now called, the *Spirillum cholerae Asiaticæ*, discovered by Koch, is one of the most sensitive of micro-organisms, easily acted on by surrounding conditions, and, in the struggle for existence, unable to hold its own against foes of its own size. The methods used for the bacteriological diagnosis of cholera are still the same as those originally employed by Koch to ascertain the presence of the bacillus, *viz.*, microscopical examination and cultivation. Recent experiments, however, have shown that, in common with many other of the pathogenic bacteria, it is able to resist extremely low temperatures. The experiments made at the Jenner Institute of Preventive Medicine* showed that this, in common with numerous other bacilli, can be exposed for twenty hours to the temperature of liquid air (-182° C. to -190° C. = -295° F. to 310° F.) without the slightest impairment of its vitality. The cultures were made on various media, solid and fluid, and, after exposure, were carefully thawed and examined. "The fresh growths obtained from the exposed tubes were normal in every respect,

* "On the Influence of the Temperature of Liquid Air on Bacteria," by Allan Macfadyen, M.D., *Proceedings of the Royal Society*, vol. lxvi.

and the functional activities of the bacteria were equally unaffected." * The prevalence of cholera in hot climates is not accounted for by any inability on the part of the spirillum to resist the influence of cold.

GENERAL CONCLUSIONS.

In speaking of the origin and prevention of epidemics I have confined myself chiefly to the greater scourges, as these may be considered types of epidemic disease generally, and their causes will include those of nearly all other diseases which assume an epidemic form. The knowledge of such causes is the great aim of the study of preventive medicine. If the causes of disease are known, the means of prevention readily suggest themselves. That epidemics still prevail is due, in part, to the fact that some, at least, of the factors which produce them are still unknown; but it is also due, in part, to the fact that some of these factors are beyond the power of man to control or modify. There are controllable and uncontrollable causes; but if the former only were known, it would make a great impression on the mortality of the human race. The history of the plague appears to show that some of its causes are beyond control. Modern experience, too, shows that sanitation will not always prevent it. The history of typhus, on the other hand, shows that this disease can be almost entirely stamped out, and that its causes are to a large extent controllable. The history of cholera has yet to be written; but its geographical origin is known, its causes are being traced, and progress has been made towards its prevention. The same may be said of the more familiar diseases, diphtheria and scarlet fever. The former has been traced, the latter is still untraced to its bacterial origin, but the geographical distribution and more general causes of both may now be defined with greater accuracy by means of the information resulting in this country from the Act for the Compulsory Notification of Infectious Diseases. With regard

* "On the Influence of the Temperature of Liquid Air on Bacteria," by Allan Macfadyen, M.D., *Proceedings of the Royal Society*, vol. lxvi.

to small-pox no such result is to be looked for. This disease has been shorn of half its terrors, not by the discovery and removal of its causes, but by a compromise and a substitution. Beneficial as vaccination has been in saving and prolonging human life, it has, by artificially preventing or masking the disease, shut out the possibility of ascertaining its ultimate causes. The causes which produce small-pox epidemics may still be in existence, but they are cut short in their course, and it is therefore impossible to trace them. We can hardly expect to discover the normal causation of small-pox while vaccination continues, and perhaps, if the latter is efficiently carried out, there may be no necessity to do so. It may be more in accordance with scientific principles to remove the causes of an evil, but we must sometimes be contented to leave the causes alone and endeavour to minimise the results.

The spirit of Positivism, of Materialism, of Utilitarianism, permeates to a large extent the whole field of modern science and literature. Especially is this the case with medical science and literature. The tendency is to ignore all that cannot be examined by the light of recent observation and weighed in modern balances: to limit the field of research to the field of vision. Individual facts, individual cases, individual specimens are the objects of attention, and even collective investigation has collapsed for want of support. Pure experimental science claims all our devotion. The worship of the practical is the order of the day. Yet there are certain directions in which the study of disease conscientiously and comprehensively pursued traverses the bounds arbitrarily set by the systems above referred to. The origin of disease like the origin of life is still enfolded in mystery. Not only are there, as Shakespeare says, more things in heaven and earth than are dreamt of in philosophy, but there are more things in earth alone than can be explained by modern science. Physical science will sometimes, however much we determine to restrain it, verge upon the metaphysical.

Meanwhile we can study the history of the past with advantage. We know that from the earliest times the life of man on our globe has been a constant hand-to-hand struggle

against foes whose advantages were so great that his victory, and even his successful defence against them, would have seemed an impossibility. Whether man, as he now exists, is the result, after a countless series of ages, of evolution from a primordial germ, or whether he was first created in his present state of physical perfection we have no certain knowledge, and perhaps never shall have. Both of these views have their ardent supporters, and there are great difficulties in the way of accepting either. Equally conflicting are the opinions respecting the later origin of the natural order Bimana, with its single species, Homo. Are all the present races of men—black, yellow, white and copper-coloured—sprung from a single pair of human beings? And if not from how many pairs? Are the Caucasian races descended from one ancestor, the Mongolian from another, and the Negro from another? Or is each division the offspring of several primal pairs? The number of original human types has been variously estimated by life-long students of anthropology at one, three, twelve and sixty, besides various intermediate numbers.* Among these conflicting statements it is hopeless to attempt to decide. We can, however, trace, by the observation of buried human skeletons, of the shape and size of the skulls, of the weapons and other implements, and of the remains of other animals found in conjunction with them, the development of man on the earth from a lower to a higher state of civilisation, and can thereby form some idea of the struggles which he had to undergo at this early period.

From such evidence we may learn that, partly by Natural Selection, partly by increasing adaptation to surrounding conditions, partly by the introduction, after a time, of new races

* *Vide* Darwin, *The Descent of Man*, chap. vii., p. 174. Virey, he tells us, reduces mankind to two original types, Jacquinot to three, Kant to four, Blumenherch to five, Buffon acknowledges six, Hunter seven, Agassiz eight, Pickering eleven, Bory St. Vincent fifteen, Desmoulins sixteen, Morton twenty-two, Crawford sixty and Burke sixty-three. Darwin himself (p. 178) considers the marked similarity both in the mental and physical features of the races of mankind sufficient proof of the unity of their origin. A diverse origin, he believes, would have left some traces in the structure of the bones.

and the consequent interchange of mental and physical traits, the palæolithic and neolithic inhabitants of Europe, the cave-dwellers and lake-dwellers, have been transformed by slow degrees into the civilised races which now people Europe and dominate the greater part of the New World. The whole of Europe, there is little doubt, was once inhabited by savages lower in the scale of civilisation than any now existing in the world.

Whatever his origin, then, we know that man was placed in the world in an apparently helpless condition, unarmed and unclothed, surrounded on all sides by gigantic animals, armed with powerful weapons given them by nature, clothed in nature's clothing, possessed of strength in proportion to their vast size, and prepared to contend with him for the possession of the world. And we know that man was the conqueror. For these giant animals are now known only by their skeletons found buried underground, and later generations of men have dug up their bones, studied their physical characters, labelled them and placed them in their museums—the trophies of an earlier age. They have disappeared and man has survived ; for man, although apparently so helpless, possessed, albeit perhaps in a rudimentary form, what the animal had not—the gift of reason. His powers of reasoning, of providing for future emergencies, called forth as they were by the necessary struggle for existence, made him more than a match for his powerful foes. Unprotected, he made the vegetable and mineral world subservient to his interests, and built houses of wood and stone : unarmed, he made weapons of the same materials, as well as of the bones of his conquered enemies, and at a later period discovered the use, for similar purposes, of bronze and iron : unclothed, he wrapped himself in the natural covering of the animals he had killed. And the discipline was a necessary one. The necessity of fighting for his life called into action his nascent physical powers and completed his physical development. It called into action the nascent powers of his mind, and commenced the development of those mental faculties which have done so much in the past and are destined to do so much in the future.

How long this struggle lasted none can tell. Analogy points to the conclusion that it was much longer in some parts of the world than in others, and that the more advanced races were ever preying upon those less advanced, and thus bringing about an intermixture of races highly favourable in the long run to the progress of the latter. The evidence of Archæology shows that at some remote period the stone age must have been practically universal. Flint implements have been found in great abundance, not only throughout Europe, but in Egypt, the early home of civilisation, as well as in many parts of Asia, and their employment has been traced even to the ancestors of the Jews and Chinese.* Yet even these do not indicate the earliest ages, for man must have been long an inhabitant of the earth before he could make an implement even of flint.† The war carried on by man against the lower animals, therefore, must have extended over an enormous period, and the different degrees of civilisation among mankind depended on the respective rapidity of their development; this development being in a direct ratio to their success in the struggle. The ancestors of the Andaman Islanders and of the now extinct Tasmanians were at one time on a par with those of the cultured Englishman. The latter has developed by more rapid stages.

* Darwin, *Descent of Man*, pp. 50, 145.

† *Ibid.*

(*To be concluded.*)

DR. LESLIE PHILLIPS ON MEDICAL AID ASSOCIATIONS.

DR. LESLIE PHILLIPS has sent us a copy of a memorial which he has addressed to the President and Members of the General Medical Council. The following extracts indicate the position taken up :—

“The ‘Medical Acts’ of 1858 and 1886 provide that only registered medical men are entitled to recover charges for medical services. Even a medical man, holding the necessary degrees or licence, may not recover fees unless his name is on the Medical Register.

“*A fortiori*, an unqualified person or persons may not recover medical fees.

“Inferentially there is no doubt that the Act recognises no right of unqualified persons to ‘own’ medical practices, a view which your own law advisers will doubtless confirm.

“Now all over the country unqualified persons are owning and directing medical practices carried on by means of salaried medical officers (*i.e.*, by ‘farming’ duly qualified men).

“These practices are called by diverse names, such as Medical Aid Associations; Dispensaries; Medical and Surgical Consulting Institutes, etc. The principle, however, is the same in all, *viz.*, the practice belongs to unqualified persons, and the mere professional style is immaterial. The doctor is certainly not the owner of the practice, and, moreover, often he is under a bond not to practise in the district, apart from the Association, after he leaves their employ.

“For the sake of lucidity, let me take an example with imaginary names :—

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(Continued from page ^{Vol x} 301.)

MAN'S work did not end with the extermination of his gigantic foes. The identical forces which brought about their destruction paved the way for others still more formidable. In general terms it may be said that two powerful enemies, largely dependent on one another for their continued activity, have from the earliest times waged incessant warfare against mankind, taxing his powers to the utmost, and on some occasions succeeding in sweeping off half the population of the world at one fell swoop. One is perverted moral energy, the other disease.

The close connection of these two forces does not immediately strike the casual observer, but it is in reality so intimate that one can hardly be discussed on any broad basis without the other. It has been observed in all nations from the earliest times, though a different construction has often been put upon it and a supernatural aspect given to a natural sequence.

The old Hindoo poem, called the "Mahaharata," shows that in India illness was always looked upon as a punishment by the gods for some sin committed. This view was held throughout the whole of India, as well as China, Asia Minor and Egypt. The *Iliad* of Homer shows that it was held by the Greeks. The Old Testament Scriptures and the writings of Josephus show us the firm hold this doctrine had on the

hydrate. It is more common in men, in the excitable and neurasthenic.

It is characterised by pain of a boring character coming on some time after eating, the pain is worse and earlier after a carbohydrate meal or after a cup of tea, the hydrochloric acid is secreted fast and has not enough proteid to fix it. The action of the saliva is prevented almost as soon as the food is swallowed. A proteid meal relieves the pain at once.

There is usually thirst and increased appetite, the hydrochloric acid causing the stomach muscle to contract more energetically and pass on the food, but occasionally the acid leads to spasm of the pylorus with some dilatation of the stomach and an intensely acid pyrosis.

The diagnosis should be confirmed by passing a stomach tube and testing the gastric juice by Gunzburg's reagent (1 gramme of vanillin and 2 grammes of phloroglucin in 30 c.c. absolute alcohol).

It is best treated by a period of absolute milk diet, the interesting researches of Pawlow on the secretion of gastric juice having shown that milk causes the least amount of secretion of gastric juice; bread is the next article of diet to be allowed, Pawlow having proved that that produces a less amount of gastric juice and also a less degree of acidity of the juice than meat, which should not be taken till all signs of hyperacidity have disappeared. Bismuth and magnesia an hour after meals are useful in these cases, and 3 grains of taka diastase with 20 grains of sodium bicarbonate should be given at meal-times when bread is allowed. In very obstinate cases lavage with water containing tannin is said to have given good results.

minds of the Jews. In the first century we know that it was accepted by them as an established fact. "Who did sin, this man or his parents, that he was born blind?" This was their sole theory of the causation of disease. The only question left for discussion was whether it was hereditary or acquired. The same view of cause and effect is shown in the history of the Roman Empire, and in our own country, so late as the year 1665—the year of the Great Plague of London—Dr. Francis Herring speaks of the outbreak as "*Ictus Iræ Divinæ pro peccatis hominum*—the stroke of God's wrath for the sins of mankind. This (he says) is not only the opinion of divines, but of all learned physicians, and acknowledged by the blind heathen in all ages by the light of nature."

This is probably the reason for medicine having been for so long, in ancient times, in the hands of theologians. When, however, it has thus been subject to religious control, it has always been in a stagnant condition. The great work of making medicine independent of religion and superstition, and of studying it on inductive principles, was begun more than two thousand years ago by Hippocrates, and continued in recent times by Servetus, Linacre, Caius, Cæsalpinus and Harvey. Nothing has been so fatal to its true development as having been for thousands of years in all countries in dependence on the received religion and its exponents. In our own country it was not till the beginning of the sixteenth century that Medicine was released from the fetters of Ecclesiasticism. Before that time it had been to a great extent in the hands of the clergy, and had in consequence been practically at a standstill for many centuries. Its real progress now began, and led up to the great discovery of Harvey a hundred years later. This event was the direct result of its newly acquired freedom, for had Harvey lived during the period of ecclesiastical ascendancy it is more than probable that he would have shared the fate of his great forerunner, Michael Servetus.

Theology concerns itself with the existence of moral evil in the world, Pathology with that of physical evil, and there can be no doubt of the close connection of the two conditions.

This, however, can give no right to Theology to set limits to scientific research. The limits of each must be strictly defined, or no progress will be made. Still, the most extended research has not been able entirely to sever the connection. Indeed, the history of disease, past and present, tends to show that the greater part of the disease now existing in the world is due either directly or indirectly to some neglect of the laws of nature, justice or morality. To moral evil, or perverted moral energy, most of the diseases with which we are acquainted may be ultimately traced. Even the ancient custom of attributing each disease to a particular deity is often only the expression, in allegorical language, of a scientific fact, possibly derived from an earlier and forgotten period of scientific culture. We are not often mistaken, even now, in attributing certain diseases to Bacchus, others to Venus, while Mars employs the emanations proceeding from the dead bodies of his victims on the field of battle to spread wide the epidemics of plague, typhus and cholera.

In view, therefore, of these relics, or germs of truth in old-world theories, may it not be possible that in earlier times certain races of men had attained to an accurate and extensive knowledge of science, ~~but~~ that these races have degenerated, but still retain, by force of habit, the old customs and traditions of their forefathers, without understanding the meaning of them? They have lost all traces of their origin, and continue to observe them only as unmeaning superstitions. It is by no means uncommon, even among civilised nations, for customs originally based on the soundest reasons, to be continued long after those reasons are forgotten, and thus to become mere superstitious exercises. The same is the case with old traditions. Allegorical language, when employed to represent actual events, has a tendency, when it becomes familiar, to be construed in a literal sense through mere sluggishness of thought. It is not difficult, in some cases, to trace the gradual change of meaning. It is perfectly intelligible, for instance, that Boreas, the North Wind, should have helped to destroy the Persian fleet. The fact thus stated, it is by an easy transition of

ideas that Boreas comes to be regarded as a Deity favourable to the Athenians, and to be worshipped by them. Ulysses, too, in the *Iliad*, calling upon Minerva for aid, simply represents the plain fact of a man making a cunning use of the advantages which Wisdom confers on him. By a too literal interpretation of such allegories a system of superstitious polytheism gradually springs up. Abstract ideas become first personified and then developed into deities. The allegory remains, but its hidden meaning is forgotten. Thus every disease whose cause has once been ascertained is liable to be attributed to the particular deity which represents that cause. Nor is this transition of thought necessarily connected with mental deterioration in other respects. The Athenians, at the time of their highest culture, had become, as St. Paul calls them, *δεισιδαιμονεστέροι*,* *i.e.*, polytheistic, or demonistic, in an extreme degree. It may, possibly, be a sign of approaching deterioration. The Athenians had certainly reached their intellectual climax at the period referred to.

Let us now return for a moment to the consideration of primeval man, who has, we may assume, advanced a stage or two on the slow road towards civilisation. He has pitted his insignificant self, armed by nature only with the germs of mental development, against the antediluvian monsters by which the world was overrun and has overcome them. They are all swept away from the face of the earth, and man has come off victorious in the struggle for existence.

This was man's first means of education, his first experience of discipline. How long this struggle lasted we have no means of knowing, probably many thousands of years, but it was this which made man what he was at the dawn of civilisation. The constant necessity for concentrating all his powers of mind and body on defending his life against his gigantic foes, and securing food for himself, brought his physical powers to a state of great perfection, and stimulated his mental development. Without this necessity it is probable

* Acts xvii. 22.

that, in default of the impetus for leading a life of activity, his mental and physical powers would have dwindled away for want of employment. Physical necessity brought about the first stage in his evolution.

Man, however, has now acquired powers which are apparently of no further use to him ; his only education has been one of war, and his foes exist no longer. He feels his power and energies greater than ever, working within him, clamorous for further employment ; and so, in his dilemma, he turns his hand against his fellow-man.

It is at this point that we first come in contact with a condition of things which continues to the present day. Man, we know, can communicate disease to the lower animals as well as take it from them. He may, therefore, have begun to suffer from disease during his prolonged conflict with the animal world, conveyed either by the teeth or by the decomposing bodies of his formidable foes. It would appear, too, from modern observations on savage races, that uncivilised man is extremely liable to disease from change of climate or any other changed conditions ; resembling in this respect, as Darwin says, the anthropoid apes.* It is possible that some diseases may have originated in this way, and been developed at a later period into more formidable outbreaks. The more extensive prevalence of epidemic disease, however, must have commenced during those tribal wars which were so common before and during the barbarous ages. Whether disease and war were contemporaneous in their origin we cannot say, but there is much to favour such a suggestion. It is, at least, highly probable that the earliest germs of epidemic disease found their nidus in the exposed and ill-dressed wounds received in tribal conflicts during the ages of savagery. In any case, as war increased in the world, disease must have increased also. There is, of course, no positive

* *Descent of Man*, p. 188. Darwin also believes that men in the savage ages fought among themselves for the possession of the ladies of the period, after the manner of some of the inferior animals, *e.g.* seals, wild bulls, red deer, etc. This would be another but a minor cause of the early spread of disease.

proof that war can of itself originate an outbreak of zymotic disease, or is necessarily a precursor of it; but it always brings about the most favourable conditions for such an outbreak, and for the propagation of pathogenic bacteria both within and without the body. The atmosphere, impregnated with decomposing animal matter from the bodies of the slain, becomes a most fertile soil for their propagation, and, if present at all, they can hardly fail to flourish in it. At the same time, the individual, whether soldier or civilian, is in the most receptive condition. The soldier, worn down with fatigue and insufficient food, becomes an easy prey to disease, while the famine, which is so often the consequence of war, makes the rest of the population almost equally subject to it. Whenever disease first made its appearance in the world, there can be no doubt that its more formidable inroads upon the race commenced when human beings began to concentrate their forces against one another.

From this remote period to the present day the life of man has been a constant struggle against a foe who works in the dark—a foe who depends not on size and strength but on subtlety and invisibility; a foe who is so small as to be practically unseen, and who never manifests his presence in his victim's body until he has made a partial conquest over it. Yet even over this insidious foe man has gained and is still gaining great advantages. This struggle with the disease microbe has indeed been a most important factor in bringing about the development of man's brain-power, of making man what he now is. It is this which has called into action that patient observation of nature in which so many men have spent their lives and which has led to such important results; and it is this which has occupied the lives of many of the greatest thinkers of the world. The study of anatomy, of physiology, of pathology, of chemistry, and, in a minor degree, of all the other branches of natural science, is constantly pursued with this one object, *viz.*, to find the latent foe and to do battle with it.

There is, perhaps, after all, something in common between the ancient and modern theories of disease and its origin.

Both agreed in attributing disease to some form of life on a different plane to those we usually see about us and invisible under normal conditions. Formerly it was a demon : now it is a physical micro-organism. Meanwhile, notwithstanding the great advances recently made in pathology and the collateral branches of science, we have not yet before us all the factors which go to make up a widespreading epidemic. We all live in fear and trembling at the mere thought of a defective drain. Sewer-gas is constantly associated in our minds with all kinds of disease and pestilence. Yet the connection is far from being fully understood. Many of our fellow-citizens spend the greater part of their lives in sewers, and yet these are among the healthiest people in London. Sewer men often live to a great age and are particularly free from zymotic disease.*

It was also pointed out that in July, 1859, when the Thames was in its foulest and most offensive condition, and the weather extremely hot, the public health was steadily improving,† and that although cholera was three times imported in a virulent form, it failed to establish itself.

Is sewer-gas really free from pathogenic bacteria? It is hardly conceivable that it can be normally so. Or is man able to adapt himself to live in an epidemical atmosphere? This opens up a large question, but it is possible that some-

* A sewerman in Chelsea was pensioned off a few years ago. He had been at work till he was eighty-three years old. We inquired of a firm of working bricklayers in the same parish who had been engaged for two generations chiefly in repairing defective sewage work ; during all this time neither the employers nor the employed had ever suffered from any of the diseases which are usually attributed to the presence of defective drains. This fact is possibly explained by recent bacteriological investigations (*Vide* MED. MAG., August, 1894). The examination of sewer-gas shows that it is not necessarily filled with bacteria. Koch found in the atmosphere of a Berlin sewer only three or four micro-organisms in 100 litres ; Haldane in an unventilated sewer at Bristol only 20. In both cases the air above the sewers teemed with them. The latter observer found in a Dundee sewer only 100 organisms in 10 litres of air ; whilst in a school in the same town he found 1510 and 10 moulds in 10 litres.

† Barnes, *Report of the Vestry of St. Leonard, Shoreditch*, 1859.

thing may be accomplished in this direction. We hear much of removing or destroying the micro-organisms of disease, but may it not be possible so to educate our physical selves as to be independent of them? The leaders of thought and science are telling us that it is the duty of man, and, indeed, of all animals, to accommodate themselves to their environment. We are told that when in the process of evolution animals begin to live under water, they gradually adapt themselves to their surroundings, their lungs being converted into gills. And when man removes from a hot to a cold climate, or *vice versâ*, he endeavours, not to change the temperature of the country of his adoption, but to adapt himself to it by a judicious change in his manner of living. Adaptation is now recognised as one of the functions of animal life, and of all existing organisms the human body seems to be the one most especially capable of adaptation in a physiological sense. This adaptation must take place in organs whose functions are beyond our ken as well as in those whose functions are more conspicuous and well defined. The arm of the blacksmith, the legs of the dancer, the thighs of the jockey, the skin of the labourer's palm, and the tips of the violinist's fingers, adduced by Mr. Herbert Spencer as instances of adaptation, must have their counterpart in those more subtle relations which subsist between man and the world of his unseen foes. It is clear that in these epidemics few, if any, can entirely isolate themselves from the pathogenic microbes, and yet the great majority shows itself to be proof against their influence. Judging from analogy, the power of resistance against infection must be greater after an epidemic, both in those who have survived an attack and in those who have escaped it. The strong man, morally and physically, is not he that always shuns the approach of danger, but he that meets it boldly and successfully passes through it. I would venture, therefore, to hope that in the future greater attention may be paid to cultivating man's personal power of resisting the evil influences around him than in endeavouring to create by-ways for him to escape them. In any case it is certain that the study of the external sources of diseases alone, without reference to

man's individuality and relation to environment, will always end in failure.

Man is not a being struck out of a mould by the million, but requires to be studied individually, in his moral, in his mental and in his physical aspect. There is a tendency in the present day, even in the profession, to study the general to the exclusion of the particular. Among the general public, who have not learned to discriminate, who are unacquainted with even the rudiments of physiology, and look upon cause and effect as constant, we are not unprepared for universal recipes. But fashion and routine, unfortunately, are not entirely unknown in the medical world as sources of the advice given to patients. Many can still remember the almost universal prevalence of venesection, followed as it was by the equally indiscriminate administration of stimulants, the unreasoning condemnation of malt liquors and the equally unreasoning advocacy of sherry and whisky, liquors of far greater potency, and, generally speaking, far more harmful and dangerous. It is no doubt very difficult to avoid making our own personal experience in some degree the basis of the advice we give to our patients, but such a system is the worst form of empiricism and unworthy of a trained member of the profession. I would venture to suggest that the most fruitful field for research in the present day is to be found in the examination of the conditions—mental, moral and physical—under which man in his individual capacity can resist the invasion of disease or falls before it.

The difficulties we meet with in defining individuality in the lower animals do not confront us when we come to deal with the human race. Both the species and the individual are well defined. We know, too, by daily experience, what Science teaches us as the "Law of Variation,"—that, in a physical sense, no two men are exactly alike. But this variation, which occurs in the physical, is traceable in the mental and also in the moral nature of man, and not only in physiological but also in pathological conditions of the human organism. That is to say, no two men are attacked by

disease in precisely the same manner. The variations in the degree of susceptibility to disease are infinite.

The origin and causes of disease, especially epidemic disease, cannot be even approximately traced without reference to the special liability of the individual as well as to the general conditions which made its invasion possible or probable. The difference is enormous, as has been frequently shown by experiment, between the effect of injecting a given quantity of the infecting material of tubercle into the human subject and into the guinea-pig. The same difference, only in a minor degree, will be found to obtain between one man and another, both as to the chances of introducing a zymotic poison and the intensity of the resulting attack when it is introduced.

Among the most important causes of this difference is heredity. Epidemics are hereditary just in the same way as gout and consumption are hereditary. The tendency, not the actual disease, is inherited. A man whose parents have suffered from gout or consumption is not necessarily gouty or consumptive, but he has inherited a certain constitution which will render him liable, under certain conditions, to become a prey to those diseases. In the same way certain persons and certain families are peculiarly susceptible to the attacks of zymotic disease. It may be said that every one inherits a certain degree of receptivity or resistance, modified by individual variability. It is a common observation that some children "catch everything". Such instances can only be accounted for on the hypothesis of hereditary tendency.

That the tendency to certain diseases is often inherited is, indeed, a fact which has received both scientific and popular support ; more, perhaps, than the actual results justify : but it is not always so distinctly recognised that immunity may be inherited also, and that thus, in time, the unchecked ravages of epidemic disease might result in the evolution of an immune race, a result which artificial immunisation would inevitably prevent. For in view of the present consensus of scientific opinion on the subject, it would be rash to suggest the possible transmission of acquired immunity, although certain facts with regard to the incidence of vaccinia have seemed sometimes

to indicate it. In all probability, however, immunity is the normal, physiological condition, susceptibility a pathological acquisition. In any case, the relative immunity or otherwise of each individual is a factor which can never be disregarded, either in reference to the liability to epidemic disease or to the severity of the attack.

(To be concluded.)

MODERN EPIDEMICS: GENERAL CONCLUSIONS.

By J. FOSTER PALMER, L.R.C.P., etc.

(Concluded from page 426.)

OF the assailable causes one of the greatest is starvation. Any condition in which the waste of tissue exceeds the supply of suitable and assimilable food will favour the reception and cultivation of microbes. Historical records, as well as modern observation, show that it is so. A prolonged famine has always been the precursor of the greater pestilences. "Famine and pestilence" have been classed together from the earliest times. When starvation assumes such proportions as to justify the appellation of famine, however, its effects are sufficiently obvious; but there are minor degrees of starvation which may sometimes account for the lack of resisting power in those who are in no danger of actual insufficiency. A rigid adherence to a particular regimen, or the exclusion of certain necessary articles of diet, may bring about results akin to those of starvation. Even overfeeding, where it leads to the excessive consumption of certain articles of diet to the exclusion of others, may do the same. All exclusive forms of diet are potential starvations and may entail some of their consequences. Habitual intemperance is, of course, simply starvation in another form, plus poisoning. There is a popular fallacy that drunkenness has a protective influence, but statistics do not bear this out. In Turkey, the most plague-stricken country in the world, the abstaining Turks are distinctly less subject to infection than those who neglect the precepts of their religion. Both classes of Turks, however, are more subject to the disease than the average European, who comes in this respect between the

CLASS III.—*Case* No. 9.—Perforation of appendix ; general septic peritonitis ; no leucocytosis. Death and autopsy. J. F., aged twenty. Admitted, 20th June, with appendicitis and general peritonitis. Duration of illness, five days. Moribund on admission from acute septic poisoning, the result of general septic peritonitis. Leucocyte count, 7,606 per c.mm. ; two hours after, 7,818 per c.mm. No operation admissible owing to patient's condition. Death four hours after admission. *Post-mortem* examination : Large perforation of the appendix at its junction with the cæcum ; general suppurative peritonitis.

There are one or two considerations we have to bear in mind to avoid being led into error. First of all, the presence of a complicating pneumonia renders a high leucocytosis of no value as an indication of pus, because the leucocytosis may be due to the pneumonia. A severe hæmorrhage, as in the case of a gastric ulcer or ruptured tubal gestation, will produce for a few days a high degree of leucocytosis. Deep-seated malignant disease causes leucocytosis. A blood count is thus of little value in distinguishing an inflammatory swelling from sarcoma. The examination of the blood from time to time, after opening a deep-seated abscess, will also sometimes give the surgeon valuable information, and may be his first warning that the cavity is not draining well, or that a second collection of pus has taken place. As long as the leucocytosis is gradually diminishing, the case, as far as the opened abscess is concerned, must be going on well. But a second rise will often give us a warning signal before either the pulse or temperature. I do not for a moment in these short notes wish to suggest that blood counting, or, indeed, any other laboratory investigation should supersede or take the place of careful daily bed-side examination in forming our diagnosis in any given difficult case. All I wish to show is that in certain obscure suppurative conditions a blood count may assist us in arriving at a correct diagnosis ; and that a simple estimation of the leucocytes present in the blood is an investigation which is neither tedious, difficult, or impractical.

abstaining and the indulging Turk, for the latter, when he drinks, drinks freely. These facts appear to point to moderation rather than abstinence as the best condition for resistance. The drunkard will be almost sure to succumb, sooner or later, when much exposed to epidemic influence, and, when he does so succumb, the accumulated effects of alcoholic poisoning will make themselves felt. I have seen delirium tremens follow immediately upon an attack of influenza when the patient has been for some time past slightly exceeding the bounds of moderation.

The children of drunkards, too, have been found to be more liable to attacks of epidemic disease, and to sink under them sooner than others.* As to the victims of intemperance themselves, their liability, when compared with people of their own age, is found to be distinctly greater. The diseased conditions brought about by habitual soaking can have no other effect than to diminish the powers of resistance and recuperation.

Idleness, mental and bodily, is another condition which, by producing partial atrophy, lessens the power of resistance to the onslaughts of the pathogenic bacteria. The opposite condition of overwork may of course have a similar result from excessive waste of tissue.

But these are not the only sources of enfeebled powers. If drink has slain its thousands licentiousness has slain its tens of thousands. The effects of drunkenness are, no doubt, more obvious to the casual observer, but the trained clinician knows that other causes more subtle and more potent are at work. It is probably for this reason that the Turks, although abstainers, are more subject to plague than Europeans, their religion even not erring on the side of severity in this respect. In well-marked contrast to them stand the Jews, whose well-known longevity, unconquerable vitality and unequalled mental scope and power of endurance are to a great extent the outcome of their long training under stricter laws and a higher ideal, by following which, however imperfectly, they had become, long

* Taquet, *London Medical Record*, 15th January, 1878, pp. 8, 9.

before the commencement of the Christian era, distinguished by the greater purity of their morals from the Asiatic natures around them.

There are other causes of disease in which the sequence of events is less obvious. Darwin says "that the first meeting of distinct and separate peoples generates disease".* The reasons of this are not fully understood. It is distinct from the actual introduction of new epidemics, and also from the acquisition of intemperate habits, and is said by some to be due to the disturbed relations of men to their surroundings, and to the loss of vital power from relinquishing those habits by which the various faculties had previously been kept in action. The Andamanese will die if removed from their islands, independently of all extraneous influences,† while the inhabitants of the valley of Nepaul suffer from dysentery and fever when removed to the plains. Man, indeed, when in a low state of civilisation, appears to be extremely susceptible to disease, and to resemble, as Darwin says, the anthropoid apes in being unable to move with impunity from one locality to another.

There is an idea very prevalent in the public mind, and not unknown among scientific observers as well, that during all epidemics many persons take the infection entirely through fear, while some, it has been suggested, die from fear without taking it at all, thus raising the mortality above its legitimate figure. The effects of the mental condition on the course of disease are well-known, and it is just conceivable that temporary nervous depression from psychical causes may have some influence on susceptibility, but it has yet to be proved that the spread of infection is greatly affected by this condition. That nervous depression from any cause may intensify disease, and thus increase the mortality, there can be no doubt. But fear in a healthy person does not have the depressing effect it would have in disease. Fear, like its opposite, courage, is of two kinds, moral and physical. It is only the latter that can be conceived of as favouring the invasion of disease.

* *Descent of Man*, p. 183.

† *Ibid.*, p. 188.

Great moral courage may co-exist with extreme physical fear. They are, in fact, often found together, and the more vivid the sense of danger—*i.e.*, the greater the physical fear—the greater the moral courage required to overcome it. Mere animal courage, such as we might suppose capable of forming a barrier against infection, is generally due to want of imagination or to indifference, and is often deficient in commanding intellects. Julius Cæsar is said to have hesitated whenever he ascended his chariot ; * Peter the Great to have trembled at the sight of water,† Napoleon to have confessed that he had his courageous (and therefore his non-courageous) days. None have so vivid and ever-present a sense of the danger of infection as the members of the medical profession, for none are so well acquainted with its possible consequences. Yet, in view of their frequent exposure, they are not unproportionately susceptible. It is not physical, but moral courage which supports them.

To me it seems more than probable that some confusion of cause and effect has occurred in this matter, and that a nervous shock, exhibiting itself in apparent fright, may, in some constitutions, be one of the premonitory symptoms of having taken an infection.

We all know the well-worn fable of the statistician who, going to a certain city to make observations, met the Plague coming out of it. "Plague," said the statistician, thinking to get his statistics ready made, "I hear you have killed ten thousand people in this city. Is it so?" "No," said the Plague, "I only killed a thousand. Fear killed the rest." Few ancient fables, perhaps, have ever had a more slender foundation in fact. Fear has constantly been credited with an amount of disease and death to which it can lay no claim. "It is *observed*," says Emerson, with the vague generalisation of the superficial writer, "that a depression of spirits develops the germs of a plague in individuals and nations."‡ There is

* Millingen, *Mind and Matter*.

† Voltaire, *Histoire de Charles XII.*, ed. 1751, p. 29 ; ed. Catby, 1832, p. 21.

‡ "Considerations by the Way."

no proof that fear, as a purely psychical condition, is by itself capable of influencing the susceptibility to disease. Excessive fear may in some cases be due to a condition of bodily weakness which renders its subject more liable to attacks, but fear as a temporary mental state is no more a cause of zymotic disease than drunkenness is a preventive against it. Fear, too, is the parent of caution, and we may therefore give it credit for some, at least, of the preventive measures which have been in any degree successful in mitigating the spread of pestilences. It is the absence of a reasonable degree of fear, when they appear to be at a distance, which gives the opportunity for their invasion. We find, too, that epidemics spread among the lower animals just as they do among human beings, and there can be no question here of the depressing influence of apprehension. Habitual timidity is usually the sign of a sensitive nervous system, the possessors of which are not especially liable to infection, while its opposite, courage, may either arise from utter ignorance and stupidity, or from extensive knowledge and experience: from complete self-reliance, or from an entire want of it. *Διχῶς γὰρ ἀπαθείς γίνονται οἱ ἄνθρωποι, ἢ τῷ μὴ πεπειράσθαι, ἢ τῷ βοηθείας ἔχειν.* Which of these opposite mental states is it which confers immunity from disease? We find from the actual accounts of all the great epidemics, as well as from our own experience of minor ones, that neither those whose apathy amounted to recklessness, nor those who had the utmost confidence in their own preventives, have been exempt. Upon the whole we may say that purely mental states have but little influence on the susceptibility to disease, but that during the attack they may have a depressing effect on the entire nervous system, by reason of which recovery may be prevented or convalescence retarded.

The general causation of epidemic disease is too large a subject to be more than referred to here. Many observers have their pet theories of causation, which they hold to the exclusion of all others. Yet probably all of them are only exaggerated views of causes which really exist. Some have looked upon sin as the origin of all disease, and there can be

no doubt that perverted moral energy has had a potent influence in the dissemination of many diseases. Others have been of opinion that disease is an essential part of the constitution of the world, and beyond the power of man to modify or control. It has been attributed to heat and to cold ; to the decomposition of animal and vegetable matter ; to the emanation of noxious vapours or fogs arising from the earth or from earthquakes or volcanoes ; to the influence of comets or meteorites ; to the condition of electric tension in the atmosphere ; to overcrowding ; to famine and luxury, drunkenness and abstinence, fatigue and indolence, excess and deficiency of ozone in the air, drought and flood. In the foreground now is the bacterial origin of disease. That many diseases are the result of a specific microbe there is now little doubt, but the actual development of these microbes in the body is due more to the receptive condition of the latter than to the number and proximity of the organisms themselves. Whether disease ever undergoes the process of evolution by the progressive development of these microbes cannot be stated with certainty. Its occurrence in a limited degree has sometimes been demonstrated, but the history of disease as well as clinical and bacteriological experience appear to negative its being anything but exceptional. Its occasional occurrence was shown in Pasteur's experiments with swine fever in pigeons and rabbits, each inoculation being more potent than the last, and fatal in a shorter period. The possibility, too, that disease germs may be normally evolved from harmless organisms and again return to the harmless form, must not be lost sight of.

These greater questions of etiology cannot be decided by any single set of experiments, nor by any single method of investigation. It is only by the pursuit of three methods and a comparison of their results that any satisfactory conclusions can be arrived at. First, the collective or historical method, by which the great epidemics are studied as they affect great masses of the population ; secondly, the clinical method, by which each individual case is observed as it occurs, with its *personnel* and surroundings ; and, thirdly, the experi-

mental method, by which disease is examined in the laboratory, divested of its natural surroundings, and placed under new and artificial conditions.

The presence of decomposing animal and vegetable matter in the air and its influence on the cultivation and spread of microbes have already been referred to when speaking of influenza and plague. So, too, has the influence of that peculiar state of the atmosphere which follows volcanic eruptions and earthquakes. Scientific observers are usually inclined to disbelieve in the effect of these "mephitic vapours," as they are called; yet the sequence is one which has been frequently observed. Surgeon-Major Wallich, the naturalist of the *Bulldog* expedition, although a complete sceptic on the subject, writes thus when in Iceland: "During the continuance of the eruption (of Mount Kotla in Iceland) great sickness and mortality are said to have occurred amongst the inhabitants of the islands and their cattle. Forty thousand sheep perished in the short space of six weeks. Similar results are recorded as having attended previous outbursts. They are referred to, not as secondary results of the phenomena, but as being directly and entirely due to the dissemination of the mephitic vapours."* These results, which have been observed in numberless other cases, Dr. Wallich refers partly to the mechanical irritation of volcanic dust in the lungs and partly to fear and nervous depression. The latter cause seems hardly adequate in the case of the sheep.

While discussing the subject of atmospheric contamination the question of fogs (of which the London fog may be taken as a type) cannot be quite passed over. Fog consists of condensed watery vapour suspended in the atmosphere and containing, in towns, various proportions of carbon dioxide, sulphur dioxide and particles of pure carbon. These ingredients, however, are inorganic, and although liable to

* *The North Atlantic Seabed: a Diary of the Voyage on Board H.M.S. Bulldog in 1860*, by G. C. Wallich, M.D., F.L.S., F.G.S., Naturalist to the Expedition; Van Voorst, 1862.

become the exciting cause of disease in the air-passages and to act as direct poisons by their chemical action, even to the extent of producing fatal narcotism or inflammation, there is no proof whatever that they favour in any way the conveyance of pathogenic organisms through the atmosphere. On the contrary, carbon is a disinfectant and sulphur dioxide is a most potent disinfectant and germicide ; so that, however injurious they may be in other respects, we must, in the matter of epidemics, look upon fogs rather as preventives than as causes of disease.

The collective defence of towns and countries against the invasions of disease on a large scale must, of course, be left to sanitary authorities and governing bodies generally, and forms one of the most important of their duties. On the other hand, the cultivation of the power to resist the attacks of disease by individuals rests largely with the individuals themselves, and is perhaps even more important than general sanitary precautions. When an epidemic has swept off large masses of the population, it has always been because the people have been in a receptive condition, and unable, from defective vitality, to resist its attacks.

The efficiency of an army depends primarily upon the capacity of the individual soldier. The health of a city depends upon the resisting power against disease of individual citizens. In some epidemics no doubt the malign influence seems to be irresistible, but the practical immunity of sewer-men, already referred to, shows that such immunity may be cultivated even in a poisoned atmosphere. An all-round healthy physique is of the first importance. The national sports of England have had much to do in sustaining the national vigour among our countrymen, and in keeping up the resisting power. Since civil war, which is always accompanied by famine and pestilence, has given place to more peaceful forms of exercise, the average duration of life has enormously increased.* The characteristically ardent pursuit

* The extent of this increase seems hardly credible, but a reference to early records will show that in the thirteenth and fourteenth centuries Englishmen rarely lived beyond the age of fifty.

by Englishmen of fox-hunting, shooting, cricket, football, boxing, and even the now discredited prize-fight, have helped to make England what it is by bringing about that degree of physical endurance without which our mental powers would be of little use to us. If, in these pastimes, lives are sometimes sacrificed, the balance is still enormously in their favour, for where one life has been lost, hundreds have been saved by the increased power of resisting the attacks of disease. The same may be said of the national love of the sea which we inherit from our maritime ancestors. Occasional sea-travelling, which is almost a necessity for town-dwellers, to supply the ozone they have been deprived of, must also be considered, in spite of dangers and discomforts, as one of the causes tending to increase the average duration of life in this country.

Generally speaking it may be said that all pathological conditions of the body are favourable to the reception of epidemic disease. The physiologically sound are not likely to be attacked by them. For the latter dietetic regulations should be entirely out of place. For them appetite is not only the best sauce but the best guide both in eating and drinking. Among the physiologically sound, however, cannot be included those who tend either to eat or drink more than nature requires. Their condition is distinctly a pathological one. It is impossible to speak of one who drinks alcohol on every possible occasion as sound either in mind or body. But it is only for such, for the physically or mentally degenerate, for the overindulgent, the artificial liver, the morbidly self-conscious valetudinarian, the neurotic, that instructions as to diet are necessary. The healthy man needs none of them. The great backbone of the country which sustains its health and vigour; the solid phalanx of intelligent and powerful men who have made the England of to-day and are making the England of the future, consists and always will consist, of those who, with evenly balanced minds and a sufficient degree of moral control, steer constantly their middle course, equally unmoved by the allurements of intemperance on the one hand and the extravagant claims of teetotalism on the other, by the varied

temptations of gluttony and the mystic attractions of asceticism. The drunkard, the teetotaler and the vegetarian are all morbid types, the necessary outcome of an artificial method of living. Reaction follows all such exclusive movements. A wave of drunkenness follows a wave of abstinence, and the gospel of vegetarianism is followed by the gospel of raw beef. Hereditary pathological conditions, such as dipsomania, will, in the long run, only be eliminated by the gradual process of evolution. All artificial attempts to suppress it will only result in the accumulation of the hereditary tendency, which will break out with increased force at a later period. A mixed diet in every sense of the word is no doubt one of the most important factors of the sound mind in the sound body. The special action of different articles of diet, the vexed question whether alcohol is a stimulant or a depressant, the relative value of animal and vegetable food, are matters for the pathologist only. All special cut-and-dried systems have their ardent propagandists, but they are adapted to individual and exceptional cases only, and can never be made into universal rules. With a mind and body in sound health nature is a better guide than theory. Those who follow too strict an artificial rule will often find in the end that they have made a fatal mistake in withholding some essential article of diet. In fact it matters less what we eat and drink than what use we make of it when we have eaten and drunk. A man who eats and drinks largely and spends his days in an arm-chair has done all he can to obtain the very worst effects of overfeeding. There is no waste of tissue to need repair, and the materials for repair become the source of disease. On the other hand, food utilised in active mental or bodily work supplies material for necessary repair, and fulfils its destined functions. It is possible that animal food is sometimes consumed in excessive proportion, especially in towns, although it does not appear that the duration of life is materially affected thereby. Dwellers in towns, indeed, appear to be rather less susceptible individually to epidemic disease, taking into account the relative frequency of exposure to infection, than the inhabitants of country villages, where vegetable food is taken in larger proportion.

Vegetarians pure and simple, however, are so few in number that no statistics can be drawn up on a sufficiently large scale to determine their relative duration of life and susceptibility to disease. They always have been, and probably always will be in temperate climates, a very small minority of the population. The increased susceptibility of excessive drinkers and their offspring has already been referred to.

Indeed, it is ever well to remember that disease is the result of a variety of causes; that it is not only "that which goeth in at the mouth" which is the chief cause of physical, any more than of moral evil. Other predisposing causes of disease exist, and sometimes a too exclusive attention to one cause tends to divert attention from others equally important. Life and death do not consist solely in eating and drinking, nor do disease and death always arise from errors in this respect. There are other vices besides drunkenness and gluttony which bring men and women to an early grave. But they shirk the trouble of reviewing their entire life, and find it easier to concentrate attention to a particular part of it. They think to cheat the laws of nature by taking some drug or by avoiding some one or two articles of diet, while in all other respects they continue to pursue a vicious course. This has been ably pointed out by a recent anonymous writer, whose words on the subject are worth considering. "The food and fuel of quackery," he says, "are the anxious wishes and deceitful hopes of the many to be enabled to escape the just penalties for the transgression of natural laws, and to commute their legal punishment for an easier sentence. Is there not a drug which will at once relieve me from the accumulated effect of intemperance? Cannot I, by swallowing some medicine, be delivered from the miseries of unstrung nerves, which have been deranged by years of unwholesome excitement? Is there not a tonic which, without any change of my habits—now so fixed that I cannot alter them—will brace my muscles, permanently weakened by hot rooms, sofas, easy-chairs, soft beds, late hours in which I have habitually indulged and must go on indulging? The quack (advertising or authentic) promises to cure all such by his patent medicine

or his prescription ; but the scientific physician knows that this is impossible, and that it is for the welfare of men that it is impossible. If a man might set at naught all physical and vital laws, might indulge all his luxurious desires, might use all sorts of forced excitements to stimulate his jaded sensations, might lead a long life of habitual self-indulgence, and whenever he chose, might reinstate his shaken body in health and comfort by merely swallowing a certain quantity of medicine, it would be bad for human nature by enabling men to sin with impunity."*

Final Causes.—Still, whichever way we turn, whatever real or fancied explanations we adduce of all these physical phenomena, we come at last to the consideration of final causes. It is not the part of the student of medicine, as it is that of the natural theologian, to employ the teleological argument to prove the existence of a First Cause. But the former, although he may not admit it, even to himself, constantly employs the teleological argument *backwards*. He does not argue from adaptation to design, but from design to adaptation. With him it is not, "This structure shows design," but, "What is the further object or design which this structure indicates?" Many of the greatest discoveries in physiology and pathology, including, probably, that of the circulation of the blood, have been brought about by this method of reasoning. It is certainly not uncommon for the physiologist or the pathologist to *assume* design before formulating any hypothesis on which to form a basis for his researches ; and if he does this he has stepped outside the limits of the positive philosophy. The old-fashioned watch argument, as it is called, is often said to be fallacious when applied to the works of nature. It may be so, but its use as an analogy has before now led observers to right conclusions. It is a true scientific method of inquiry to search for the adaptation of organs and functions both in health and disease in normal and in abnormal conditions, and to pursue this inquiry up to the ultimate cause of the various phenomena, wherever it may

* *Thoughts of a Physician* ; Van Voorst, 1868, page 164.

lead us. Nor must this pursuit be checked by any of the artificial boundaries set by exclusive and one-sided systems. It is as unscientific to be restrained in the search for truth by the dogmata of positivistic or materialistic bigotry as it is to be restrained by those of religious bigotry or superstition.

Final Ends.—There remains; too, in the study and treatment of disease, notwithstanding all our professions of practical utilitarianism, a spirit of striving after an unattainable ideal, a spirit which rises superior to all human experience and thus transcends the bounds of all purely experimental systems. Especially is this the case in relation to the subject now before us. This optimistic spirit is essential to the very existence of the healing art and, though often inconspicuous in individuals, exercises collectively a very great influence and carries us beyond the limits of the present to the possibilities of the future, keeping alive the ardour of research and the hope of progress.

The final end and object of those engaged in the study of epidemiology and preventive medicine is to sweep off epidemic disease from the face of the earth. This they will never succeed in doing. But the ideal must be kept constantly in view. In the search for this unattainable ideal the greatest achievements have been made, and by the mental efforts made in its pursuit the mind is kept in activity and vigour and is stimulated to further exertions. The ultimate aim of the study of medicine, said the late Dr. George Wilson, "is the realisation of immortality for man". And although this end is never attained, but is being daily defeated by the death of patients we had hoped to save, the true clinical observer never gives way to despair, but continues to pursue the struggle against death with increasing earnestness. Thus only will real progress be made. It is the personal search for truth which keeps alive man's intellectual being, as it is the personal struggle for food which keeps his physical being in health. If all our aims, physical and intellectual, were attained, we should soon sink to the condition of mere animal parasites from stagnation of mind and body. "I dread for

humanity," M. Renan once wrote, "the day when knowledge shall have penetrated all its strata. Whence then would come the instructive sentiments—bravery which is so essentially hereditary, that noble love which has nothing to do with reflection, all those thoughts which are not to be accounted for, which are in us and yet independent of us, and form the best part of the appanage of a race and of a nation?"

The sequence is true, but its consummation is in the very far distance, and M. Renan's dread for humanity is hardly necessary. There is certainly no immediate danger of knowledge penetrating all its strata. Whatever it may accomplish in other branches, we *know* that in *one* its ends are unattainable. Had M. Renan entered upon the field of pathological research, his fear of human omniscience would soon have disappeared in view of the magnitude of the inquiry and the incompleteness of the results which the human mind, during a known period of at least 4,000 years, has been able to bring about.

OBSERVATIONS ON BILLS OF MORTALITY MADE IN
THE SEVENTEENTH CENTURY.

BY THE EDITOR.

(Concluded from page 433.)

RICKETS comes in for examination next and seems to sorely perplex our author. No mention of this disease being found amongst the "Casualties until the Year 1634, and then only 14 for that whole Year" "the Question is, whether the Disease did first appear about that time, or whether a Disease which had been long before, did then first receive its Name? To clear this difficulty out of the Bills (for I dare venture on no deeper Arguments) I enquired what other Casualtie before the year 1634, named in the Bills, was most like the Rickets; and found, not only by Pretenders to know it, but also from other Bills that Livergrown was the nearest. For in some years I find Livergrown, Spleen and Rickets put all together by reason (as I conceive) of their likeness to each other." After looking "forwards and backwards" he found that "in the Year 1629 when no Rickets appeared, there were but 94 Livergrowns; and in the year 1636 there were 99 Livergrown, although there were also 50 of the Rickets: only this is not to be denied, that when the Rickets grew very numerous (as in the year 1660, viz., 521) then there appeared not above 15 of Livergrown". The Rickets, however, were on the increase and were still increasing, 190 in 1649, next year 260, next after that 327, "and so forwards with some little starting backwards in some years until the year 1660 which produced the greatest of all". As regards the "back-startings" alluded to in some years, the following is the explanation given:







Missing pages.

Erratic pagination.