

SECTION I.

SANITARY SCIENCE & PREVENTIVE MEDICINE.

ADDRESS,

BY J. RUSSELL REYNOLDS, M.D., F.R.S., F.R.C.P.

PRESIDENT OF THE SECTION.

THE causes of disease, with which preventive medicine has to deal, are so numerous and so various that it is, first of all, necessary to arrange and classify them in some logical order. This I have attempted to do in the scheme which follows, premising that it is of provisional character only, and may be found useful as a working assistant until something better is propounded to take its place.

1. The first division is between those which are inherent in the individual and those which are brought to bear upon him from outside. In the former category are to be found hereditary constitution, sex, age and temperament; in the latter, all those influences which disturb the balance of income and expenditure of both material or ponderable, and of immaterial or imponderable elements.

Every one has his life conditioned by the former. There is no possibility of eradicating the conditions, or of modifying them, when once developed in an individual; but their effects may be prevented from becoming disease, by timely recognition and counteraction. Every one, on the other hand, requires for the healthy performance of vital functions, an equilibrium between the income of material—in the form of food, air, and the like—as well as the income of heat, light, and other forces, and the expenditure or excretion, or going out of material, and of energy.

Income may be wrong in quantity, or unwholesome in quality, while outgo may be at the same time defective; and so to the introduction of new poison from without is added retained poison from within. It is by the recognition of these causes of disease, and the employment of all our antagonistic powers,

that preventive medicine may presume to be scientific in its method, and successful in its results.

The first of the inherent causes of disease is—

A. HEREDITY. There are many conditions passed down from one generation to another that are not morbid, such as configuration, height, mental and moral qualities, which are said to “run in families,” but with which we have nothing to do here. But there are others which are morbid, the influences of which we have to cope with, and if possible to intercept. They may be arranged under the heads of (1) redundancy or (2) deficiency of organs; (3) arrests of development; (4) unhealthy conditions of function or structure of particular organs, or systems of organs; (5) disturbances of the whole body, diathetic, constitutional diseases, the tendency to which does or does not show itself until different epochs of life, when specific trophic changes occur; and (6) special proclivities to “take diseases” coming from outside; and conversely, insusceptibilities of analogous kind which latter cannot be regarded as morbid, but which may sometimes prove traitorous if relied upon too implicitly.

Speaking generally the power which the physician has to diminish hereditary disease lies in two directions (*a*), the forestalling of morbidity by the prevention of ill-assorted marriages; and (*b*), the special guidance of tainted children, by all measures that can be used or devised for the purpose, by controlling moral, mental, social, and physical education, and regimen of life. This must be commenced before birth, continued in the nursery and schoolroom, and maintained during manhood, and even to declining years.

a. Marriages of consanguinity, even when there may be the very rare event of freedom from all taint on either side, are well known to become, in the second, third, or fourth generation, the source of much deformity and misery; and this in spite of all special statistics to the contrary. Marriages of consanguinity unfortunately “run in families,” and so intensify the evil; and they are doubly difficult to circumvent, first because of the primary bias to their contraction, and then because the poor creatures thus produced are specimens of Nature’s workmanship in its most untidy mood; features have rarely been duly chiselled; the sense of beauty has long been dead; while gauche figures and manners often render the victims little short of repulsive to all but those who, born under like conditions, have their faculties of perception so maimed and blunted that they know no better, and are also debarred by their own defects, from making any higher choice.

This is but a feeble account of what occurs too frequently

when some distinct hereditary taints do exist in a family, and where marriages among its members have been permitted. Definite disease, as well as deformity, is the too frequent result; and the result is both persistent and aggravated until, happily, sterilisation may set in. No one can doubt the power of "artificial selection" in the production and perpetuation of advantages or peculiarities that may have been accidentally or artificially brought about. No one can doubt the force of "natural selection" along the lines of utility and the most consummate art; and no one can fail to see, or ought to fail to see, that there exists in man the power to modify the race to which he belongs; and acting up to his highest light, in all the paths of knowledge, to use his art to diminish or destroy that which has within it, at its beginning, the seeds of its own inherent decay, being assured that if he does his work well, nature will internally perform the rest. Conversely every change, accidental or inherited, which limits the capacities of life, is liable to become fixed by transmission through successive generations.

But (*b*) there are marriages taking place daily, not those of consanguinity, but of unhealthy people, and of those who are actually suffering from developed disease, of marked hereditary character, or from as yet undeveloped taint, and this often happens when the taint is very strongly exhibited in other members of the family. Let it always be remembered that hereditary taint, although undeveloped, is in itself disease, and then the grave character of the responsibility of propagating it may be, if not duly, approximately gauged. The function of the physician is to examine carefully, and advise discreetly. He must weigh *all* the parts of the family history,—and here he will meet with the greatest difficulty, for often the facts are not known, or, when known, are either concealed or misrepresented. He must form an opinion of the intensity of the hereditariness in each particular malady, and also in the family under consideration; and he must have the courage of his convictions. This may make him unpopular or hated, but he must be strong enough to do his duty, and find, in doing it, his reward.

But it is in a very small minority of cases that preventive medicine is ever called into operation in this early stage. The minority is as small as the majority is vast in which the physician is consulted before disease has advanced into open and obvious activity.

The devices that must be employed to prevent the development or further progress of inherited disease, are as manifold as the affections themselves, and some further insight into the

prevalence of the latter may be gained by a simple enumeration of those which are the most familiar. But here let me make two remarks by way of caution. First: there is no disease that has yet been shown to be *always* hereditary in its origin, so that, *e.g.*, when we meet with insanity or phthisis in an individual we are not, at once, to conclude that it was "inherited" by him because a parent had been epileptic, or a grand-parent had died of consumption. A large proportion of hereditary diseases can be traced to no hereditary source in particular individuals, therefore we must allow that, in a large number of cases where the possibility of inheritance is patent, a certain number may have developed the disease *de novo*. Secondly, with regard to many people the anti-hygienic conditions and habits which have led to disease in their ancestors may be persistent as cherished heirlooms, and be effective for mischief now. Especially is this the case with regard to the large group of diseases of the nervous system. There is much more than the mere physical contamination by descent in the etiologic conditions of a boy or girl, who may be brought up in constant association with an idle, self-indulgent, hypochondriacal or drunken father; and it is quite impossible to over-estimate the dire misfortune to a girl of being educated by an hysterical mother. No high powers of the microscope are needed to discover the *modus operandi* of the *materies morbi* of the contagium of "bad example."

I pass now to some special examples: 1st, the redundancy; 2nd, the deficiency; as well as 3rd, the arrested development of certain organs afford scope for the teratologist rather than the physician. They furnish illustrations of curious facts in heredity, and in this way are interesting and instructive, and may be useful. Hare-lip is so often the result of a mental impression made upon the mother, that the sequence of events cannot be confined to the chapter of accidents; the same is true with regard to supernumerary fingers or toes, and these peculiarities are liable to recurrence through successive generations. Observe here that the original cause of the deformity was not hereditary but accidental, and yet that it became hereditary. This question of the hereditary transmission of acquired habits or conditions is still *sub judice*, but to my mind many of the facts recorded by Darwin are susceptible of this interpretation, notwithstanding the very strong evidence afforded to the contrary by the history of the habits of the Mahometans and Hebrews.

4. Morbid conditions of function or structure of particular organs or sets of organs, and such as do not affect the *general* health, are very commonly met with, and for some of them

much may be done. These may be resolved mainly into organic changes which limit, derange or destroy, functional activity. (a) The organs of special sense furnish the best examples of this class. Almost every variety of limitation or perversion of the sense of sight, from slight myopia to absolute amaurosis, seems to run in families. Sometimes the defects are congenital, sometimes they appear in adolescence, and again they may be deferred until declining years. It is in the early recognition of these maladies that the main hope of amelioration is to be found. Ophthalmic science is a growth of our own day, and its powers are now being used for the education and strengthening of the healthy eye; in the timely correction or removal of some sources of deficiency; and the supply of optical instruments to reduce to a minimum the disabilities with which some are born and which others acquire. Whatever may have been the pre-science of our forefathers and their skill in surgery, it has been reserved for the latter part of this century to see "the blind receive their sight," and these not only among the favoured few but among the multitude; and still further, not as the result of any painful operation, or in the face of any risk, but simply by adding to a profound and scientific knowledge of the structure and functions of the eye the aid yielded by a mastery of the sister science of optics.

(b) Deaf-mutism, again, may be hereditary, congenital, or acquired, and some of the most astounding results of training have been witnessed in this field. A congenital deaf-mute, if left alone, becomes as a rule an imbecile; one who has been born with language and hearing but has lost them both in early life, may become the same, if nothing be done to educate him, while the results of due teaching are marvellous. Two boys, brothers, were brought to me at about three and five years of age; they were congenital deaf-mutes and imbeciles, and examples of the same miserable condition were found in other members of the family. A very clever, most patient and persevering tutor was found for these boys, and when the elder was between eleven and twelve years of age he had been taught to read, write, and speak with accuracy.

He could read not only from books but from the lip or from the hand; could articulate very well; could parse a sentence in English and translate it into French or German! There are thousands in this country who have no advantage of this kind, and so they remain to the end of their days mere vegetating boys and girls, or men and women, a burden to their relatives and a disgrace to the community.

5. The fifth group of hereditary diseases is one so large that it seems to include almost all the maladies that flesh is heir to,

except those that are the result of direct introduction of poison from outside. They are as numerous as the organs of the body, and as various as the possibilities of change. Such inherited ailments agree however, in their consisting of a general tendency to disturbance of varied functions and structures, and in their becoming expressed in the form of so-called diathetic or "constitutional" disease.

If there are, on the one side, occasional examples of hereditary "nervousness," or simple epilepsy; there are, on the other, tubercle, scrofula, Bright's disease, and others about which it may be truly said, "the whole head is sick, the whole heart is faint, and there is no soundness in it." Yet, even in extreme cases, preventive medicine has its work to do.

(a) The condition of ill health most frequently met with in hereditary diseases of the nervous system, is one of undue liability to disturbance;—given in any one of the antecedents of a particular individual, either insanity, epilepsy, hysteria, tendency to excesses, great nervousness, or what not, the outcome may be any other of the maladies mentioned, and not at all necessarily a reproduction of the initial disease. It is by bearing this fact in mind that the physician will see the necessity of being armed at all points. It is not enough to avoid or counteract the tendency to convulsions in the first dentition, the second, or the third, but other diseases such as chorea, hysteria, wilfulness, tricky ways, cruelty, and deceit must be borne in mind. No routine practice will be useful; it is often worse than useless. For example a child at twelve becomes nervous and restless, his father had fits when he was young, and is an odd man now; some other members of the family had convulsions, an uncle was epileptic, and therefore this is regarded as a case for bromine, a diet restricted to insipid inefficiency, books are to be put aside, school abandoned, the boy petted and pampered at home in the bosom of his family, several of whom are somewhat queer, and so—in spite of bromide and of a redundancy of counsel—he becomes a victim to the very malady from which so much was done with the intent to protect him; and this and the like has happened scores of times in my experience, when the boy was simply anæmic, wayward, underfed, and not quite straightforward in his ways, and really required iron, not bromine; good food and plenty of it; the discipline of school, as well as its work; the companionship and the sports of his own sex, instead of the petting of his sisters, and little brothers, over whom he tyrannised in secret, and so escaped the thrashing he deserved.

Another illustration of the like mistake is seen often in girls, whose mothers have passed through an early life of indulgent

petting into one of hystero-mania, or egomania, and gradually into that of chronic silliness and self-absorption, and then follows the sacrifice of parent, husband, child, or friend to each and all of her foolish whims. "No one has ever opposed her," "She has always had her own way;" this is what we are told, therefore she must go on as she has been doing, and her daughter must follow suit. There is nothing the matter with the girl except occasional migraine, from some real or hypocritical fasting, or from sitting up at night without food poring over a trashy novel. She can sit a horse, but she cannot sit upright in a chair; she can play lawn-tennis, but she cannot walk; she cannot sit out "morning church," but she can dance for five consecutive hours. "She is just like her mother," her relatives exclaim; "we dare not thwart her, or she will become as bad," and so she goes her own ways and fulfils their worst predictions. These are but common illustrations of the fault of thinking that hereditary disease must take its parent form; or of acting upon the presumption that, as the form is the same, there is nothing to be done. On the contrary, much may be done by taking patients from home, and all its evil ways; giving regular employment of useful sort; exercise of mind and body; fresh air, good food, plenty of rest at reasonable hours, and utterly declining to admit the existence of anything but a slight malady that needs, however, definite treatment, and that of the kind described.

(b) Of gout, rheumatism, tubercle, scrofula, syphilis, cancer, Bright's disease, and many others, it is only necessary to observe that to be forewarned is to be forearmed: and that, when there may be a strongly marked hereditary taint, its development into disease may often be delayed or eradicated by timely care. We lose more lives through carelessness than through ignorance. May not the thin limbed, and thin faced boy, with pink and white complexion, over tall for his age, who easily perspires and passes lithates; whose temperature and pulse run up quickly; who declares that he is very well until some general languor or local pain compel him to give in,—might he not often be saved from attacks of acute rheumatism, by careful habits, food, clothing, and medicine, and so spared all the troubles of a damaged heart? We have to look for these things, not have them thrust upon us. The day may be yet distant, but it will surely come when regulated physical examination of the bodies of the young will be as necessary and as common as examination in the Latin grammar, or the multiplication table, or other matters.

6. But there is another group of hereditary conditions, not common, but well marked, viz., a proclivity to "take diseases,"

sometimes of several sorts, sometimes of one only, for, *e.g.*, such as scarlet fever or whooping-cough. The converse condition of insusceptibility cannot be regarded as a morbid condition. Caution as to exposure is almost as important in the one case as in the other, for rashness is not without its victims, and to this allusion has been made already. Many precautions must be taken on behalf of those who have hereditary taint, for the conditions may be multiform, which come together to produce from it the fully developed disease. As an example of popular knowledge on this point I quote a paragraph from *The Times* of Sept. 12th, in its review of Mr. Colvin's recent "Life of Keats." The writer says, after alluding to the eminently pugnacious character of the poet in early life, "It was not till the hereditary taint of consumption, which had already killed his brother, became developed by the over-exertion of a walking tour in Scotland, that pecuniary troubles, caused by a stupid and stolidly unsympathetic guardian, combined with the hope deferred of a long engagement to Fanny Browne, and perhaps to some extent the disappointment of literary ambition, fostered a certain morbid tendency of his nature, if the term 'morbid' can fairly be applied to a turn of mind to which literature owes some of its greatest masterpieces."

B. SEX has always found its place among the "predisposing causes of disease"; and if general etiology were the theme of this address there is very much that ought to be said regarding it. But as the physician has no power to direct the production of boys or girls respectively, all that preventive medicine can do is to guide the development of each. Organs must be present to take on morbid action, but the *differentia* of sex are far wider than the possession on the one hand of ovaries, and on the other of testicles. The moral, mental, and physical conditions and aptitudes of the two sexes differ; and while civilisation has intensified, through generations, these *differentia*, the tendency of much recent fashion—I cannot call it civilisation—has been to diminish them: so that we encounter on every hand manly or "masculine" women and effeminate men. In uttering its protest against this perversion of nature, this devolution instead of evolution of the race, preventive medicine may be of service.

There is nothing to my mind more simply silly than the "cant" or "slang" that has been uttered about the "superior" and the "inferior" sex. Each may be perfect in its way, but each is spoiled when it apes the other. In rough conditions of life women may have been, and are now, better fitted for physical labour than are those whose very configuration and faculties have been modified by social habits of refinement; and it

certainly is not the aim of the obstetric physician, either man or woman, to encourage the development of the "masculine pelvis."

It is worthy of note, here, that it is not the highest qualities of man that young women imitate, but rather, on the one hand, the roughness of the youth, his bravado, and uncouth language; or on the other, the lackadaisical *nil admirari* tone of the pedant and the fop; with, it may be, an occasional dash into imitation of excessive learning, and the habits of the ascetic or recluse. The men who mock women's ways also mock their foibles, not their strength; and lisp and sigh or groan out their unsatisfied longings in vapid admiration of sentimental nonsense, whether it be in poetry, music, or painting, and find out something "quite too lovely" in a line, a strain, or a daub, that no sensible man would care to hear or see again.

The brain of women is not improved by being roughened or over-strained; and the emotional nature of man is enfeebled by this reversal of the order of Nature; and we find the tendencies to disease inverted without any advantage to either. The physician may, I think, do much in counteracting this tendency of the present day; protesting, on the one hand, against all foolish pruderies, mock-modesties, and the like; and, on the other, encouraging healthy habits of body and mind, always bearing in mind that the highest type to aim at is the perfection of woman and the perfection of man, and not the production of moral and mental hermaphrodites which, thank Heaven, are usually sterile.

Let it not be supposed that I do other than admire the great strides that have been made of late years, in the higher education of women, both for intellectual and practical work. These may be readily overdone as they are in men, and very frequently the results of over-strain are seen in illness, incapacity, and distress. Their exhibition, however, is less painful than the frivolous inaptitude and idleness of men, who, with all social and educational advantages, do nothing, never occupy themselves with any calling or pursuit, but are content to "bide or loaf about" and live upon their incomes, or their friends as the case may be. Over-strained women often become sour and cynical, and morbid, as do briefless barristers and unpopular parsons, who may have much laboriously gathered learning in their brains, but no congenial work to do. They complain of like discomforts, "diminished brain-power," as the favourite expression goes, and entire dissatisfaction with everything and everybody. Under-occupied men become hysterical and silly, and the prey to every form of hypocondriacal misery. It is the highest sphere of man and of woman to be the complement of

each other, and to combine in the work of home first, and then of all around it; but the work of the one should be a woman's work, and of the other, "all that may become a man." It is in the imitation of the ways of the other sex that women becomes repulsive, and man despicable.

With regard to sexual proclivities to organic diseases, there is something for the physician to do in being forearmed. For example, the greater frequency of simple ulcer of the stomach, of erythema nodosum, goitre exophthalmica, and the like in women; and of angina pectoris, canceroma ventriculi, locomotor ataxy, and other maladies in men, may be of service not only in diagnosis and prognosis, but in treatment.

There is, however, much that prevention may do by regulating the habits of boys and girls. In healthy exercise, the avoidance of over-strain of muscles and prolonged fatigue; in wholesome food and sufficient rest; and in a score of ways many a trouble which might easily become developed into disease may be avoided. Many cases of heart and lung disease originate in the rough games of schools; many of the troubles of women in their indolent and unwholesome school-room and after life, in the follies of their dress, and the hours they keep.

C. AGE. We know much, but understand little, of the time-ordered events of life. There is an average pulse and respiration time; there is the incubative period of life as well as of the exanthemata; dentition, puberty, climatic changes, and decay have their relations, more or less fixed, with time; and a knowledge of the predispositions attending various ages may be of service in the prevention of disease. In infancy the thermogenesis is low and the capacity for digestion limited to certain kinds and quantities of food; so that danger lurks in defective clothing, and defective feeding. There is rapid development, and the reflex functions are over-active, so that there is undue proclivity to spasm, not only of the voluntary muscles, but of the vessels; for spasm may cause infantile paralysis as well as infantile convulsion. Febrile conditions are common, and so are local disturbances of the circulation, such as internal congestions, and other forms of congestion not internal, such as chilblains. It is by regard to the nursery, the clothing, the food, and the surrounding conditions of domestic kind, that the physician will ward off much disease.

In dentition—whether the 1st, 2nd or 3rd—the nervous conditions which precede as well as accompany the eruption of the teeth must be duly regarded and foreseen, and so, many troubles averted before local discomfort of the gums has taken place.

At puberty it is by guiding the *general* habits of the individual, rather than by looking after possible *local* troubles ; by maintaining a healthy tone of domestic life rather than by special treatment, that the physician will do his best to prevent disease. We are too often disposed to be looking for some special sign of change, forgetting that "change" is always going on ; and so, sometimes, we may let golden moments or months pass by unused. The follicle of the wisdom tooth may be found in the embryo jaw ; and many of the evils of all the so-called "changes of life," exist long before any special events have made them obvious. Bearing these thoughts in mind we may always see much to guide us in advising those upon whom "age" is stealing, but who have as yet had no warning that it is so, for they are "younger than their years." Those who are "older" often come quite soon enough, but rarely too soon, for help. The horizon of thought and work ought to be made smaller when memory becomes treacherous, arteries rigid, and the heart's impulse low. Timely caution, based on facts which only the doctor knows, or from the revelations made to him in his confessional—although carefully concealed at home—might save hundreds of "shocks," or more slowly growing and increasing griefs, when some unlooked-for "break-down" occurs, and relations and friends exclaim, "This is quite too terrible ; he seemed so young a man, and was only yesterday quite busy at his work, and full of life and schemes." He ought *not* to have been busy at his work.

As in babyhood we are exposed to the wills and whims of others, to carelessness, stupidity, or over-fussing ; to bad feeding, neglect, or exanthemata ; to tumbles, broken legs, or other frivolities ; so, later on, when the romantic period of youth—be it for learning or for play,—has done its best or worst, and *early middle life* begins, the exposures fraught with danger are those of over-excitement and over-work, and against these the physician knows only too well how much he could do if the patient would but hear and follow. We pass on to *middle life*: sometimes a wholesome table-land, but often a still arduous, too arduous climb, or a slow decadence of failure and dismay ; and we see success leading to excess on the one hand, or failure plunging into dishonesty or despair upon the other, and here too we must again warn in time ; and as the life goes on to its *second infancy*, through an emotional epoch of pitiful weakness, a senile hysteria, the physician has again to use all his care to see that he, who has outlived all those who gave him joyous welcome to his cradle, is yet tended as he should be, and piously cared for to his shroud.

There is no stage of life at which we are not wanted, no age

when we are without anything to do, and let us be ever mindful of our high responsibility of foresight, being assured that in the vast majority of instances we, in spite of many prejudices, shall find ready adjutants thankful for any hints that we may give; and, by doing our work well, be spared having to frame an answer to the terrible question sometimes, quite fairly put, "Why did you not tell me this before?"

D. TEMPERAMENT is a word more frequently used than analysed; and although its striking forms are known to all, it sometimes happens that its influence on the tendency to disease is disregarded until the disease is brought about. The physician, however, should be on his guard, and try to prevent the "*sanguine*" youth or man from relying too complacently on his energy—which may not always mean strength—and so protect him from the consequences of undue hopefulness, carelessness, and from many troubles he had not in the least degree anticipated. On the other hand, the "*phlegmatic*" may have their morbid proclivities lessened or removed by timely warning, and rousing to a sense of duty; while the "*nervous*" may be strengthened against their trouble by the wise counsel of the physician, who may have the art of obtaining confidence, and speaking with authority.

II.—I come now to the *second* great group of "causes of disease," to which I alluded at the outset, viz., the disturbances of the equilibrium or balance between the necessary elements of income and expenditure, whether these be of matter or of force. It is absolutely necessary for health that we should "take in" certain things and forces, and that we should "give out" others. It is also essential that what we "take in" should be wholesome, and conducive to healthy life.

This range of subjects is so wide and varied that I can but enumerate some of them, and point out, generally, wherein the physician can act in the prevention of disease.

A. Income is both material and immaterial, or ponderable and imponderable; we need food and air, light and heat on the one hand; excretion of material, and exertion of nerve and muscle on the other. These should be balanced, or we are not in health.

1. The *income* of matter involves all that is included under the head of "Food,"—solid, liquid, and gaseous,—which may be either defective or excessive in quantity, or wrong in quality. The absence of certain elements, such as vegetables, for example, has its entail of scurvy; while deficiencies of either the albuminous, amylaceous, oleaginous, or saline elements produce their

specific morbid changes. Deficiency of food of all kinds is often, too often, sadly, the cause of multiform maladies; associated, as it almost invariably is, with other anti-hygienic conditions, such as over-work, over-crowding, and intemperance. Excessive feeding, on the other hand, which at last brings its own remedy in loss of appetite, may on the way to that stage, produce a hundred maladies of every organ in the body.

But the great source of disease, against which preventive medicine has shown its strongest powers, and with which it now wages war the most vigorously and incessantly, is the introduction of noxious matter, either with food, by the air we breathe, or by direct inoculation.

The appliances of science have done much to diminish the evils that arise from the metallic or other poisons, such as lead, mercury, antimony, steel, phosphorus, and the like; and the mode in which good has been obtained is by the prevention of their entry into the organism, and also by rendering assistance in their excretion. In like manner those more subtle poisons, which are the physical bases of all zymotic disease, are to be robbed of their power for mischief mainly by being kept out of the body. The physician has found out the sources of many of these poisons, as well as the modes by which they enter the body, and having done so has devised means for their arrest. The *materies morbi* has been separated from much that had surrounded it, and measures for its modification or destruction have been discovered and applied. Our knowledge of the definite importation of cholera, typhoid, and more recently of some outbreaks of scarlet fever, by means of water and of milk, and further, the knowledge that by simply boiling these fluids the poisonous material is deprived of its power for mischief, afford grounds for hope that, by increased observation, the sources of other maladies may be found, and means for their destruction be devised.

The magnificent results that have been obtained and demonstrated with regard to vaccination and variola have stimulated the zeal of many enthusiastic workers, and raised—as almost all beneficial discoveries have done before—a perfect tempest of opposition, misrepresentation, and frivolous and irrelevant talk. The questions of syphilisation and of inoculation for rabies must be regarded as still *sub judice*; but a sufficiently strong case has been made out in regard of both these poisons, not only to justify, but to demand further enquiry.

2. There are certain imponderables, such as heat, light and electricity, that we require for healthy life, and the deficiency in the income of which is the frequent cause of disease.

(a) We all need external warmth, and at the extremes of age the need is greatest. Many follies of habit may be rectified by the physician, even although in some individuals the constitution is so marvellously elastic that it can bear an amount of illusage that would kill many a race of animals. Whatever may be said of the process of "hardening" by exposure, it surely cannot be a universal advantage to undress under the trees of Hyde Park, in an east wind and drizzle, at 7 a.m. in the winter months, plunge into the half-frozen Serpentine, and get home to breakfast cold and blue, with chattering teeth, and exclaim with a mixture of pharisaism and apology in tone, "It is when it is cold as this that it does you all the good in the world!" There is much "tubbing" and bathing in the present day that is excessive, unphysiological, and mischievous, and there are endless follies in the form of clothing that the physician can do little to cope with simply because there are two much more popular preachers than he, viz., fashion and fad.

Excessive heat has some injurious effects in itself, but the really active sources of heat-disease in hot climates are the malarial or other poisons which are there, and the injudicious clothing, eating, and drinking which in too many places are habitual. The occupations which expose stokers, furnace-men, and the like to intense heat may be rendered nearly if not quite innocuous by attention to clothing, to the length of exposure, to the full supply of water and of fresh air, and to the alternation of work done with periods of due freedom from exposure; these things to be arranged with knowledge of the wants entailed by special kinds of labour in individual cases. To the philanthropy of employers, and the zeal for all sorts of social improvements in a rapidly growing class of men, as well as to the labours of the men of science, are we indebted for the prevention of much of the evil that excessive heat might bring about.

(b) The absence or deficiency of light, and especially of sunlight, shows its morbid effects in the impaired health of miners, navigators, workmen in cellars, in city offices, and in the night. The night-working to which I refer is such as must limit the income of sunlight to a considerable degree. Those who suffer most are the reporters, literateurs, printers, writers, and many others whose work is nocturnal exclusively, and who require some distinct changes to be made in their habits.

Anæmia is the prominent mischief brought about by deprivation of light, and anæmia means very much—very much more than mere pallor of the skin. There is no organ in the body which it does not affect; it cannot be uprooted by iron or food, or fresh air, or any other means save that of light; and we do

well in prescribing this early in the anæmia of night-working men.

The exposure to excess of light may be mischievous to the eye in many ways, but the prevention of such trouble is obvious, viz., the avoidance of such exposure. But the great majority of cases of "insolation," are to be traced to the co-operation with exposure to light, of excessive heat, bad air in tents, and barracks, unfit clothing, and irregularity of habits, together with over-exertion, and early neglect of symptoms.

(c) Electrical disturbances of health, such as occur in electric and magnetic storms afford much interesting matter for examination, but they are of comparatively rare occurrence, and are often susceptible of explanation by mental and moral rather than physical conditions.

(d) There is, however, another very common source of discomfort and disease increasing year by year in this restless age: I mean that of physical concussion of the body as a whole, or of its parts. "Accidents" show us what violent concussion may effect in one moment; but daily life points out a more serious danger than accident can do. A great amount of shaking and knocking about may be borne by some with impunity, but there are hundreds, nay, even thousands, who are now steadily, slowly but surely damaging themselves by constant travelling, and especially by railway. Such travelling is often accompanied by hard work, much worry, and exposure to the changes of temperature, which make up what we are pleased to consider as, and call, "our climate." But beside and above all these the mere recurrence of shaking or "shock" is observable enough. The most prominent effects are irritability of temper, restless fatigue, want of power of application, defective memory, want of confidence, and want of judgment, with insomnia or uneasy sleep, and depression of spirits. The jar of frequently stopping suburban trains is more commonly and quite as seriously damaging as are the occupations which lead men to travel many hundreds of miles per week. Crying children, who will not be rested by a gentle rhythmic movement, may be shaken to something like sleep by a vigorous nurse; and so may the busy man who, paper in hand, jumps into a first-class carriage at the end of a day of work and worry, and is concussed into a sort of coma by six to seven minutes of the train. In the early stages of such troubles, some modification of the daily mode of transit may be of service; but when the discomforts have gone to the point of destroying sleep, appetite, and relish for work, nothing but an absolute cessation of the travelling is of the smallest service.

B. The next great group of causes of disease may be put under the one head of modified expenditure as compared with income. There must be in health an outgoing of both material and of energy; and disease is actually present, lurking near, or very easily brought in when arrest of excretion is present.

1. The excretion of *material* is as essential as its introduction. (a) Arrest of "excretion" introduces "local" troubles, which tell back and limit "secretion," and this latter limitation becomes at once a "general" or "constitutional" disease. Retained cutaneous excreta produce acne and miliaria; arrested secretion may be followed by pleurodynia, sciatica, local paralysis, pleuritis, or any other inflammation. So with the urinary organs. Arrest of excretion affects the bladder, and the kidneys by a backward action, but the non-action of the kidneys places life in imminent peril from toxæmia of most urgent sort. So with the bowels,—habit, laziness, shyness, or what not, may lead to hernia, or apoplexy, by the straining they induce; but more frequently hemorrhoids, accumulations of faecal matter, and their consequences, are the immediate result; but if the intestinal *secretion* be either arrested or misdirected then grave constitutional disturbance is present or at hand. The same principles hold good with regard to all the systems of the body. The physician has to guide with regard to "excretion"; but common sense, about matters that are mere "pathological pap" to himself, he will find absolutely wanting, and its dictates quite unappreciable by otherwise well-informed and capable men and women, as well as by boys and girls. Want of attention to "excretion" may be long concealed, but a suppressed "secretion" at once places the patient in the doctor's hands. General medicine may do much for both, but its true rôle is in prevention.

But (b) evacuations may be excessive, and these of either blood itself, or of other fluids containing it, or its main elements in large proportion. It is enough to mention the drain of hæmorrhoids, or of menorrhagia, the exhaustion of chronic diarrhoea, diuresis, or diaphoresis, and leucorrhœa to indicate the directions in which preventive medicine may do its best; only again emphasising the common fact that these things have often to be looked for to be discovered, and then some considerable discount allowed as to the accuracy of statements made from either delicacy, the wish to be let alone, ignorance, or the "little knowledge" carried to the point of "danger," conceit, caprice, or stupidity.

2. In controlling the amount, quality, and conditions of

"expenditure," in *mental*, *moral*, and *physical* directions, the physician has a wide range of work. The elimination of force is as important as is that of matter.

There is, on many sides—mental, moral, and physical—a tendency to meet excesses of one kind with excesses of another. There is a "polarity," so to speak, in society, to be seen in the way and degree to which overwork goes along with—I cannot say begets—underwork; mental strain is associated with mental idleness; eager attempts to solve moral and social questions by something more rapid than a motto of mere "*solvitur ambulando*" impotence, side by side with the lazy "*nil admirari*," provoking egotism and uselessness of full-blown or unripe swelledness; while at the same time the training of the physical athlete is seen in heightened contrast by glancing at the waxy, cumbersome, dull stupidity of those who take no bodily exercise beyond that of lounging in the carriage or the club, diversified only by the too-frequent cigarette.

(a) Defective mental occupation begets—by way of bad hours, alcoholism, a love for poor literature, and self-indulgent habits—silliness, self-consideration, egoism, hysteria, hypochondriasis, and progressive feebleness of mind, memory, and understanding. Ten talents may earn another ten; or, *per contra*, they may be abused or lost, with character to boot, by simply being laid aside or hid in a napkin; for it is not the man with *one* talent only that may call upon himself the strong disapprobation of his Lord. To use the powers we have, and incite others to do the same, is a part of our work in the prevention of disease.

Again, the moral nature of man and of society may be stunted, misapplied, or blotted out by simple indolence. How often do we not meet with people who care nothing for anything or anybody but themselves; who read both sides of a debate, a philosophical dispute, or a police report, with a languid indifference, and without ever caring to exercise their own thought as to which is right or wrong, "because its such a bore to make it out, don't you know,"—until, by steady practice of not using the brains he has, his one little talent has shrivelled up, and when he may, perchance try, to turn it to some account, he finds that somebody or some conditions have put a brass farthing in its place. This don't-careism of young people so common now may be somewhat improved by parents and tutors, but it is the physician who will do more than either if he uses his opportunities aright.

The mere allusion that I have made to the deficiency of "physical" exertion, is enough to point out the true line that preventive medicine has to take. It is not so much in youth

as in middle life that its effects are shown, and our powers are often limited to the diminution of troubles as they occur, rather than to their prevention beforehand.

(b) In this part of "the Nineteenth Century" we come into contact with excess of work,—mental, moral and physical—on almost every hand. But let us, so far as consequences to health are concerned,—at once distinguish between work with worry and work without; which comes almost to mean voluntary and involuntary exertion. Work does not hurt much, worry does. Some are put to learn or do things that they are unfit for, and they suffer. The work may be of the kind that they cannot do, or the amount required may be out of proportion to their strength. Some men can no more learn mathematics than others can music. There is a *Pons Asinorum* somewhere, not only in Euclid, for almost everyone, and much trouble of school, and college, and after-life might be entirely spared if relatives and tutors would recognize the fact.

Mental work is not excessive if the appetite be good and the sleep sound; if these be interfered with, the student or the athlete (in muscle) is doing too much. Work for its own sake is beneficial, but under the pressure of an examination looming in the distance, or of some panic in business, work, to get over the difficulty, is often made excessive, and then worry comes on, with its train of physical troubles that attend loss of appetite and loss of rest. The functions of all organs are damaged, and well is it for the man who has the physician for his friend to help him how to arrange his life.

The effects of sudden moral shock are known almost as well as those of physical concussion; but the long continued wear and tear of a life, distracted by a conflict of emotions, is often unsuspected or unrecognised until it is too late.

Hysteria, melancholia, paralysis agitans, a confusion of ideas and purposes when any attempt is made to use them—what I have called a mental and moral chorea—through incapacity of mind, and loss of all decision and precision of thought are the most common events; but, with this, there often comes as well, some strange moral perversion, taking the form of extreme melancholia and self-accusation most frequently, but occasionally running into another, still more lamentable state, viz., that of general paralysis of the insane.

The only excess of physical exertion to which I will allude now is that of such kind as shall embarrass the heart and nervous system. There are no physical exertions which, in themselves are necessarily detrimental to the heart. Rowing, riding, walking, running, climbing, in reasonable moderation or only occasional excess are beneficial, and highly so; but when the amount of

necessary exertion is compressed into a deficient amount of time then it becomes mischievous. The heart has its own special relationships to time, and if these are seriously or persistently disturbed both functions and structure suffer. An exertion which quickens the pulse and respiration may be harmless if within certain bounds; but if the eyes become prominent, the face flushed, the lips livid, and the extremities cold and dusky, the danger point is reached. The line is an easy one to draw but a difficult one to keep. Yet I am sure it is not out of our power to help. Many cases of heart-strain may be greatly relieved by rest, and it is by violent rather than continued over-exertion that the brain becomes gravely affected. But too prolonged or too extreme an amount of physical exercise has its victims, suffering from weakened arms and legs, and other evidences of spinal exhaustion.

The fatigue of excessive muscular exertion upon the nervous system is seen in loss of sleep and appetite in a small scale; but its effects upon armies on the march has been seen in an increased frequency and severity of traumatic tetanus and other affections, partly induced by worry, defective food and clothing, and often by accompanying depression. Epilepsy, chorea, paralysis, and the like I have often found to date from physical fatigue, and to have their recurrences almost invariably traceable to the same cause occasionally brought into play.

That which we denote "preventive medicine" when applied to individuals, becomes general "sanitary science" when we have to deal with masses; and it is only by a careful scrutiny of all the *causes* of disease that we can render that science as efficient as it ought to be. It has sometimes happened that researches, in one direction, and for the attainment of one end, have been unexpectedly the means of throwing much valuable light upon cognate or outlying matters, such, for example, as the relation, almost accidentally discovered, between the drying of the soil in sundry towns and the diminution of phthisis; but in the main it has been by earnest, planned, and persistent industry that the great achievements of science have been possible.

Life is lengthened, its existence rendered less painful and more hopeful, and its ailments so much reduced by what has been already accomplished, that—given what is wanted in time and in freedom of research—there seem to be scarcely any limits to the good that we may predict for future generations. Diseases, our enemies, one after another may be diminished, rendered harmless, or stamped out of existence. The adaptation of

man to his environment may be so greatly improved, his frame so fitted to resist not only disease but natural decay, that its pains and weakness may disappear, and be remembered only in the history of evolution, and thus its inevitable end may be without either suffering or fear. The moral nature may be so attuned to its highest faith, and so free from fret, sorrow, or remorse, that death will be welcomed as was birth, for the last "enemy" that shall be destroyed is death; destroyed, *i.e.*, by being no longer our enemy but our friend.
